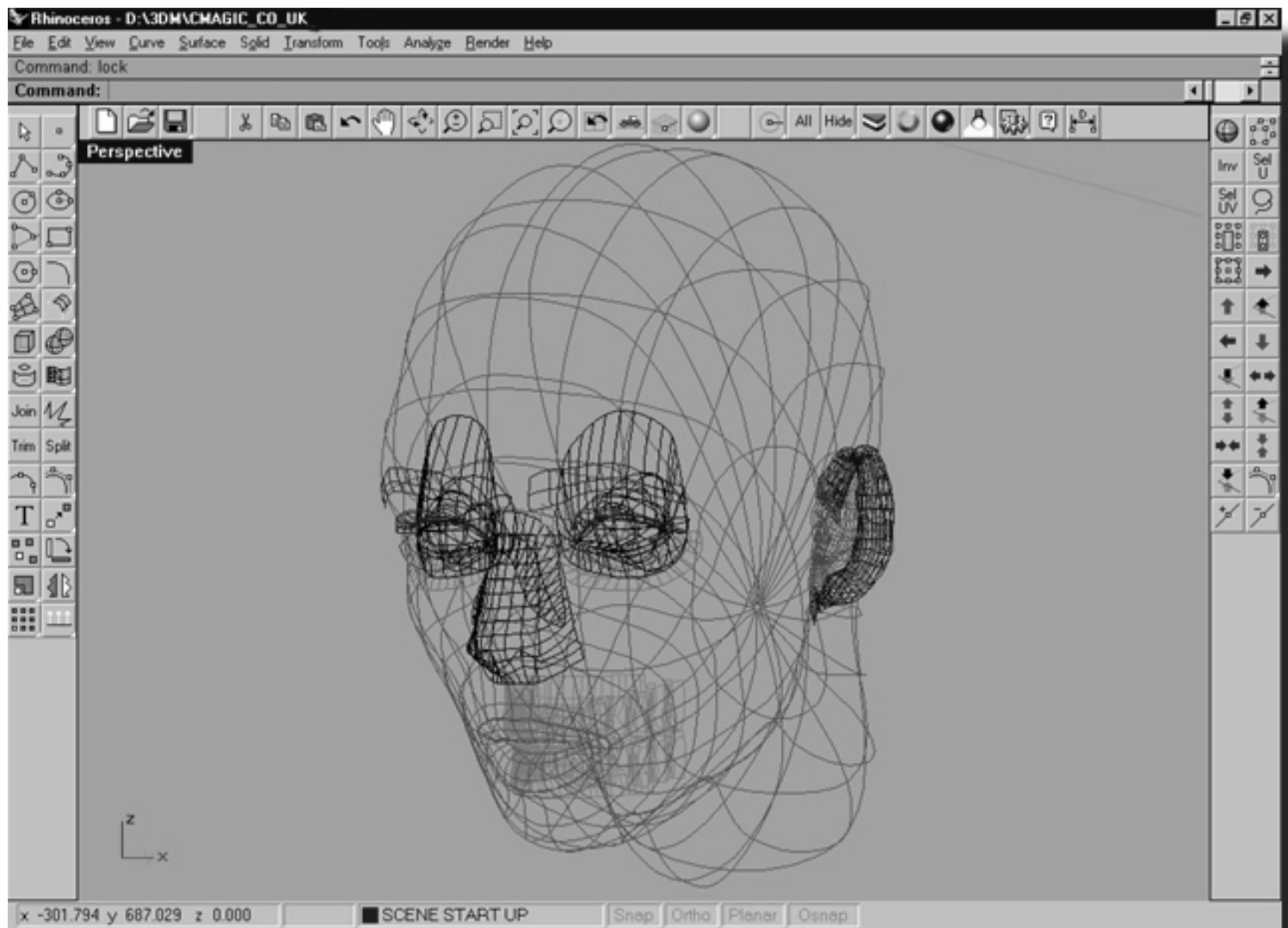




Supermodels Professional 3D Training Tools:  
Modelling the Human Female Head and Face using NURBS  
with  
**Rhinoceros®**



written by

Joseph Richard Saltzman and Steven Hägg-Ståhlberg

**Skill Level: Beginner - Intermediate.**

Published by Cinemagic Productions Limited., 1999.

P.O. Box 918  
Iver  
SLO OJL  
Buckinghamshire, England.

Published in Great Britain

Copyright © Cinemagic Productions Limited, 1998-99

The moral right of the authors has been asserted.

All Rights Reserved. Without limiting the rights under copyright reserved above, no part of this publication may be reproduced, or transmitted by any means (electronic, mechanical, photocopying, recording or otherwise) currently in existence or hereinafter devised without the prior written permission of both the copyright owner and the and above named publisher.

A copy of this e-book has been deposited with the British Library.

**ISBN 0 9536456 0 6**

This e-book may be ordered by post direct from the publisher.

Tel: +44 (0)1753-733-190  
Fax: +44 (0)1753-736-619  
Email: [cmagic@cmagic.co.uk](mailto:cmagic@cmagic.co.uk)  
Internet: <http://www.cmagic.co.uk>

Rhinoceros® is a registered trademark and Rhino is a trademark of Robert McNeel & Associates. Supermodels Professional 3D Training Tools and Rhinette are trademarks of Cinemagic Productions Limited.

Other trademarked names do appear throughout this publication. Rather than to list the names and entities that own each of the trademarks or insert a trademark symbol with each mention of the trademarked name, the publisher states that it is using the names for editorial purposes only and to the benefit of the trademark owner, with no intention of infringing upon that trademark. This document is supplied as an educational guide and intended for informational and instructional purposes. Reasonable care has been taken in preparing the information it contains. However, this document may contain omissions, technical inaccuracies, or typographical errors. Cinemagic Productions Limited does not accept responsibility of any kind for customer's losses due to the use of this document.

---



# Dedication

To my loving wife Sarah and daughter Emily Anne, the two most treasured people in my life.

# Acknowledgements

Very special thanks to my colleague and co-author Steven H. Stahlberg simply one of the finest artists and mentors I know of and without whom this project would have never been possible.

I extend most most sincere and heartfelt appreciation to: Helen, Sally and Edward who's love, support and unfaltering willingness to help always made this project become a reality -- I cannot begin to thank you enough.

To everyone at Robert McNeel and Associates for creating Rhinoceros, the best 3D modelling application in the universe and especially to Bob McNeel, Michael Gibson and Mikko Oksanen.

And lastly to everyone who's stood in our way -- a bouquet of barbed wire...

---

# Introduction

The aim of this tutorial is to teach nearly anyone with the desire to learn how to create a realistic human female head using a NURBS based modeller. In this case, the NURBS based modeller that we've decided to base this e-book on is Rhinoceros. Although we've based our lessons on Rhinoceros (because it's our favourite at Cinemagic) the fact is that the methods and techniques shown here are widely applicable to other software packages too, including but not limited to: Maya, Softimage, 3D Studio MAX, etc. For this reason, we've tried to keep things as basic as possible (tool wise) and have done our level best to avoid using fancy widgets and gizmos that might not be widely available in other packages.

The reality is that you don't need software with a bunch of bells and whistles to create great looking heads or other organic forms. Rhinoceros provides exactly what is needed, good honest software tools that perform the job that they set out to -- admirably!

If you're already using Rhinoceros then you know it's about the most powerful, user friendly and stable NURBS modelling software for the Windows platform this side of the Centari system.

If you're not using Rhinoceros, then seriously what are you waiting for?

In our view, it's probably one of the best, most well written pieces of graphics software that we've ever had the pleasure of using. Oh, and just in case you think that software that currently sells for less than US\$1000 couldn't be any good, then I've got some news for you! We use software here at the studio daily that costs more than 15 times the price of Rhinoceros -- does it work any better than Rhino? Certainly not!

Rhinoceros IS amazing software -- if you try it, you'll buy it!

Put simply, by using the robust toolset and many features found within Rhinoceros it is possible to create nearly any form organic or mechanical that you can imagine -- impressive?

We think so!

---

## Why Rhinoceros?

Here at Cinemagic we first became acquainted with Rhinoceros like many others did when several years ago an open beta testing program was conducted by the manufacturers of the product, Robert McNeel and Associates located in Seattle, Washington, USA. Prior to this, we had been creating most of our models here at Cinemagic using primarily polygonal methods. It's not that we think that there is anything wrong with polygonal modelling (in fact we still rather like polygons--polygons can do very good things) we nevertheless were interested in exploring NURBS based technology further and some of the advantages that it might offer us in terms of character modelling for animation. Even though some of the high-end applications that we already had in house did offer NURBS modelling to some degree already, the toolsets were rather limited in scope in comparison to what Rhinoceros offered straight out of the box at a mere fraction of the cost.

Naturally, this situation didn't leave too many options open for us. The choice for us was to either make a substantial investment in yet another high-end software package or go with Rhinoceros. In the end, we decided to go with Rhino and we've never looked back, it's was the best purchase we ever made.

I freely admit that when we first used Rhinoceros I wasn't all that keen on it. Of course, that had something to do with it being a very early beta version and in those days it looked and felt awful lot like AutoCAD (at least I thought it did). I can remember trying to work with it at the time and finding it rather difficult. Now looking back, this had little or perhaps nothing to do with Rhinoceros per se, and was essentially a result of my mind set still being locked into thinking in terms of polygons, not NURBS. Shortly after, I spent a great many hours on the Rhinoceros mailing list, asking questions of everyone, looking for guidance and basically just trying to get my head around trying to work effectively with the application. Then one day, as if by magic it just "clicked" and I realised that it wasn't Rhino that was making life more difficult, it was ME!

Soon after, I began to use Rhino nearly every day within our production work and absolutely grew to love it. Time progressed, the user interface was even further improved by its makers and the functionality refined into what we see today, simply one of the best modelling tools available anywhere at any price. Rhinoceros has become an integral part of our business, now we couldn't dream of doing without it!

Rhinoceros has so many great tools built right in that it's quite possible for the new user to feel a bit overwhelmed by it all, I know I did at first! The thing is, Rhinoceros does everything you can imagine and then just a bit more. However, don't let it's ease of use fool you, this is certainly no toy, it's a precision application that makes use of some serious rocket science behind the scenes. In our view, Rhinoceros will easily go head to head with the very best software modelling tools available.

Best of all, Rhino is not only powerful, it's easy and fun to use too! In fact, we've noticed that it is so easy to use that those just starting out with it often tend to make things more difficult than they really need be! So, as you work through the remainder of this tutorial keep in mind that just because Rhinoceros has abundance of tools that doesn't mean you HAVE to use them all -- not at once anyway.

**The golden rule of working with NURBS: Keep everything as simple as possible at all times!**

Always remember this and you can't go too far wrong.

As you continue to use and create models with Rhino you will increasingly find that certain tools and functions will become your favourites. Off the top of my head I think it's fair to say that we use about 20 or 30 commands with regularity but only 5 or 10 on a daily basis when creating organic character based models. We don't worry about the rest of them, we know they are there if we need them but if not, well, you really don't need to concern yourself.

Remember you don't need to know what every part in a car does in order to be an excellent driver. Of course, knowing what's under the bonnet can only be of benefit, but it's certainly not a requirement by any means.

---

# About the Tutorial

This tutorial has been based in large part on the techniques and methods of my esteemed colleague Steven H. Stahlberg who's artistic achievements in CG never fail to amaze.

It is fair to say that Steven has changed the entire way that we work here at Cinemagic. With my hand on heart, I can honestly tell you that techniques and methods that he has kindly imparted to us over the past few years have made an enormous impact on our output. Adopting Steven's methods of working have done more to improve the visual quality and interactivity of our organic characters than any other single factor.

As a core part of this instructional package, we've included the head and face of an actual NURBS character named "Rhinette". All of the actual geometry and its associated dataset which has been distributed on this CD-ROM was modelled entirely by hand here at Cinemagic. At no time during the process were digitizers or other modelling aids used. All of the geometry was created entirely within Rhinoceros, and no other software applications were used (with the exception of Softimage / Mental Ray and 3D Studio MAX R2.5 for rendering only). Modelling on the project began in London on March 25th 1998 and was completed on ?

Truth is, it's unlikely ever to be completed to be quite honest -- this is a perpetual project, a work in progress so to speak.

The actual development and construction of Rhinette was based in large part on the work of Steven's "Ariana" character which served as a master guide and overall inspiration for her eventual creation. It would be fair to say that in Rhinette is in some sense a distant cousin of Ariana.

When developing Rhinette our aims were: a.) Rhinette should be a unique and individual character, not a clone of Steven's Ariana character, truth is, she couldn't be. There are some very good reasons for this, at the core most of them are legal. Essentially we couldn't include the original geometry to Ariana because of prior licensing and distribution agreements that were already in place. With the afore mentioned legal issues in mind, we had to make sure that Rhinette would be built in a similar manner as Ariana whilst still managing to look quite different.

b.) Rhinette had be constructed using the same principals, techniques and methods employed by Steven (within reason) while remaining applicable to working within Rhinoceros and perhaps other NURBS based modelling applications as well.

c.) Although from the outset this tutorial was designed to be based on Rhinoceros, we felt that it was most important that the methods depicted should not be so software specific that they could not be used with other NURBS based software modelling applications (within reason). I've long maintained the view that we should avoid specialist modelling tools and stick to pretty much the nuts and bolts functions that you might expect find in most professional software applications.

Oh yes, there is a little something else worth mentioning...

Rhinette may not look quite as "attractive" as Ariana because I'm not nearly as gifted as Steven Stahlberg (but I'm working on it and hope to be one day!) In the words of Wayne and Garth "I'm not worthy" but it's quite likely that neither are you and that, IS just the very point!

We've set out to shatter the myth that you have to be "born" with artistic talent -- you do not. That fact is, and we've shown that you don't have to be a natural artistic genius, skill and ability are something that can be learned (otherwise there would be no point in art schools). At the very least you can certainly improve the standard of your current art work using the methods and techniques outlined within this tutorial. How far you decide to take things - well that's down to you. Something that we know for sure is that every single artist has to start at the same place -- the beginning. Even the great masters had to start somewhere and you'll never know what you are capable of achieving unless you get stuck in and really give it a go. Participation is what counts and practice does make perfect, hopefully your technique will improve with each and every model you create.

We've generally tried to keep things as simple as possible in within this tutorial, simple tools and simple methods. Of course, sometimes by a weird twist of fate trying to do things the simple way can sometimes take longer or seem more complex, so you may know of or find far better ways of doing the same thing (I'd be surprised if you didn't). I'd like to state for the record that we don't think we've come up with the only way of working or even the best way, in fact, more often than not many of our methods may seem long, drawn out and a bit redundant. I fully accept this is true, however, this tutorial was designed purposely to be so, with the intention to force you into repeating tasks and using commands many times over, until they have been drilled into your minds and you begin to dream about them at night. So what is the ideal method then? We think the ideal method it's the one YOU find most advantageous to your personal workflow. Our intention is to show you one possible method of proceeding (in the full knowledge that many others exist) and we hope that our examples will act as a basis upon which you can further experiment in order to form your own ideas, methods and techniques for use in future.

We have found that these tutorials produce outstanding visual results for most people and you don't have to be a rocket scientist or artistic genius to use them either. We've put these lessons together using a "prompt by prompt" style. Our methodology is to show you where you are at (point a) and then explain where you want to be (point b). We then explain one possible method of getting from (point a) to (point b) and why you'd want to do it in the first place! In our view, it is not particularly important how you get from (point a) to (point b) -- only that you manage to do so and the image looks as intended once complete.

Perhaps more than anything we hope that you'll come away from this tutorial with a better idea of importance of scale and proportion in 3D portraiture and the many perils and pitfalls to watch out for when creating a NURBS representation of a human face. We also hope to inspire and excite you about the nearly limitless possibilities that sophisticated software such as Rhinoceros makes possible for creating works of fine art with your computer.

Lastly, we have really enjoyed compiling this tutorial. I know it has taken what seems like ages to write and we sincerely hope that you will enjoy it and find it useful. This project has provided us both with a great sense of satisfaction and we look forward to starting work on writing the next edition. As mentioned earlier, this is a perpetual work in progress that will continue to develop over time. Rest assured, there is still much more to come from us yet and registered users shall be advised as and when updates and supplemental editions to this tutorial become available.

Most of all, we would be very interested in hearing from you. If you can manage the time, please e-mail us and let us know how you've been getting on.

Happy modelling!

Joseph R. Saltzman, Managing Director  
Cinemagic Productions Limited.  
London, UK

---



# How to use this tutorial...

This tutorial has provided in the form of an electronic book (e-book) and meant to be used in concurrence with Rhinoceros.

Now that the tutorial has been opened with the Adobe Acrobat Reader, try this...

- Minimise the Adobe Acrobat Reader and start a Rhinoceros session by either double clicking on the desktop icon or launching the application from the Windows Start, Programs menu.
- Once Rhinoceros has been started minimise the application and return to the Adobe Acrobat Reader.
- With the two applications now running you can easily switch between them by using pressing the **Alt** and **Tab** keys at the same time.

You can now read the step by step instructions contained within the tutorial. When your ready to try out what has been described, all you need do is switch into Rhinoceros by pressing the **Alt** and **Tab** keys at the same time -- your eyes need never leave the monitor!

Once you've finished working within Rhino and are ready to move on to the next step, just switch back into the tutorial by pressing the Alt and Tab keys at the same time once again.

Naturally, your system will need contain sufficient amount of memory and be of a reasonable specification, however, most users with modern machines should experience no difficulties.

---

## Navigation:

This is a very lengthy document, however, making your way through it all should be fairly easy if you remember these tips:

- You can return to the main contents of the book at any time by clicking on the Cinemagic logo found at the beginning of each chapter.
- On the first and last page of each chapter you will find hot links that will enable you to move forward or backward through the document.
- You can and should also make use of the Adobe Acrobat "Bookmarks" feature and the page navigation buttons found on the toolbar.

We can appreciate that many of you would have preferred a printed "paper" book. Yes, we like traditional books too and reading off a screen does take some getting used to. However, we like to think of ourselves as a forward thinking green minded company and somehow we don't think loads of trees should die just so you can learn a bit more easily -- sorry. Besides, printing this tutorial would not have been practical as the original manuscript with associated images came in at just under 1000 pages -- that's about the size of the Yellow Pages phone book for an average big city! Remember, one real benefit by providing this tutorial in electronic form is that updates become possible, something that with a paper book would be near impossible to contemplate. You always have the option of printing the chapters if you fancy, so freedom of choice is maintained.

---

## Working with the Geometry:

**IMPORTANT** -- *Please Read:*

The actual geometry comprising "Rhinette" (i.e., the model) has been included and you will find it on the CD-ROM.

In order to save your work you will need to copy the geometry files from the CD-ROM onto your hard drive.

During the course of the tutorial you will often see an instruction such as this:

Example: "*Open up the Edit Layers dialogue and create a new layer entitled: Testing 123*".

However, be aware that since we've already done the work for you it is likely that this layer already exists.

Be sure that you **DO NOT OVERWRITE EXISTING LAYERS !**

To avoid this, rather than name the layer: "*Testing 123*" try something like "***My Testing 123***", this way the layer will not be overwritten.

In any event, you should always check to see if a layer already exists, if it does, then be sure to name yours something else.

---

# Contents

Title Page (a)	<a href="#">Click Here</a>
Title Page (b)	<a href="#">Click Here</a>
Dedication / Acknowledgements	<a href="#">Click Here</a>
Introduction	<a href="#">Click Here</a>
How to use this tutorial	<a href="#">Click Here</a>
Chapter 01	<a href="#">The 1st Curve</a>
Chapter 02	<a href="#">The 2nd Curve</a>
Chapter 03	<a href="#">The 3rd Curve</a>
Chapter 04	<a href="#">The 4th Curve</a>
Chapter 05	<a href="#">The 5th Curve</a>
Chapter 06	<a href="#">The 6th Curve</a>
Chapter 07	<a href="#">The 7th Curve</a>
Chapter 08	<a href="#">The 8th Curve</a>
Chapter 09	<a href="#">The 9th Curve</a>
Chapter 10	<a href="#">The 10th Curve</a>
Chapter 11	<a href="#">The 11th Curve</a>
Chapter 12	<a href="#">Half and Half</a>
Chapter 13	<a href="#">Smooth Operator</a>
Chapter 14	<a href="#">On The Surface</a>
Chapter 15	<a href="#">The Mouth, Part One</a>
Chapter 16	<a href="#">The Mouth, Part Two</a>
Chapter 17	<a href="#">The Mouth, Part Three</a>
Chapter 18	<a href="#">The Mouth, Part Four</a>
Chapter 19	<a href="#">The Mouth, Part Five</a>
Chapter 20	<a href="#">The Mouth, Part Six</a>
Chapter 21	<a href="#">The Mouth, Part Seven</a>
Chapter 22	<a href="#">The Mouth, Part Eight</a>
Chapter 23	<a href="#">Reparameterisation</a>
Chapter 24	<a href="#">The Eyeball</a>
Chapter 25	<a href="#">Creating the 1st Eyelid Curve</a>
Chapter 26	<a href="#">Creating the 2nd Eyelid Curve, Pt 1 of 2</a>
Chapter 27	<a href="#">Creating the 2nd Eyelid Curve, Pt 2 of 2</a>
Chapter 28	<a href="#">Creating the 3rd Eyelid Curve</a>
Chapter 29	<a href="#">Creating the 4th Eyelid Curve</a>
Chapter 30	<a href="#">Creating the 5th Eyelid Curve</a>
Chapter 31	<a href="#">Creating the 6th Eyelid Curve</a>
Chapter 32	<a href="#">Creating the Nose, Part One, Profile and 2nd Curves</a>

Chapter 33	Creating the Nose, Part Two, Curves 3 & 4
Chapter 34	Creating the Nose, Part Three, Curves 5 & 6
Chapter 35	Creating the Nose, Part Four, Curves 7 & 8
Chapter 36	Creating the Nose, Part Five
Chapter 37	Sculpting the Form, Part One of Two
Chapter 38	Sculpting the Form, Part Two of Two
Chapter 39	Blending Surfaces for The Eyelids
Chapter 40	Blending Surfaces for The Nose
Chapter 41	The Ear
Chapter 42	The Teeth
Chapter 43	Blending In Using 3D Studio MAX R2.5
Chapter 44 (bonus chapter)	References
Chapter 45 (bonus chapter)	Visual Perception and Composition
Chapter 46 (bonus chapter)	About Lighting
Chapter 47 (bonus chapter)	About Textures
Chapter 48 (bonus chapter)	Skin



## THE 1ST CURVE

### Contents:

- [Forging a Head -- some things to consider](#)
- [The importance of pre-planning](#)
- [Drawing the initial head curves -- How many are needed?](#)
- [Using a background image -- Rotoscoping](#)
- [The Rhino User Interface](#)
- [Scene Setup](#)
- [Drawing the 1st curve -- The Main Profile.](#)
- [Clean and Refine](#)
- [Example Movie -- Creating the 1st Curve.](#)
- [Table One -- A list of points and coordinates for the completed 1st curve](#)
- [Shutting Down the Scene](#)

## Forging a Head -- some things to consider

Now comes the part you've been waiting for, actually creating the head shape itself. It's not quite as difficult as you might think, however, there are a few very important points to keep in mind -- no pun intended! First, as with all things when using NURBS curves the old saying "Less Is More" couldn't be more appropriate. Again, and I must stress this point most firmly, the fewer curves you use to define the ultimate shape of your head the better.

Why? Well, if you use a lot of NURBS curves you're going to run into a load of rather nasty problems, most of which have to do with the over complexity of the resultant geometric objects produced. Now complex objects have some real shortcomings, paramount amongst them is the simple fact that they just become far too difficult to work with! The more NURBS curves you use, the more control points get created, the more control points the harder the object is to edit -- you get the idea!

Although I like to avoid editing control points by pushing or pulling them as much as possible, unfortunately it's just a nasty little job that is an essential part of becoming a professional CG artist. The problem really starts when you've got so many points that it becomes near impossible to tell which one you're trying to move. Another nasty side effect of using too many curves is that the surface that is produced becomes rather hard to control especially if they are placed close together producing a rather wiggly uneven surface.

In most cases, when working with NURBS you want a nice smooth surface, after all that's what they do best and the way to achieve this is to keep your curves sparse using no more than absolutely necessary! Obviously, there are many exceptions to this, such as creating wrinkles, clothing and things of that nature, but for our purposes we are going to want to keep things as nice and smooth as possible. Lastly, the more complex your object becomes the harder it will be to animate.

The surfaces produced will be undisciplined and you may notice bulges, ripples and loads of other abnormalities that you hadn't initially planned on. And finally, spare a thought for your computer because even if you've got the most powerful digital workstation on earth there is absolutely no point in creating more calculations than are necessary to get the job done, its a waste of CPU cycles not to mention your valuable time.

As with so many things in 3D there are loads of ways to create a human head shape and this is only one of several methods. Always bear in mind that there are quite a few ways to achieve similar results when working in 3D and there is no one single right or wrong way to model per se. For the most part, if it looks right then chances are it is, but having said that its possible to create a head with so many curves that looks correct but for all practical purposes can't be animated -- not very well anyway! The point I'm making and this is something that holds very true with many 3D related issues -- **everything boils down to a question of trade-off's**.

The head shape in this tutorial will *initially* be constructed with a North/South Pole parameterization. That is to say, all the curves will start from a single point at the TOP of the head (known as a singularity -- in graphics lingo) and terminate at the base of the neck. A good way to visualize this is to imagine that an old fashioned bird cage with really thin wire bars has been placed over the top of someone's head. The top of the cage where you would expect the hook would be at the top of his/her head and the base of the cage would be at the neck line. Now imagine that you could press the thin wire bars of the cage with your fingers inward so that they would eventually conform the shape of the head inside. In effect this is more or less what we will be doing with the software, creating a "cage" of NURBS Curves.

---

## The importance of pre-planning

Before you set about drawing a single curve or point with any modelling application you should give a great deal of prior thought not just to how many curves you'll require but how many points you are going to need as well. This can only be done by careful research and pre-planning and it is the most important aspect to the ultimate success or failure of the entire modelling project.

This advice applies to those who own digitisers as well. Don't think for a minute just because you've got a digitiser that somehow this eliminates the need for an advance planning stage -- it does not. The truth is that this is a stage that cannot be skipped, you must know where you are going long before you arrive, otherwise you're heading for big trouble down the road. You will wind up spending so much time trying to fix all the problems you've created for yourself that it would have been quicker just to take the time to plan things out in the first place.

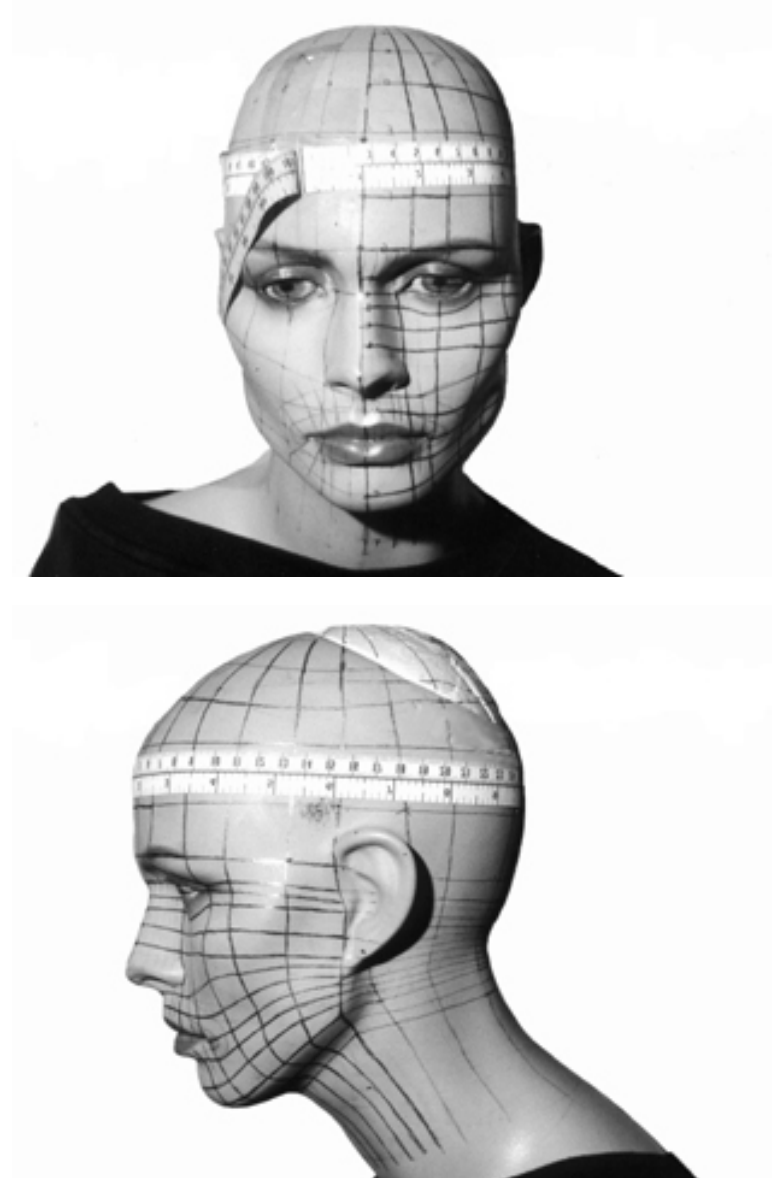
So how do you go about determining how many curves and points you'll need in advance? Well the best way is to use or make a model of a real head, take some photographs, or use a video camera to get some good reference material on your subject. Collecting good reference material is an art in itself but as a general rule you are going to need at the very least one good photograph of your subjects head in profile. The profile is the single most important image reference associated with the human head as it contains the most information about it's structure and complexity. Despite this, finding a really good level profile shot, especially of an attractive woman in a fashion magazine or elsewhere is particularly difficult as they are almost always in three quarter view. You're also going to want a photo from a front view, back view, even a top view if you can manage it.

Taking photos of your subject can be a bit tricky and it's important that you do the following. I recommend that you use a good 35mm SLR camera mounted on a tripod and preferably with a telephoto lens. The subject should be seated a fair distance away from the camera and the telephoto lens should be used to zoom in on the head/face which will help to minimise the optical effects of perspective. You should instruct your subject to neatly comb or tie their hair back and away from the face, exposing as much of the ear and side of neck as possible. Depending on the relationship you have with the model, I'd suggest that you try talking him/her around to allowing you make a few "lines of reference" on their face with a medium felt tip marker or a grease pencil, just explain that they can wash the marks off later.



The lines you draw should be placed at strategic key points on the head/face, among the most important in my view are the: temple, brow bone, eye centre line, bridge of nose, cheek apple, cheek hollow, nose base, upper lip, mouth centre, lower lip, chin tip and jawline. When drawing the horizontal lines you should try and keep them as near level as possible, except of course when following natural facial contours. Your quest should be to draw the lines as neatly and as evenly spaced as possible.

I'd also recommend that using double sided tape, you stick a tape measure around the head between the temple and brow bone as this can provide a really good visual cue for alignment/registration purposes later. It's also quite helpful to fix a yardstick horizontally behind your subject this can also be quite helpful for alignment/registration when brought into a photo editing application such as Photoshop. You should seat your subject on a swivel type office chair, having them sit with good posture, eyes forward, back straight and most importantly dead still. Insure that your subject is well and evenly lit from all angles and pay attention that there are little or no disruptive shadows. The basic idea is to rotate your subject on the chair while photographing them from a fixed distance and position.



Okay, so in the previous screenshots above you can see that I've marked up the key points of the head/face with a black felt tip pen. I've decided that I will use **11** curves (running North to South from the pole) that will make up one half of the head. By the way, remember what I said a little earlier on about finding good reference images from which to work. Do you think the prior screenshots fit the definition of a good reference images?

Well they certainly are not as good as they might be! So what's the problem? First off, the head in the front view is looking down and she is cocked to one side, slightly. In addition, you'll notice that in the front view the head is poorly lit on one side creating a rather deep shadow. Despite the various "problems" these images are still fine for us to work from and will provide more than enough visual clues to keep us going. I should add that we are not trying to create a carbon copy of the reference image anyway -- **it's only real purpose is to keep us on track in terms of basic scale and proportion.**

---

## Drawing the initial head curves -- How many are needed?

We will begin our project by first building half a head, which in this case will require that **11** NURBS curves be drawn. How did I arrive at the figure of **11** curves? Well, in my experience 11 curves is just about right amount needed to produce a nice realistic head shape without becoming too complex. The fact is that this is a **totally arbitrary figure**, you could use more or less curves, it is entirely up to you. Yes, I have personally done it with far less curves -- as few as 6 or even 8 for a whole head so I acknowledge that it certainly can be done. I've also noted that while Rhino is capable of producing a nice smooth surface with very few curves indeed other software applications rarely will, so let's just stick with the figure of 11 for the time being.

Now the following instructions may sound a bit confusing so please pay close attention. We will begin to draw our initial curves using the **InterpCrv** command which will produce a type of spline called an **Interpolated Curve**. A bit later on, once we've created all 11 of our curves we will create a second set of 11 splines on a new layer, this time using the **Curve** command, snapping the edit points of the new splines to the edit points of the old interpolated curves.

So why bother using interpolated curves in the first place if we are only going to wind up replacing them? Because interpolated curves produce a curve that sticks fairly close to the same movements that you make with your mouse so it makes it pretty easy to get the shape correct quickly. For example, if you were to try and draw the exact same shape using the **Curve** command (*which produces a curve by control points*) as you did with the InterpCrv command you'd notice pretty quickly that the curve it makes does not stick to the shape and further editing would be required. However, while interpolated curves are easy to draw and do produce a nice shape they don't loft up very well. Okay, I lied, that is not strictly true, they loft fine, I just don't like them. With non-uniform point distribution, interpolated curves will tend to produce very complex geometry when lofted, (*a.k.a. skinning or surfacing in other applications*) and complexity is something that we want to avoid at all costs.

---

## Using a background image -- Rotoscoping

Perhaps the single most important aspect of making any 3D model of the human anatomy look realistic is the relative scale and proportion of the object. Simply put a human head/face will never look "right" unless you've got the basic proportions correct in the first place.

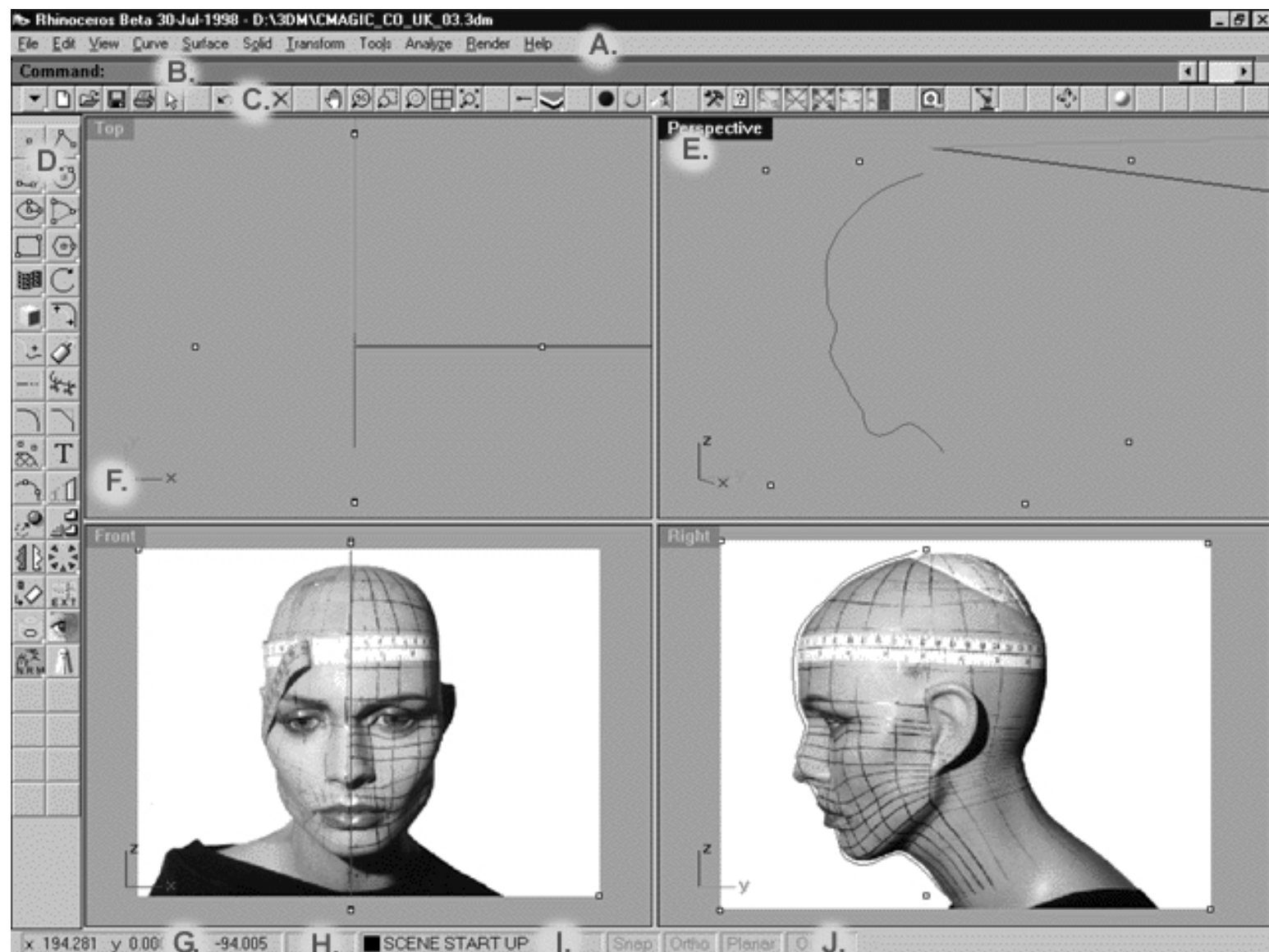
Luckily as a 3D artist you don't necessarily have to be the most highly skilled draftsman (but it couldn't hurt) to get the job done as most software applications allow you to "trace" a curve over a background image (a.k.a. Rotoscoping). I Hope you were paying attention to the "importance of pre-planning" section a bit earlier because during rotoscoping is when all your efforts to create excellent reference images will really pay off.

Okay so let's assume that you've now got some good reference photographs of your subject taken from the front, side, 3/4 views -- now what? Well the first thing is to get them scanned into your computer somehow, using a flatbed scanner is about most common way of doing it. Depending on where you live, most photos will come back from the lab as 4x6's so it's good idea when you scan them to use a decent resolution, about 100 dpi is fine.

Tip -- Don't go wild with the resolution or you'll create images that will grow large and will only serve to choke the performance of Rhino when imported.

Next you will want to bring your scans into a high quality photo editing application such as Photoshop or Paintshop Pro. Now your task is to get the front, side, and 3/4 views in registration (i.e., lining them up) with each other. If you "spun" your model on an office chair while photographing as suggested the views should line up pretty well, but they will never be dead on because the human head is not perfectly round nor is it centred on the body exactly. In most cases, due to variations in the pose and neck you'll find that the distance between camera lens and the subject in the front and side views are different and will need to be compensated for somehow. It is possible to change the scale of a background image in Rhino using the **ScaleBackgroundBitmap** command, however I find that it is easier to get your images as close a possible to begin with and this way you can be much more accurate with the alignment overall.

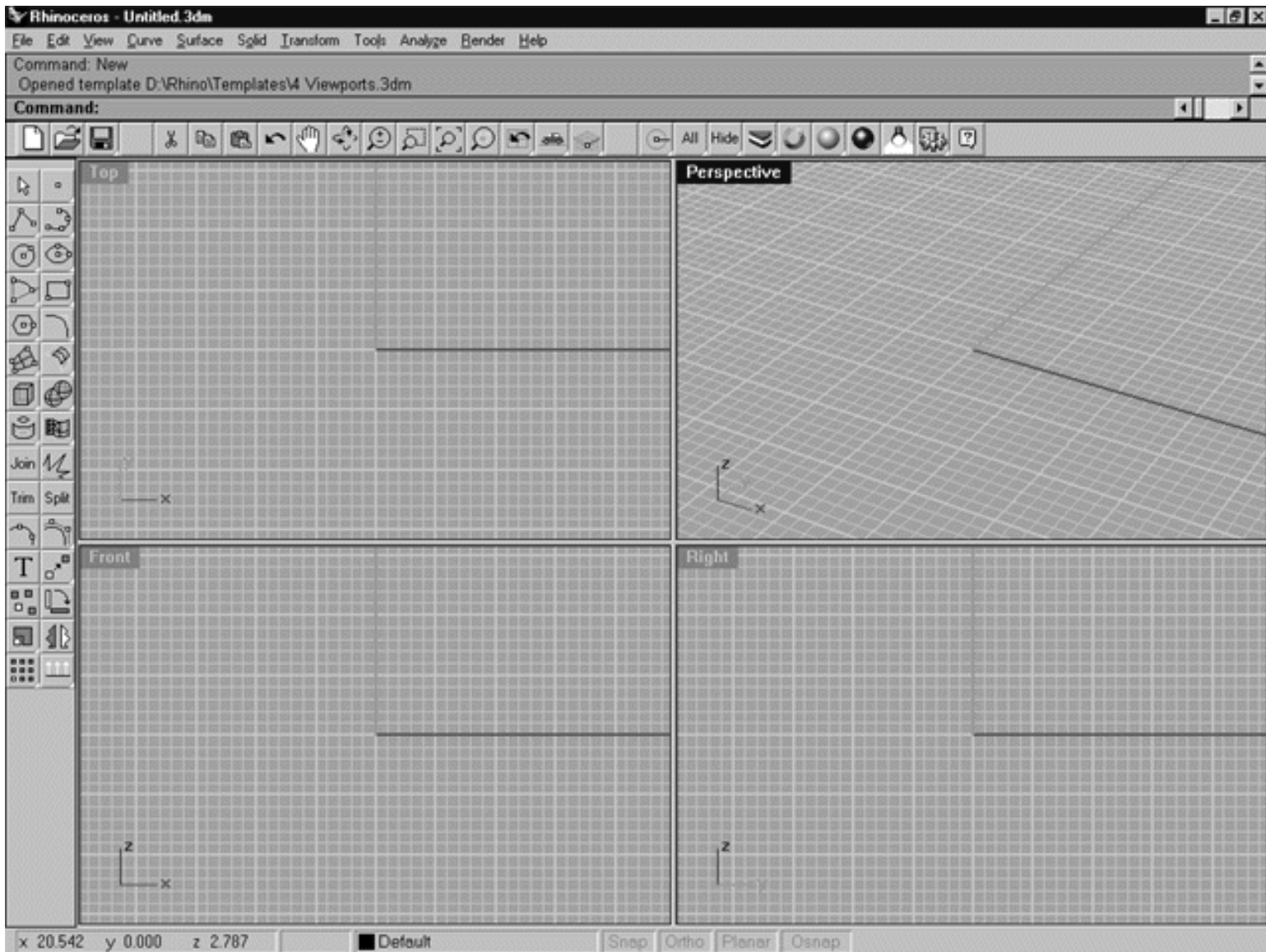
## The Rhino User Interface



This screenshot shows what the Rhinoceros user interface looked like during the beta build as at **30-July-1998**. Because Rhino is still in its beta phase as of the writing of these tutorials it is quite possible that your interface may differ slightly by the time you read this. The primary areas that we will concern ourselves with during the following lessons have been highlighted within the screenshot and are as follows -- you should make it a point to become very familiar with them!

- (A) **The Menu Bar** -- This is where you can select Rhino's many functions and features.
- (B) **The Command Line** -- This is where you can type and enter commands as well receive system prompts from Rhino.
- (C) **The Upper Toolbar** -- Because Rhino offers toolbars that may be fully customized the look of yours may vary, however, these toolbars offer a quick and efficient way to issue commands to Rhino by clicking on icons rather than typing in the commands.
- (D) **The Side Toolbar** -- Same as previous.
- (E) **The Viewport Label** -- Not only does the viewport label tell you what view you're looking at but has functionality as well. When the viewport label is highlighted in blue it means that view is currently active. To activate a given viewport just left click with your mouse anywhere within the view you want to turn on. To maximise or minimise a viewport just double left click on the label itself.
- (F) **The Axis Tripod** -- This shows you the orientation of coordinate system of the given viewport you are working within. Note -- Currently unlike many other animation based software applications Rhino defines the **Z axis as UP** not Y as you might expect! If you're coming from a CAD or maths background this may seem quite natural. Despite this minor annoyance to character animators, Rhino has a great many ways to manipulate the coordinate system and construction plane. Rhino comes with an outstanding help file with loads of information on this topic and I recommend that you take the time to read and understand as much as possible about it.
- (G) **The Lower Status Bar / Coordinate Display** -- This box displays the exact coordinates of the mouse position within a given viewport, just move the mouse around and see what happens..!
- (H) **The Lower Status Bar / Angle & Moved Units Display** -- This box will display the degree of an angle (when rotating an object) or the amount of units transformed (when moving an object).
- (I) **The Lower Status Bar / Layer Info Box** -- This box displays the layer that is currently active. Layers are a method of grouping that can help you organize large amounts of objects in a scene. This idea is similar to the old method of using overlays in drafting and is term that is also quite commonly used in other drafting and modeling programs. Layers can be named, their colours can be changed, and they can be turned on or off. You can also lock the layer so objects cannot be selected which is something that we will do often throughout the course of these tutorials. Left clicking on this box will open up a list of available layer(s) and allow you to quickly select and make a given layer active. Right clicking on this box will open up the Edit Layers dialogue box which will allow you to perform a whole host of actions including but not limited to turning layers on and off, locking, changing colour, and much more.
- (J) **The Lower Status Bar / Osnaps** -- Left clicking here will open up the Osnaps dialogue box. This will allow you to select and set many types of different types of persistent object snaps including End, Point, Near, Midpoint, Center, Intersection, Perp, Tan, and Quad. Using an object snap allows you to "snap" or "magnet" one point to another -- not only useful but essential!

UPDATE! -- This is a screenshot of the interface for final release version of Rhino 1.0 which became available in November 1998!



As you can see the release version is not all that much different from the beta test version. In the current 1.0 release many of the icons will have changed and/or been improved. In addition, the commands have now been finalized and unified so many will have been altered since the beta cycle. If you're used to working with the beta don't worry, most of the old commands should still be recognized by the system. Note -- because this tutorial was prepared during the beta cycle and compiled prior to the release of version 1.0 you may find some discrepancy in the graphics or command names given. We've tried to catch most of these but a few may have still slipped through the net. We would therefore appreciate it if you would kindly report any command names or graphic images that you've found to be inaccurate so that we may correct any inaccuracies or errors for future Supermodels upgrades -- thanks!

As you work with Rhino you will make mistakes, it is unavoidable no matter what your level of experience may be. Fortunately, the Undo command can assist in your rescue in 9 out of 10 cases and is a real lifesaver. The Undo command undoes the most recent create, edit, or transform commands issued. Be aware however that currently Undo will not have any affect on viewports, file or render commands, construction planes or drawing assists! The number of commands you will be able to effectively undo depends on the number of undo levels that have been set up. The application's default is five levels which you can change in the Rhino Settings dialogue box.



When and if panic does start to set in remember that the ESC key is your friend. When working with Rhino it will enable you to "break" out of and cancel just about command or thing you may be doing or shouldn't be doing for that matter. It will not fix anything per se, but it will get you out of potentially sticky situations -- try it, you'll like it.

Above all, if you value your time and efforts then **SAVE YOUR WORK OFTEN** and make **BACKUP COPIES** of your files..!

Get in the habit of making a back up copy of your file at the very beginning of your work session, in fact, do this before you do anything else. Remember to save periodically and often while you work, you'll be glad you did when your computer decides to crash. And lastly, use your common sense and always do a save before attempting any major or untried operation, that way if something goes wrong you can always get back to where you were before the nightmare began.

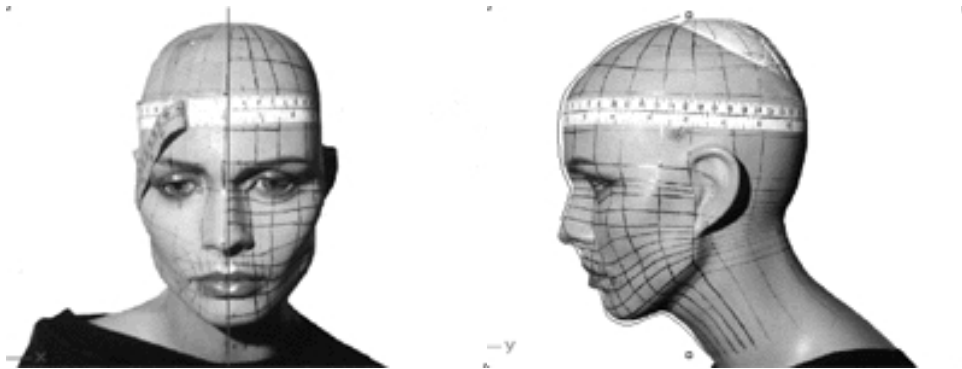
---

## Scene Setup

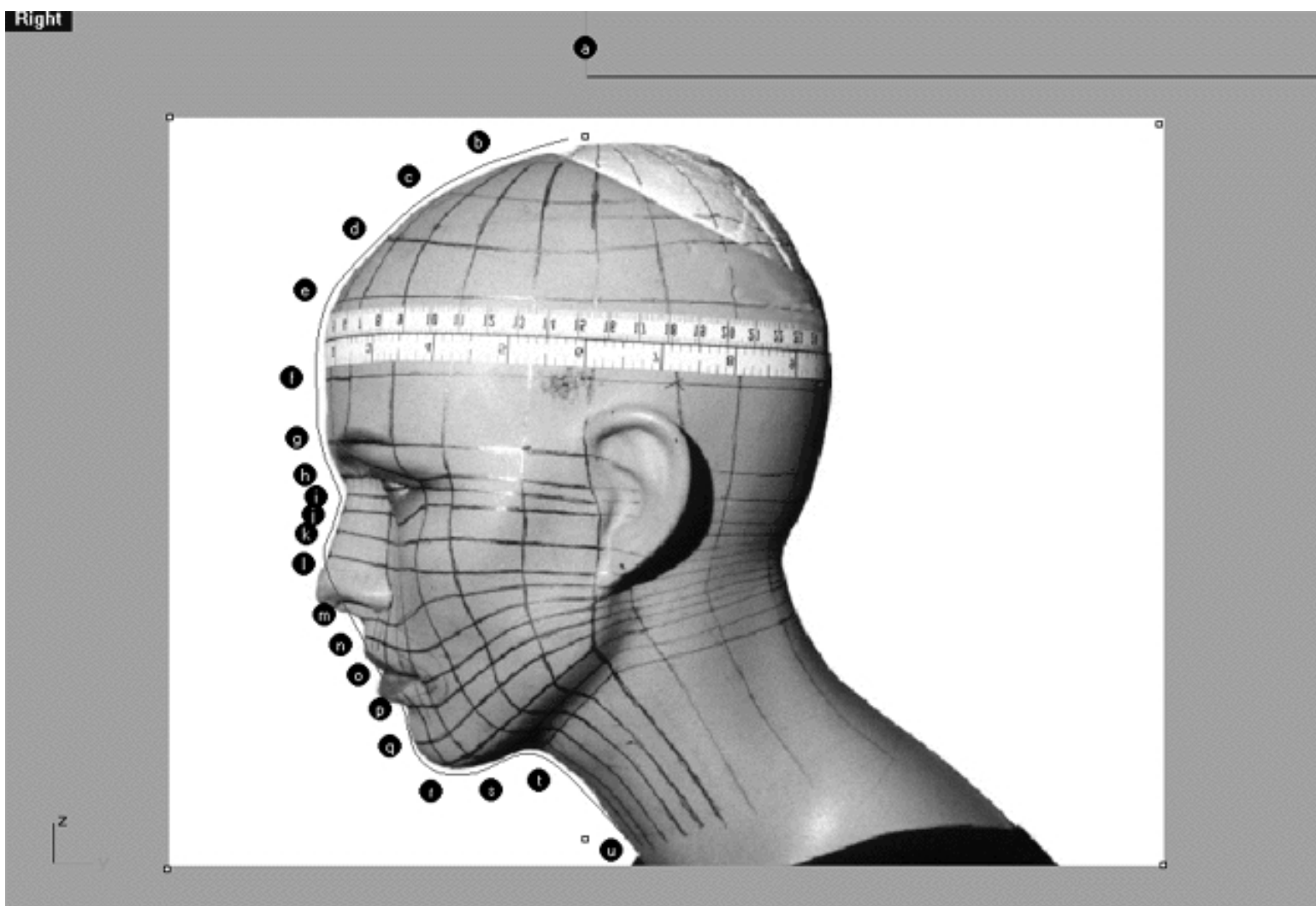
- Start a new Rhinoceros session by **Double clicking** on the *desktop icon*  the application will begin.
  - Choose **File, Open** from the menu bar and **Double click** on **START\_A.3DM** in the file list, it will load and open.
  - Confirm at the Lower Status Bar the currently active layer is entitled SCENE START UP. If it is active proceed to the next step, if its not then make it active by left clicking on the layer box, highlighting the correct layer and clicking on it.
  - Again, at the Layers Box on the Lower Status Bar this time right click on the box, the Edit Layers Dialogue box will open. Confirm the following switches have been enabled or disabled:
    - The Layer entitled Annotated Dots\_1 should be LOCKED.
    - The Layer entitled Guide\_01 should be ON.
    - The Layer entitled Photopoints should be ON.
    - The Layer entitled Frozen should be LOCKED.
    - The Layer entitled SCENE START UP should be ON.
    - When you've finished making your changes (if any) click on OK.
    - All other Layers should be set to OFF.
    - Confirm that you can see a background image in the Front and Right viewport.
    - Confirm that the grid display in the viewports have been disabled.
  - Zoom out all the viewports by selecting the Zoom Extents/Zoom Extents All Views icon  or by typing the command **ZoomExtentsAll** at the command line and pressing Enter.
-



# Drawing the 1st curve -- The Main Profile.



- Maximise the **Right Viewport** by double clicking on it's label.
- In the maximised **Right Viewport** you should see a background "rotoscope" reference image and a single red curve with group of annotated dots labeled (*a - u*). This red curve is a guide to help you in drawing your new interpolated curve which we will do next...





This **Right Viewport** screenshot above shows the 1st guide curve.

You may have noticed that the 1st red guide curve does not quite follow the profile of the face exactly. There are several good reasons for this, most importantly because the neither the background image of the "dummy" or the lines drawn on her face are completely accurate (they are neither perfectly vertical or horizontal). Additionally, the "dummy" itself has not been constructed 100% correctly either, the placement of the eyes are not quite right and the back of the head is somewhat unnatural in its construction. So then why did we use her in the first place?

To stress the very important point that it is unlikely that you will ever encounter a perfect subject or background image -- remember Human Beings are NOT naturally symmetrical. With this in mind you must learn how to "compensate" for such anomalies by using all the visual information available to you and then making educated guesses about how best to proceed. What do I mean by this? Quite simply, you must make a strict rule of carefully observing what ALL your viewports are telling you, and never, ever, rely solely on one viewport for information and visual clues as you will get into real trouble if you do.

In the world of 3D seeing is not always believing and more often than not what looks correct in one view will be way out of whack in another. Get in the habit of constantly switching between the Right, Front and Top Views before during and after you make a move. Rotate the object in the Perspective Viewport often and try and "confirm" the moves you make before continuing on.

The second reason that the red guide curve does not follow the profile of the face as you might expect comes down to a matter of artistic preference. Again, idea behind this tutorial is not to make a carbon copy of the mannequin as it would be easy enough to scan or digitise it if that was what we had in mind but then we wouldn't be learning anything -- would we? Rather, the point of this lesson as an artistic exercise is to teach you how to create such an object within the software based on visual information of various quality -- so let us get down to it then.

- We will begin by creating a new layer -- At the bottom of your screen you will see the *Status Bar*, **right click** on the *Layer info box* -- the *Edit Layers dialogue box* will open.
- **Left click** on the *New* button and in the *Name field* type: **Interp\_01**.
- Move the cursor to the *colour field*, **left click** on the *colour field*, the Select a colour dialogue and colour wheel will appear, choose a nice bright blue (i.e. **R:0 G:0 B:255**) then click **OK**.
- You will be returned to the *Edit Layers dialogue box* again, **left click** on **OK** to exit.
- Return your cursor to the *Status Bar* at the bottom of the screen and **left click** on the *Layer info box* -- the Layers list will appear.
- Locate **Interp\_01** in the list (the one you created a few moments ago) and move your cursor over its name (it will highlight) **left click** on it to make the layer currently active.
- **Left click** on the red guide curve (*Guide\_01*) to select it -- it will highlight.
- Display the curves edit points by choosing the *Edit Points On/Off icon*  or typing the command **EditPtOn** at the command line -- the edit points will become visible.
- Again, move your cursor to the *Status Bar* at the bottom of your screen, **right click** on the *Layer info box* -- the *Edit Layers dialogue box* will open.
- Locate the layer named **Guide\_01** in the list, use the scroll bar to move up or down as needed. Once found, **left click** on the **Lock** radio button -- this will "lock" the layer and prevent any unwanted alteration.
- **Left click** on **OK** to exit from the *Edit Layers dialogue box*.
- From the toolbar select the *Interpolated Curve Icon*  by **left clicking** on it with your mouse, or type the command **InterpCrv** at the command line.

- Turn on *Grid Snap* by pressing **F9** -- this will make the start of the curve "snap" to desired coordinates.
- Begin to draw your 1st curve at point (a.-- i.e., *the North Pole*) by **left clicking** with your mouse at coordinates 

x	0.000	y	0.000	z	0.000
---	-------	---	-------	---	-------
- Turn off *Grid Snap* by pressing **F9**.
- Move your cursor to point (b. -- *Head top 1*) then **left click** to set the point.
- *\*Note* - If for some reason you have trouble trying to figure out about where to place a point you can always refer to: [Table One](#) -- which can be found below and lists the exact coordinates of each point on the curve.
- Once again, move your mouse in a downward direction following the profile contour of the head and place your third point (c. -- *Head top 2*) by **left clicking** with the mouse where indicated.
- Continue this procedure for all the remaining points, (d.) through (t.) *\*WARNING* -- Do not place a point between (t.) and (u.) only AT (t.) and (u.).
- Place the last point (u.) by **left clicking** at the appropriate position, then drag the mouse out a bit and press **Enter** -- this will complete the curve.

Now that you've completed drawing the 1st curve, display your edit points by first select the curve by **left clicking** on it with your mouse - it will become highlighted.







Now "turn on" the points by choosing the display Edit Points On/Off icon from the toolbar or typing the command: **EditPtOn** at the command line. Notice anything odd? How about that despite the fact that you only left Clicked a total of **21** times with your mouse to establish points (a.) through (u.) you've now have **23** points showing up on the curve..! If you look you can see an extra point between has been added between (a.) & (b.) and (t.) & (u.). So where did the extra 2 points come from then? Well it all has to do with the nature of the way interpolated curves work in Rhino and one of the reasons that they seem to produce more complex geometry. This is one of the primary reasons why we will "rebuild" them a bit later on in the exercise.

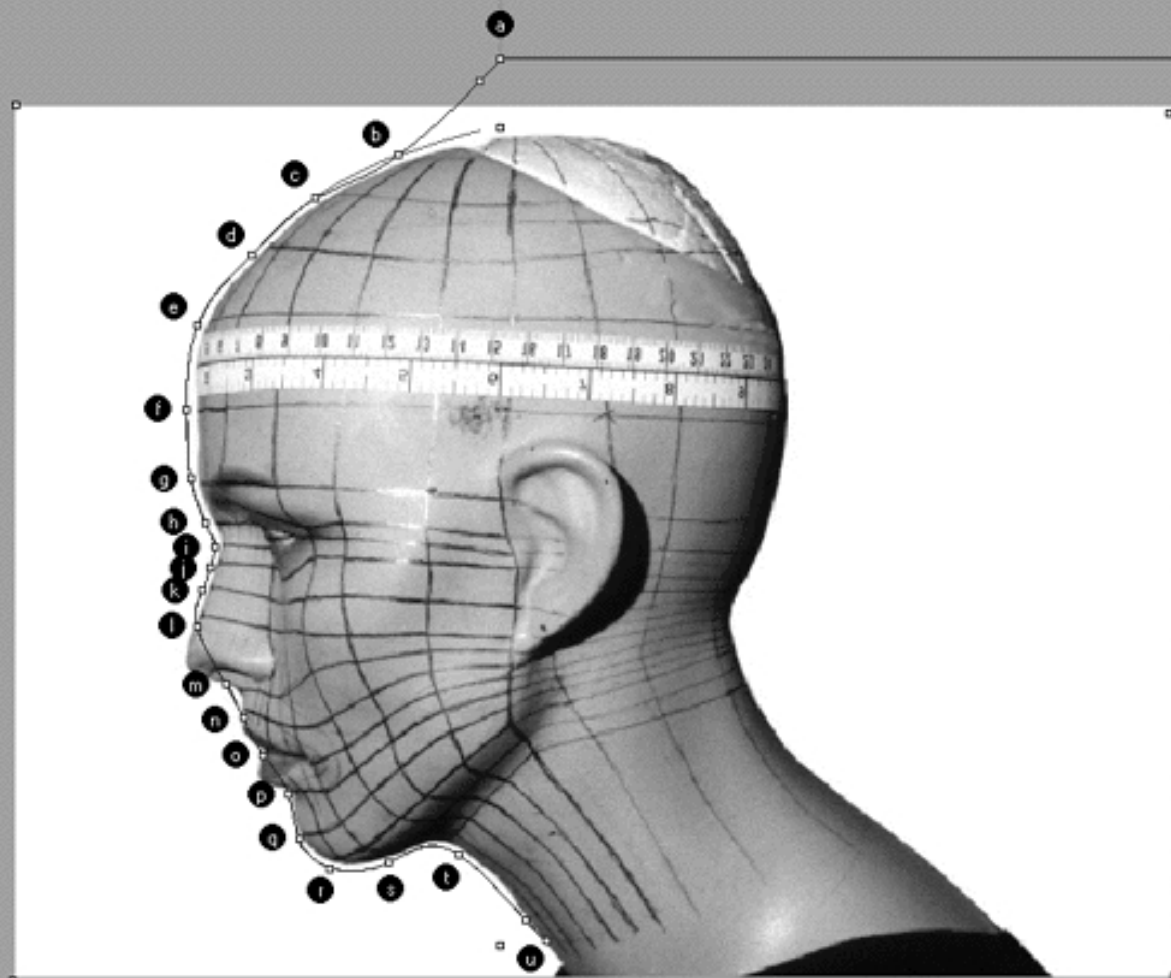
## Clean and Refine

Before finishing up work on a curve it's always a good idea to check it over carefully and refine if necessary. One thing that often happens when "snapping" curves on to points is that they don't stick to each other as well as they should and its more than likely that some misalignment has taken place. Therefore, I highly recommend getting in the habit of doing the following:

- Move your cursor to the *Status Bar* at the bottom of your screen, **left click** on the *Osnap field* -- the *Osnap dialogue box* will open.
- Make the point snap active by **left clicking** on "Point" a check should appear -- If any other boxes are checked disable them.
- Click on **X** to exit the *Osnap dialogue*.

- Choose the *Zoom window icon*  from your toolbar by **left clicking** on it or type the command: **ZoomWindow** at the command line.
- Drag out the selection box, enough to encompass only a few points to begin with, (i.e. points **a - c**).
- With the exception of point (**a.**) and the phantom point, if any of the points seem to be anything less than spot on with the guide curve select the offending point with your mouse. **Left click and Hold the mouse key down** (the point should highlight) and while doing so drag the misaligned point to where it should be -- it should then snap on to the point when you get close enough.
- Now pan the view to the next 3 points ( **d - f** ) to do this **left click** on the *Pan icon*  again, if you find any points that are not spot on snap them to where they should be.
- Continue this procedure for all the remaining points ( **g - u** ).
- When you've finished, double check your work for accuracy.
- Hide any edit points that may be currently displayed by choosing the Edit Points On/Off icon  from the toolbar or by typing the command: **PtOff** at the command line.
- Zoom out all the viewports by choosing the Zoom Extents/Zoom Extents All Views icon  from the toolbar or by typing the command: **ZoomExtentsAll** at the command line.
- Congratulations, you've now completed drawing & editing the first curve..!

Right



This **Right Viewport** screenshot shows the completed profile curve.



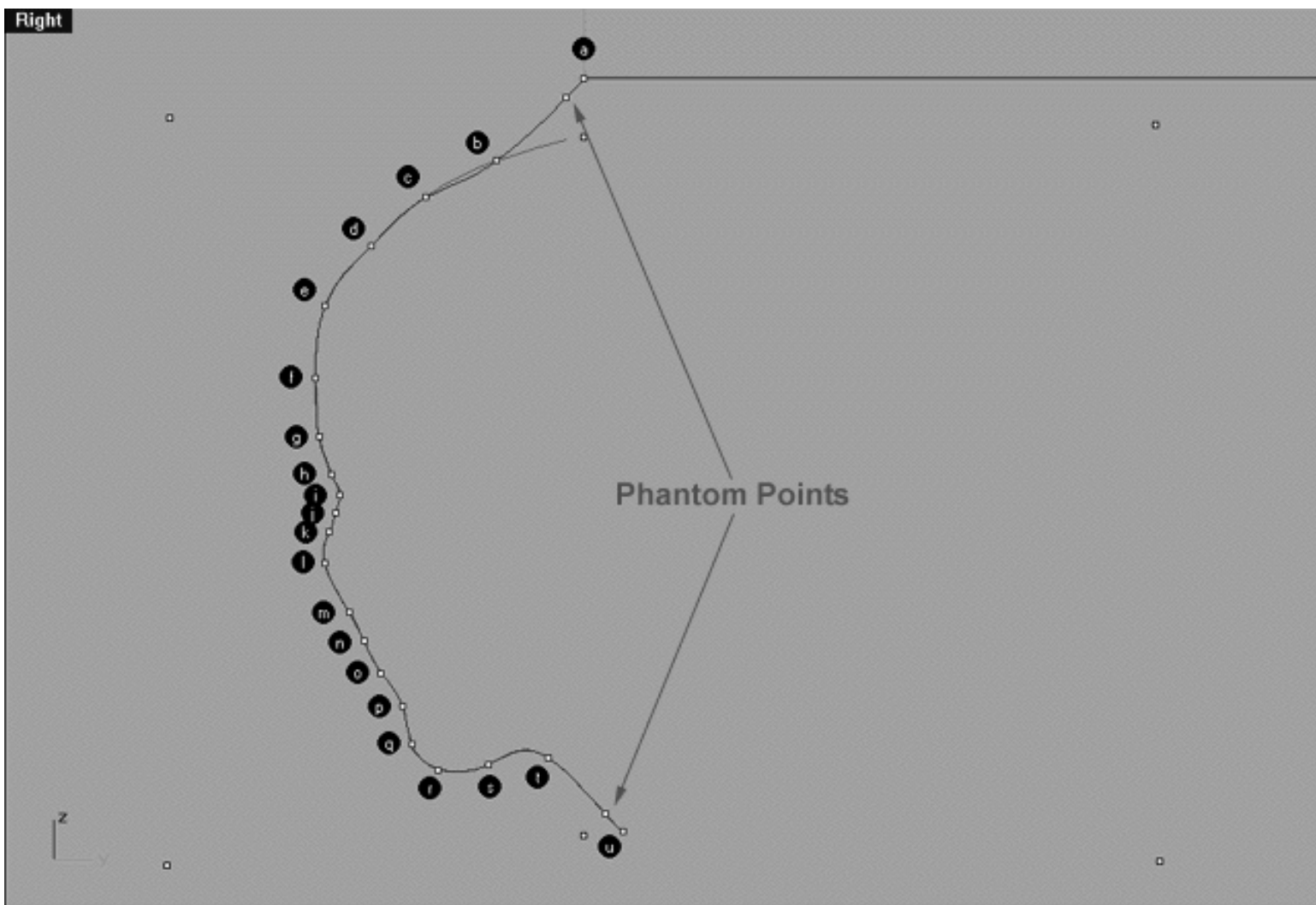
View an example movie of how to create the 1st curve -- [Click Here](#).

Now the quick witted may have noticed in the prior screenshot that the curve that I just drew does not really follow the nose and mouth as well as it might do -- and you'd be absolutely right. Why?

Again, because for the time being **we are only really trying to establish a "basic" starting shape for our head and since we are going to build the nose and mouth as separate geometry later on in the lesson it would be a waste of time to concern ourselves with too much detail right now.**

Our main aim at this stage is to establish and pin down the key points of the face (i.e., points a-u). In the screenshot below I've turned off the background image so you can see the curve & points a bit more clearly.





The key points of the face are shown in the screenshot above as black annotated dots labeled ( a - u ) and correspond directly to Table One below:

## Table One - A list of points & coordinates for the profile curve

[Click Here](#)


## Shutting Down the Scene


Before moving on to the next lesson you should do the following:

- Confirm that no Osnaps are currently active. You can easily tell if any are in their active state by looking at the Osnaps box on Lower Status Bar. If any Osnaps are active the word "Osnaps" will be in a normal dark black font, otherwise if they are inactive the font will appear ghosted. To enable or disable the Osnaps at any time, left click on the Osnaps box and tick or un-tick the options as required.
- Open the Edit Layers Dialogue box and turn off Guide\_01.
- Left click on the Layer Info box at the Lower Status Bar, highlight the layer entitled SCENE START UP and click on it -- it should now become the active layer and its name should appear in the box.



- Confirm the newly created curve has in fact been associated with the correct layer. Do this by right clicking on the Layer Info box at the Lower Status Bar, the Edit Layers dialogue will open. Find Interp\_01 in the list, select OFF and press ENTER to exit. The profile curve should now disappear from all the viewports. If

it didn't you'll need to associate it with the correct layer now. To do this choose the Layers icon  from the toolbar, left click and hold down the mouse key as you do the layers flyout should appear. Now choose

the Change Layers icon  from the flyout by continuing to hold down the mouse key whilst moving the cursor over the icon, when you're on top of it release the mouse key. The command line will respond with the following prompt: **Select Objects for layer change:** Click on the profile curve to select it and then press the ENTER key. The Layer for Object dialogue box should now open. Find Interp\_01 in the list and highlight it by clicking on it, once you've done so click OK to exit. The curve should now be associated with the correct layer.

- If the profile curve (Interp\_01) is not currently displayed in all the viewports turn it on now by right clicking on the Layer Info box at the Lower Status Bar. Find Interp\_01 in the list and select ON then press ENTER to exit.
- Last but not least be certain to SAVE YOUR WORK.

---

[Go To Next Lesson - Drawing the 2nd Curve](#)

**RETURN** to Top of Page -- [Click Here](#)

Written by Joseph R. Saltzman.

Co-produced in association with Steven Ståhlberg

©1998-1999 Cinemagic Productions Limited. All Rights Reserved.

Duplication of this document including images and text by any means is expressly forbidden without prior written consent of Cinemagic Productions Limited.

Web Site: <http://www.cmagic.co.uk> Telephone: +44 (0)1753 733 190 Fax: +44 (0)1753 736 619 email: [cmagic@cmagic.co.uk](mailto:cmagic@cmagic.co.uk)

# MOVIE CREATING THE 1ST CURVE

To **PLAY** the example movie, double click below:

To **RETURN** to the head shape tutorial -- [click here](#).

## TABLE ONE

POINT	X AXIS	Y AXIS	Z AXIS
a - North Pole	0.000	0.000	0.000
b - Head top 1	0.000	-30.769	-29.061
c - Head top 2	0.000	-55.949	-41.955
d - Head top 3	0.000	-75.510	-59.351
e - Hairline	0.000	-91.897	-80.427
f - Temple	0.000	-94.989	-106.158
g - Browbone	0.000	-93.941	-127.057
h - Crease of top eyelid	0.000	-89.282	-140.398
i - Eye centre line	0.000	-86.515	-147.947
j - Under-eye area	0.000	-87.988	-153.894
k - Bridge of nose	0.000	-90.200	-161.027
l - Cheek apple	0.000	-92.046	-171.960
m - Nose base, cheek bone	0.000	-83.261	-189.395
n - Upr lip, cheek hollow	0.000	-77.755	-199.841
o - Centre of mouth, cheek hollow	0.000	-71.682	-211.104
p - Lwr lip under, cheek hollow	0.000	-64.286	-222.560
q - Tip of chin	0.000	-61.083	-236.186
r - Jawline	0.000	-51.474	-245.314
s - Nape of Neck	0.000	-33.161	-243.436
t - Neck	0.000	-12.527	-241.138
u - Base of neck	0.000	13.900	-267.423

**RETURN** to tutorial -- [Click Here](#)

**RETURN** to previous lesson -- [Click Here](#)




## THE 2ND CURVE


### Contents:

- [Scene Setup](#)
- [Drawing the 2nd curve](#)
- [Example Movie -- Creating the 2nd Curve.](#)
- [Editing the 2nd curve](#)
- [Moving from Right View to Front View -- 1st](#)
- [Return to Right View -- 2nd](#)
- [Return to Front View -- 3rd](#)
- [Return to Right View -- 4th](#)
- [Return to Front View -- 5th](#)
- [Take it to the Top View -- 6th](#)
- [Snapping things up](#)
- [Example Movie -- Editing the 2nd Curve.](#)
- [Example Movie -- Editing the 2nd Curve, snapping to the guide.](#)
- [Table 2 -- A list of points and coordinates for the completed 2nd curve](#)
- [Shutting Down the Scene](#)
- [Summary of Lesson\(s\) -- Curves 1&2](#)

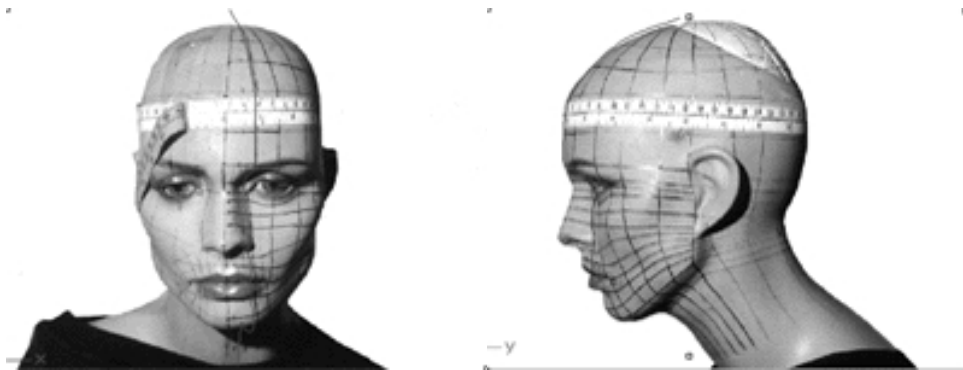
---

## Scene Setup

- If you've not done so already start a Rhinoceros session by **Double clicking** on the desktop icon  the application will begin.
- Choose File, Open from the menu bar and Double click on **START\_A.3DM** in the file list, it will load and open.
- Confirm at the Lower Status Bar the currently active layer is entitled SCENE START UP. If it is active proceed to the next step, if it's not then make it active by left clicking on the layer box, highlighting the correct layer and clicking on it.




- Again, at the Layers Box on the Lower Status Bar this time right click on the box, the Edit Layers Dialogue box will open. Confirm the following switches have been enabled or disabled:
- The Layer entitled Annotated Dots\_1 should be LOCKED.
- The Layer entitled Guide\_01 should be OFF.
- The Layer entitled Interp\_01 (the Profile Curve) should be ON.
- The Layer entitled Photopoints should be ON.
- The Layer entitled Frozen should be LOCKED.
- The Layer entitled SCENE START UP should be ON.
- When you've finished making your changes ( if any ) click on OK.
- All other layers should be set to OFF.
- Confirm that you can see the background image in the Front and Right viewports.
- Confirm that the grid display in the viewports has been disabled.
- Zoom out all the viewports by selecting the Zoom Extents All icon  or by typing the command: **ZoomExtentsAll** at the command line and pressing ENTER.



## Drawing the 2nd curve



Now that we've completed the all important first profile curve the procedure from here on in is mostly just a matter of copying the profile curve, rotating it about the centre point into a new position, and making necessary adjustments to the new rotated curve by moving the points to where we want them (a.k.a. "pulling points"). By rotating each new curve about a common centre point we are in effect creating a cylindrical shape -- which after all is just what we want to do.

**Description:** The 2nd curve begins at the top pole and runs along the top & front of the head, over the brow bone (at about the inner start point of the eyebrow) into the corner of the eye socket (near tear duct) and down along the side of the nose continuing just over the lips (about halfway between the lip peak and the mouth corner) following on over and under the corner of the chin and ending at the base of the neck.

- Choose the *Zoom: Extents All Viewports icon*  from the toolbar or type the command: **ZoomExtentsAll** at the command line.
- Go to the Lower Status Bar at the bottom of your screen, **right click** on the *Layer info box* -- the *Edit Layers dialogue box* will open.
- Locate the layer named **Guide\_02** in the list, use the scroll bar to move up or down as needed. Once found, **left click** on the **LOCK** radio button -- this will "turn-on" the layer while at the same time protecting it from unwanted alteration.
- **Left click** on the **New** button and in the *Name field* type: **Interp\_02**.
- Move the cursor to the *colour field*, **left click** on the *colour field*, the "*Select a colour*" dialogue and colour wheel will appear, choose a nice bright blue (i.e. **R:0 G:0 B:255**) then click **OK**.
- You will be returned to the *Edit Layers dialogue box* again, **left click** on **OK** to exit.
- Return your cursor to the *Status Bar* at the bottom of the screen and **left click** on the *Layer info box* -- the Layers list will appear.
- Locate **Interp\_02** in the list (the one you created a few moments ago) and move your cursor over its name (it will highlight) **left click** on it to make the layer currently active.
- Open the *Osnap dialogue box* by moving your cursor to the lower status bar and **left clicking** on its title. The *Osnap dialogue box* will open, enable the *End snap* by **left clicking** on End -- a check will appear indicating that it is now active. If any boxes are checked/active other than "End" disable them now.
- Close the *Osnap dialogue box* by clicking on **X**.
- If you've not already done so, hide any currently displayed edit points by choosing the *show/hide edit points icon*  from the toolbar or type the command: **PtOff** at the command line.
- In **Any Viewport** Select the first profile curve (i.e. Interp\_01) by **left clicking** on it -- it will highlight.
- From the toolbar **left click** on the Rotate 2D icon  or type the command: **Rotate** at the command line.
- At the command line you will receive the following prompt: **Choose centre of rotation (copy)**.
- Type: **copy** at the command line and press **Enter**.
- In the **Right Viewport** Move your cursor to point (a. -- X:0, Y:0, Z:0) on the first profile curve (i.e. Interp\_01) -- the cursor should snap to it, when it does **left click**.
- At the command line the system will respond with the following prompt: **Angle or first reference point:**
- Now, move your cursor into the **Top Viewport** and bring the cross hairs to about the 6 o'clock position (near the bottom of the window) once you've done this **press and hold down the Shift Key** on your keyboard -- the curve should align itself perfectly along the Y axis.

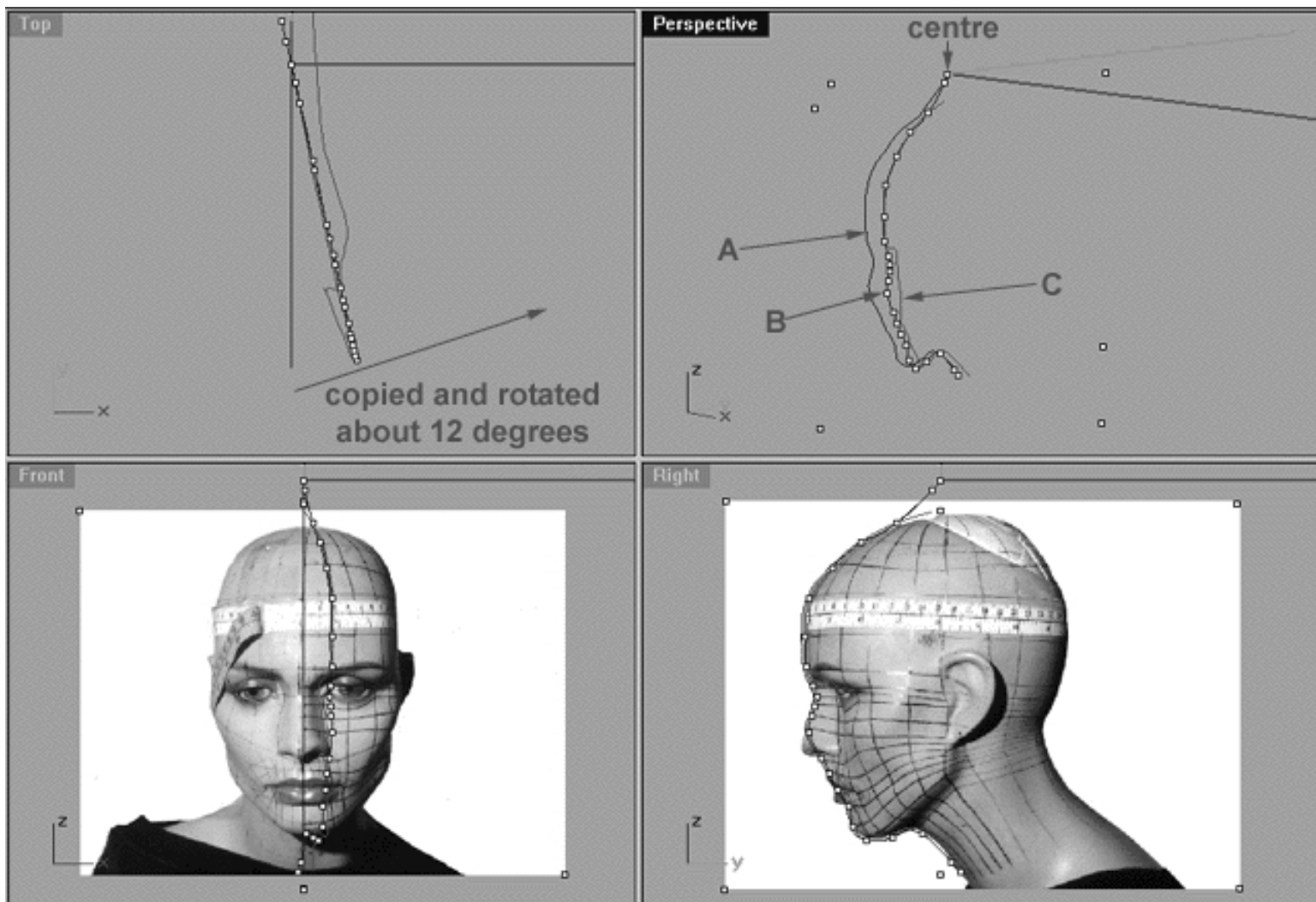
- While still **holding the Shift Key down**, drag the cursor along the -Y axis about 130 units and **left click**.
- The system will then respond with the following prompt at the command line: **Second reference point:**
- Rotate the curve anti-clockwise about **12 degrees** and **left click**.
- Press **Esc** on your keyboard to complete the operation.
- In the **Perspective Viewport** select the newly rotated curve by **left clicking** on it -- it will highlight.
- Choose the *Layer Control Icon*  from the toolbar by **left clicking** on it and **holding down the key** -- select the *Change Layer Icon*  from the flyout.
- Select **Interp\_02** from the *Pick layer for object dialogue* -- it will highlight. This will make certain that Interp\_02 has been associated with the correct layer.
- Click **OK**.
- Disable any currently active Osnaps.



To view an example movie of how it's done

[Click Here](#)

---




This screenshot shows our original profile curve (**A**), after having been copied and rotated about 12 degrees on its \*centre, and now located at position (**B - I've turned on the edit points so you can see more easily**). \*Note - the centre of all the curves we create will be at the uppermost endpoint located at X:0.000 Y:0.000 Z:0.000. Curve (**C**) in red represents where our new rotated curve (**B**) should be positioned once the points have been appropriately pulled into place. As you can see, one very important aspect to this 2nd curve is that it begins to define one corner of the eye socket and side plane of the nose. For this reason, when looking at the Right Viewport you can see that points **h** through **i** (along the nose) are going to be "flattened out" in comparison to the original profile curve by moving them in towards the face along the Y axis. In fact, most of the points will have to be moved inward just a bit along the Y axis.

## Editing the 2nd Curve

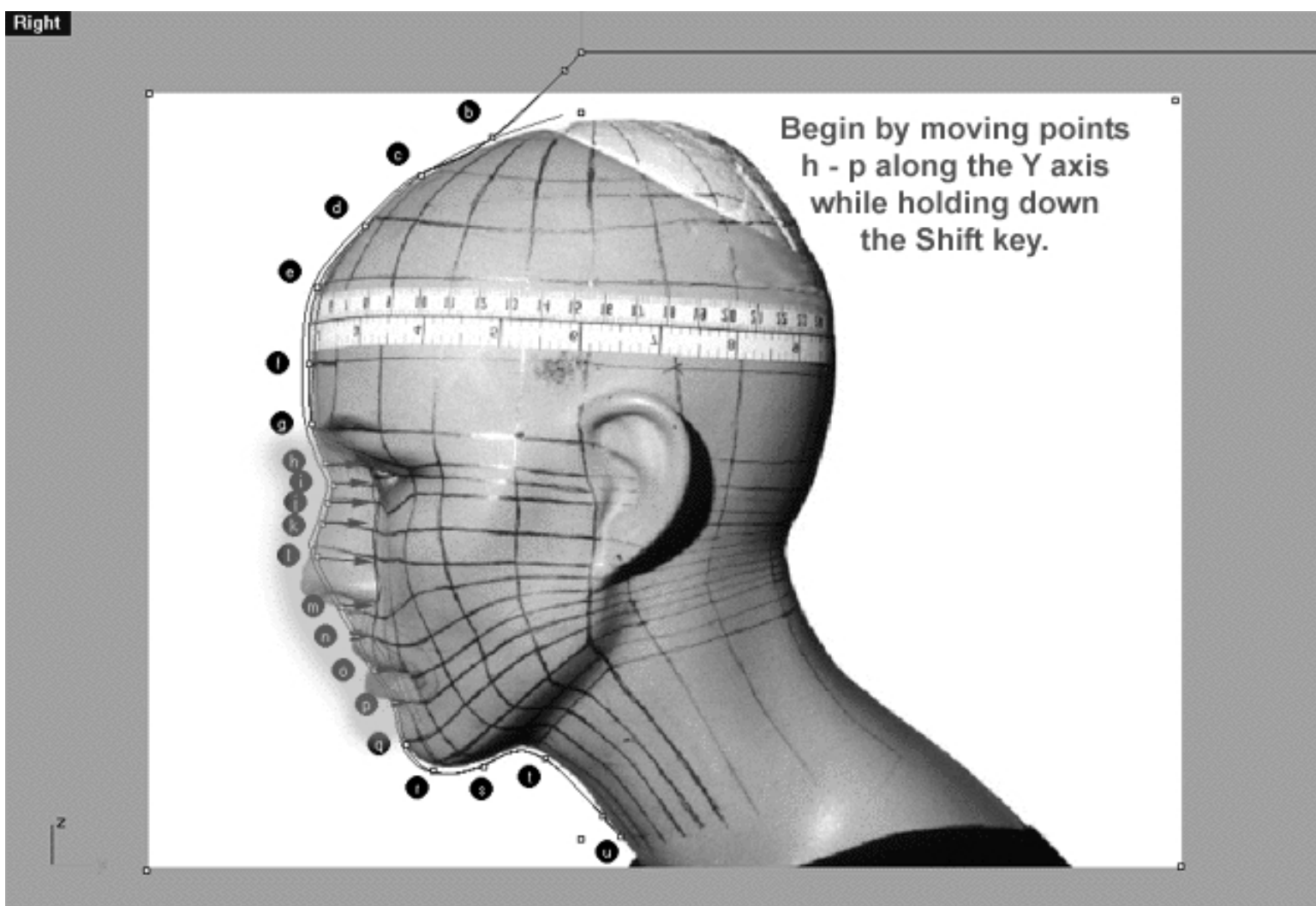
- Maximise the **Right Viewport** by **double left clicking** on its label.
- Now let's lock the layer containing the profile curve ( **Interp\_01** ) -- At the *Lower Status Bar*, **right click** on the *Layer info box* -- the *Edit Layers dialog box* will open.
- Locate the layer named **Interp\_01** in the list, use the scroll bar to move up or down as needed. Once found, Confirm that it has been **LOCKED**. If not, **left click** on the **LOCK** radio button -- this will "lock" the layer.
- Locate the layer named **Guide\_02** in the list, use the scroll bar to move up or down as needed. Once found, **left click** on the **LOCK** radio button -- this will "lock" the layer and prevent it from being disturbed while we continue to work.



- Click on **OK** to Exit.
- Now display the edit points for the rotated curve (Interp\_02), select the curve by **left clicking** on it -- it will highlight. Then choose the *Show edit points icon*  from the toolbar by **left clicking** on it or type the command: **EditPtOn** at the command line.
- Begin by moving edit points ( **h - p** ) to do this, **left click** on a point -- it will highlight. Then with these points only, **hold down the Shift Key**, **left click** on the highlighted point and drag the point inward toward the red guide curve ( Guide\_02 ) along the Y axis while continuing to hold down the Shift key.

So why hold down the Shift key while dragging? Because by doing so the given point will be constrained to the current axis move in a perfectly horizontal or vertical manner as case may be, thus staying in ideal alignment.

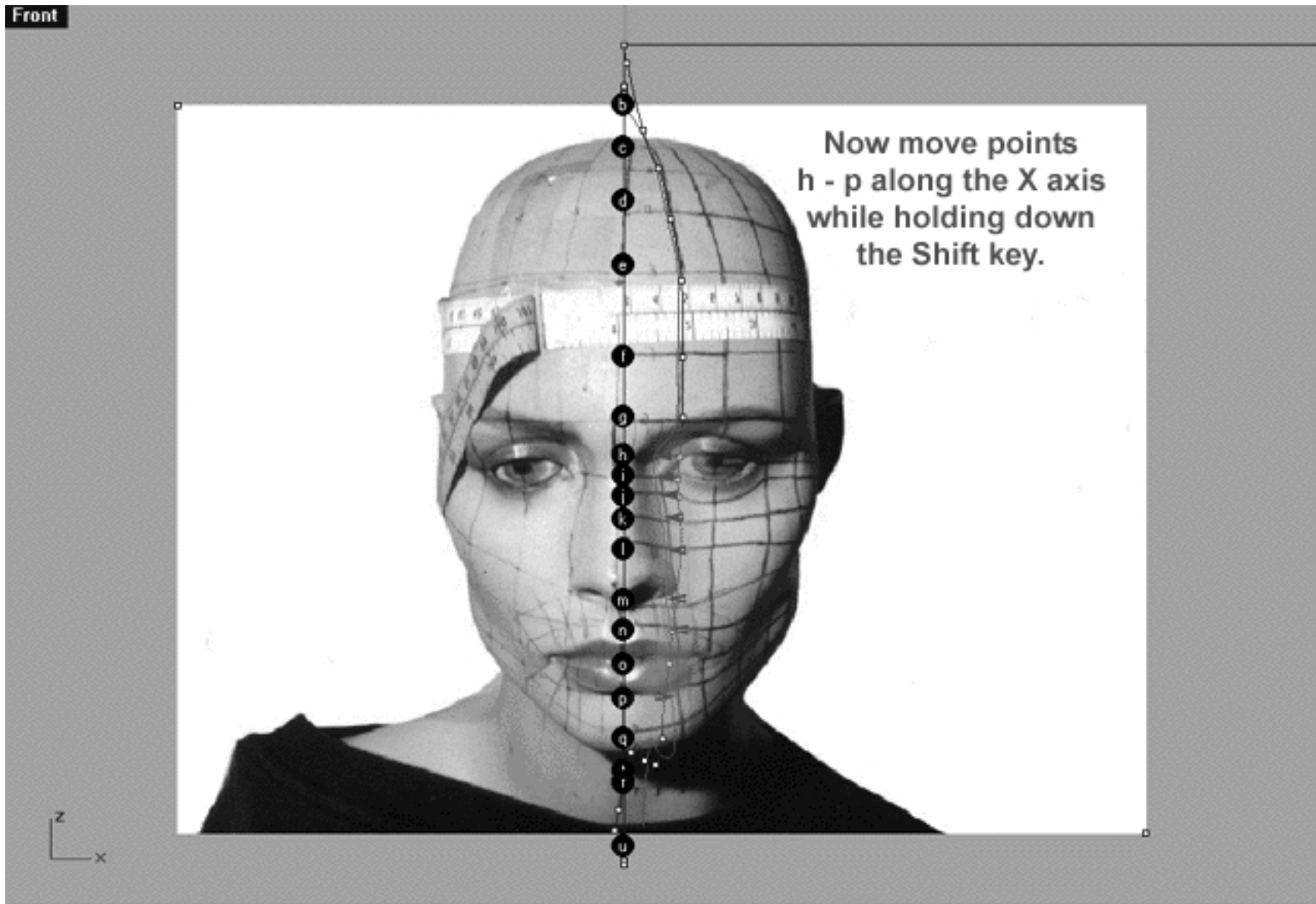
**\*Note** -- this is not a technique that will work under all circumstances and it's not something that you should always do (i.e. don't hold down Shift while dragging just for the sake of doing it). Again, this is best done when you want to keep the points in alignment along a given axis, either straight across or straight up and down. As you model increasingly more you will begin to get a feel for when it will work and when it will not.



This **Right Viewport** screenshot shows points ( **h - p** ) on the 2nd curve (Interp\_02) prior to being dragged inward toward the red guide curve ( Guide\_02 ) along the Y axis.

# Moving from Right View to Front View -- 1st.


- **Double left click** on the **Right Viewport** label -- the viewport will minimise.
- **Double left click** on the **Front Viewport** label -- the front viewport will maximise.
- Again, start by moving edit points ( **h - p** ) to do this, **left click** on a point -- it will highlight. Then for these points only, **hold down the Shift Key**, **left click** on the highlighted point and drag the point toward the red guide curve ( Guide\_02 ) along the X axis while continuing to hold down the Shift key.

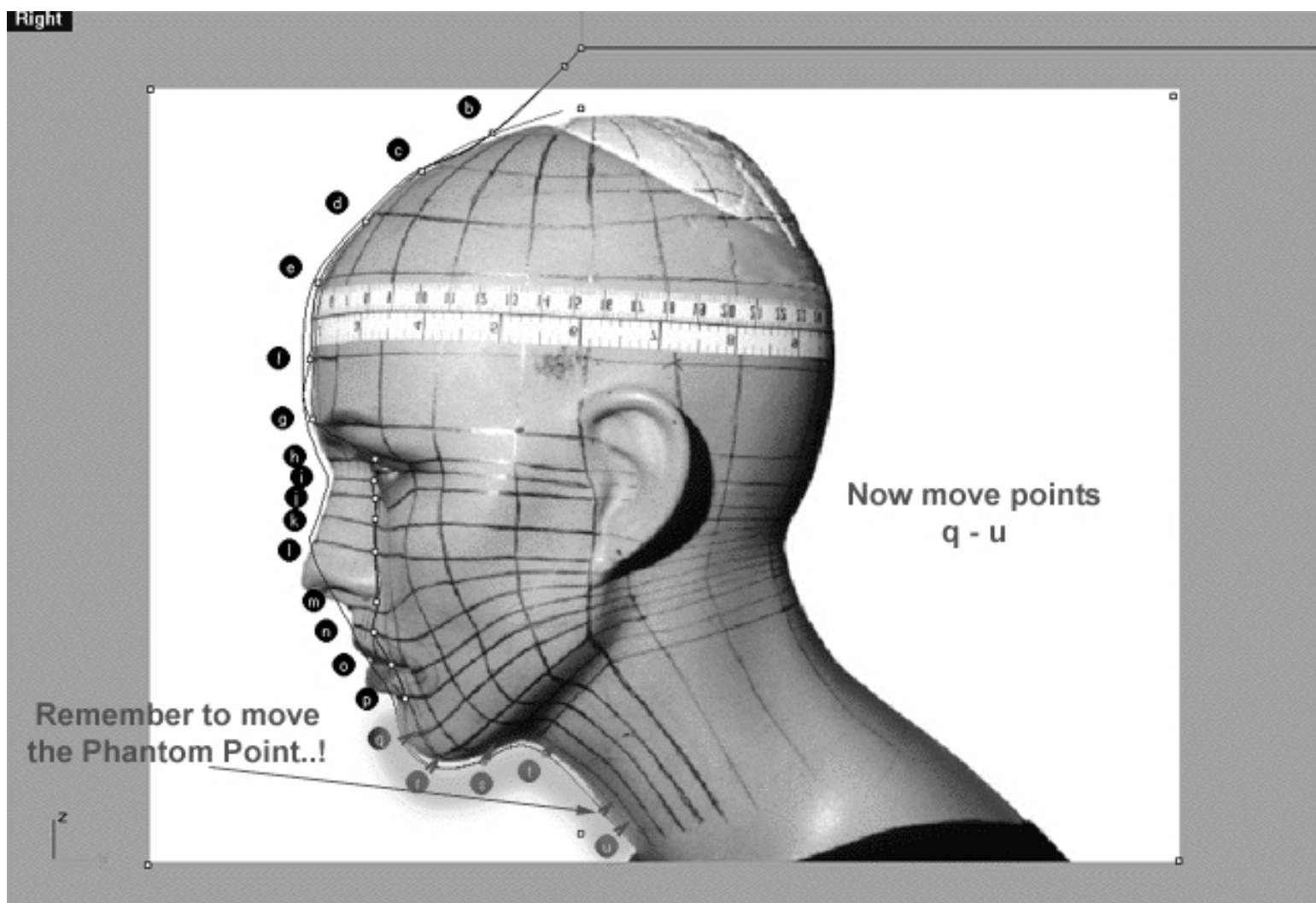


This **Front Viewport** screenshot shows points ( **h - p** ) on the 2nd curve (Interp\_02) prior to being dragged toward the red guide curve ( Guide\_02 ) along the X axis.

## Return to the Right View -- 2nd

- Once completed, check your work and return to the **Right Viewport**.
- Maximise the **Right Viewport** if you've not done so already by **double left clicking** on its label.
- *\*Tip -- You may find it very helpful to zoom in closely on the area which you are working.*


- Before proceeding, confirm that no *Osnaps* are currently active and if any are disable them now.
- Start with point ( **q** ) to do this, **left click** on it -- it will highlight. Then drag it across and up slightly towards the guide curve using the background roscope image for reference.
- Now move on to point ( **r** ) again **left click** on the point -- it will highlight. Then drag it across and up slightly as you did in the last step.
- With the next few points ( **s - u** ) things get a little bit more tricky and the bad shadow on the background reference image doesn't help any so do be careful and take your time. \*Tip - Try to match the shape of the red guide curve as best you can.
- Once completed, zoom out by choosing the *Zoom Extents icon*  from the toolbar and **clicking** on it.

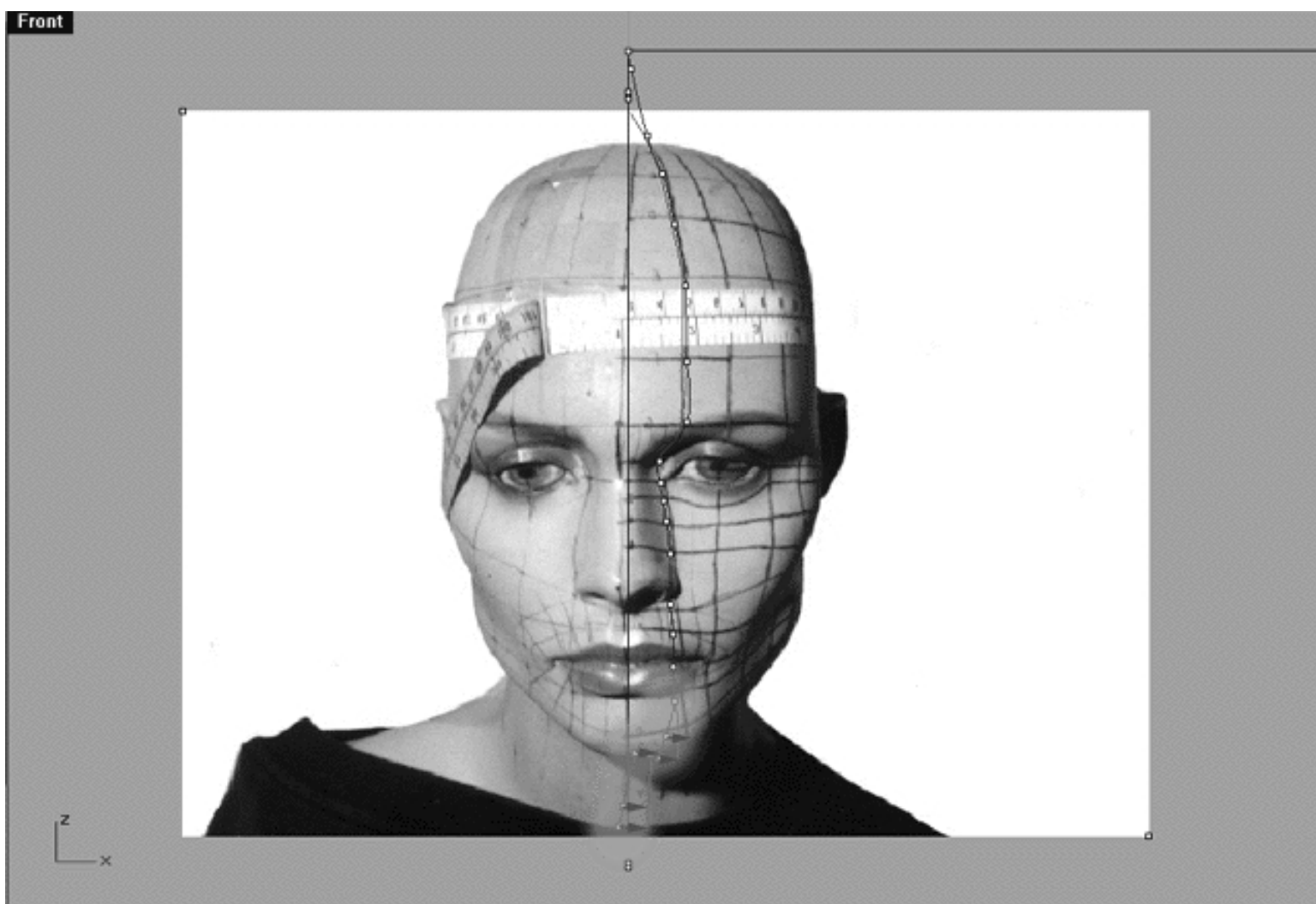


This **Right Viewport** screenshot shows points ( **q - u** ) on the 2nd curve (*Interp\_02*) just prior to being dragged toward the red guide curve (*Guide\_02*) along the Y axis.


## Return to the Front View -- 3rd

- Once you've completed the prior step, check your work and then minimise the **Right Viewport** by **double left clicking** its label.


- Maximise the **Front Viewport** by **double left clicking** on its label. *\*Note - Depending on your screen resolution it may be necessary to zoom in on the points!*
- We will now move points ( **q - u** ) into position. To do this, start with point ( **u** ) **left click** on the point -- it will highlight. Then, **hold down the Shift Key**, **left click** on the highlighted point and drag the point until it meets with the red guide curve ( **Guide\_02** ) along the X axis while **continuing to hold down the Shift key**.
- Next move the phantom point and repeat the previous procedure.
- Next move point ( **t** ) and repeat the procedure for the remaining points ( **s - r** ).
- While your zoomed it tightly, take this opportunity to adjust any points that may be misaligned with the red guide curve along the X axis. *\*WARNING* - only move the points along the **X** axis, **DO NOT** move them along the Y axis!
- Once completed, zoom out by choosing the *Zoom Extents icon*  from the toolbar and **clicking** on it.

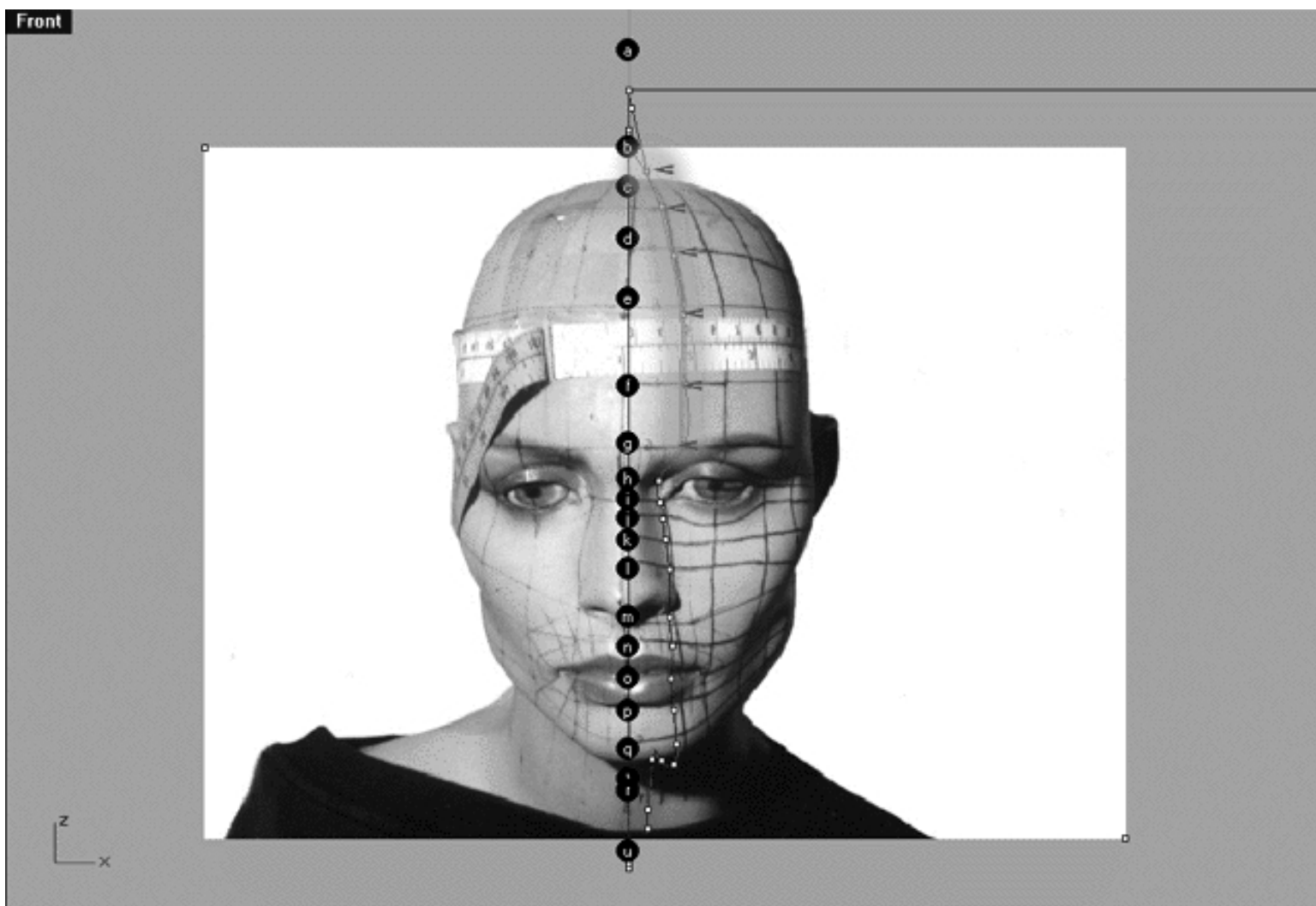


This **Front Viewport** screenshot shows points ( **q - u** ) on the 2nd curve ( **Interp\_02** ) just prior to being dragged toward the red guide curve ( **Guide\_02** ) along the X axis.

- Now while still in the **Front Viewport** zoom in pretty tightly on points ( **b - g** ), to do this choose the *Zoom window icon*  from the toolbar or type the command: **ZoomWindow** at the command line.





- We will now concentrate on moving points ( **b - g** ) into position. To do this, start with point ( **b.** ) **left click** on the point -- it will highlight. Then, **hold down the Shift Key, left click** on the highlighted point and drag the point until it meets with the red guide curve ( Guide\_02 ) along the X axis while **continuing to hold down the Shift key**.
- Repeat this procedure for the remaining points ( **c - g** ). *\*Note -- depending on your screen resolution you may have to pan the view.*
- Once completed, zoom out by choosing the *Zoom Extents icon*  from the toolbar and **clicking** on it.

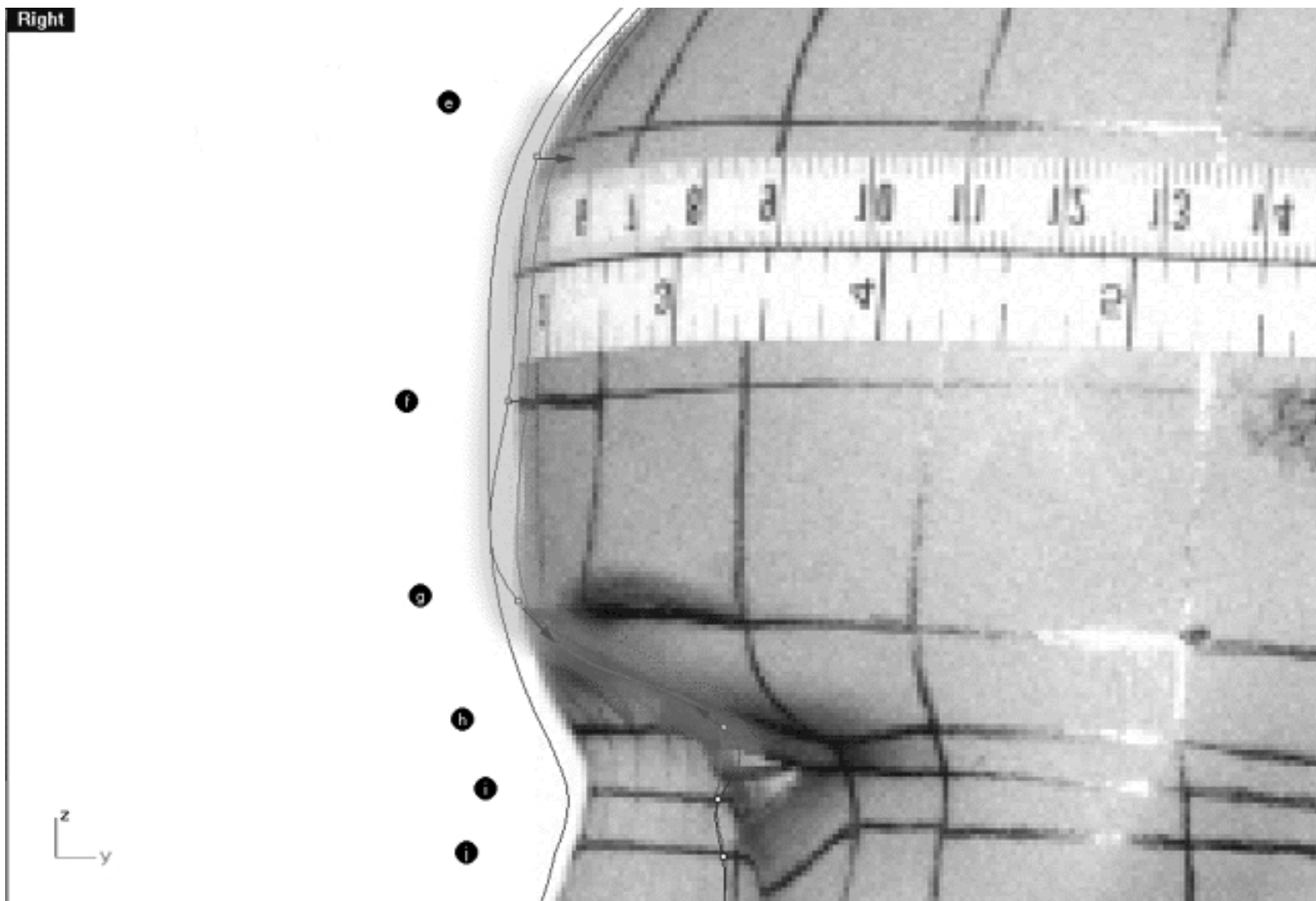


This **Front Viewport** screenshot shows points ( **b - g** ) on the 2nd curve (Interp\_02) just prior to being dragged toward the red guide curve ( Guide\_02 ) along the X axis.

## Return to the Right View -- 4th


- Once you've completed the prior step, check your work and then minimise the **Front Viewport** by **double left clicking** on its label.
- Maximise the **Right Viewport** by **double left clicking** on its label.

- Now, zoom in very tightly on points ( **b - h** ), to do this choose the *Zoom window icon*  from the toolbar or type the command: **ZoomWindow** at the command line.
- Notice anything? Well, points **e**, **f**, **g** and **h** could be in better alignment. We will now concentrate on moving points ( **e - h** ) into position. To do this, start with point ( **e** ) **left click** on the point -- it will highlight. Then, **hold down the Shift Key**, **left click** on the highlighted point and drag the point until it meets with the red guide curve ( *Guide\_02* ) along the Y axis while **continuing to hold down the Shift key**.
- Repeat this procedure for point ( **f** ).
- Now we will move Point ( **g** ) *\*Note - do not hold down shift key when moving!* You should move the point down and inward a bit along the Y axis, the curve should now conform to the guide more closely.
- Now concentrate on moving point ( **h** ) up and over till the curve conforms quite well to the guide.
- Once completed, zoom out by choosing the *Zoom Extents icon*  from the toolbar and **clicking** on it.




This **Right Viewport** screenshot shows points ( **e - h** ) on the 2nd curve ( *Interp\_02* ) just prior to being dragged toward the red guide curve ( *Guide\_02* ) along the X axis.

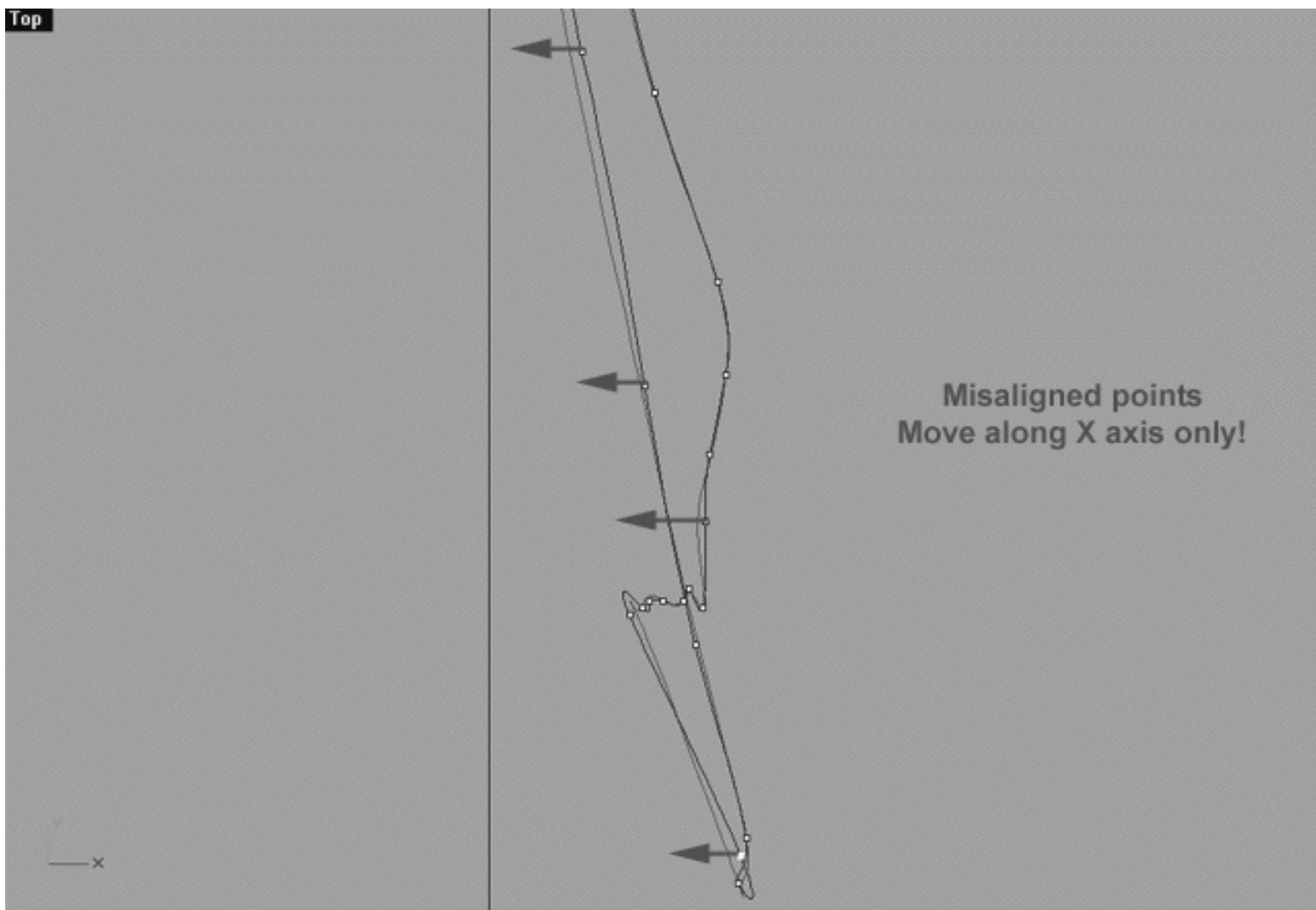
## Return to the Front View -- 5th

- Once you've completed the prior step, check your work and then minimise the **Right Viewport** by **double left clicking** on its label.
  - Maximise the **Front Viewport** by **double left clicking** on its label.
  - Carefully check how well the curve is now conforming to the guide in this view and correct any misalignment where necessary. *\*Tip - pay particular attention to area surrounding point ( h ).*
  - Once you've finished, zoom out by choosing the *Zoom Extents icon*  from the toolbar and **clicking** on it.
- 

## Take it to the Top View -- 6th

- Check your work and then minimise the **Front Viewport** by **Double left clicking** on its label.
- Maximise the **Top Viewport** by **Double left clicking** on its label.
- Turn off the annotated dot labels. At the bottom of your screen you will see the *Status Bar*, **right click** on the Layer info box -- the Edit Layers dialogue box will open.
- In the Name field list find the layer called *Annotated Dots* and select the **Off** radio button -- click on **OK to Exit**.
- Zoom in on the curve, carefully check to see how well the curve conforms to the guide.
- Correct any misalignment you may find along the **X AXIS ONLY** -- to do so, **left click** on the misaligned point -- it will highlight. Then, **hold down the Shift Key**, **left click** on the highlighted point and drag the point until it meets with the red guide curve ( Guide\_02 ) along the X axis while **continuing to hold down the Shift key**. It's rather important to mention that there is always going to be a certain degree of misalignment in your curves especially when you zoom in very tightly. You should not be overly concerned with such minor deviations, they are quite normal and trying to tweak them all is really a waste of your time. Just try and get the overall alignment of the two curves to match up more or less and if they are a little off don't worry about it. Remember, overworking your curves can cause more problems than it solves so learn to recognize when enough is enough.
- Once you've finished, zoom out by choosing the *Zoom Extents icon*  from the toolbar and **clicking** on it.





This **Top Viewport** screenshot shows an example of slightly misaligned points (*\*Note -- your results may vary*) on the 2nd curve (Interp\_02) just prior to being dragged toward the red guide curve ( Guide\_02 ) along the X axis.






To view an example movie of how it's done

[Click Here](#)

## Snapping things up

Okay, for all practical purposes the 2nd curve has now completed. Before we move on any further let's test how well you've done overall at aligning the 2nd curve to the guide. How will we do that? Basically by displaying the points on the guide curve and seeing how close you came with your edited points. Once we've done that we will "snap" all of the 2nd curves points to the guide just to keep instructor and student in sync with each other. Yes, this is a bit of a cheat and under most day to day circumstances you're not going to have the luxury of a guide curve to rely upon to help you. Remember that the whole point of using this guide curve in the first place is to help teach you how to work with the visual information you have available and make educated approximations as to where the curves should be placed based on that data. \*Tip -- during daily production I almost always create some quick guide curves as templates to help me construct difficult objects - you should too!

- Minimise the **Top Viewport** by **Double left clicking** on its label.
- Maximise the **Right Viewport** by **Double left clicking** on its label.
- Now we must unlock the Guide\_02 curve so that we may select and display its points. At the bottom of your screen you will see the *Status Bar*, **right click** on the Layer info box -- the Edit Layers dialogue box will open.
- In the *Name field list* find the layer called Guide\_02 and select the **ON** radio button -- click on **OK** to **Exit**.
- In any Viewport select the Guide\_02 curve by left clicking on it.
- Display its edit points by choosing the *Show edit points icon*  from the toolbar by **left clicking** on it or type the command: **EditPtOn** at the command line.
- Okay, here comes the test -- take a close look, how close did you manage to come? Well done! I'm quite sure you came very close indeed but we can still get even closer, so let's get on with it.
- Now we must again lock the Guide\_02 curve so that we don't mess things up while snapping. At the bottom of your screen you will see the *Status Bar*, **right click** on the Layer info box -- the Edit Layers dialogue box will open.
- In the *Name field list* find the layer called Guide\_02 and select the **Lock** radio button -- click on **OK** to **Exit**.
- Open the *Osnap dialogue box* by moving your cursor to the lower status bar and **left clicking** on its title. The *Osnap dialogue box* will open, enable the *Point snap* by **left clicking** on **Point** -- a check will appear indicating that it is now active. If any boxes are checked/active other than "Point" disable them now.
- **Left click** on the **X** to Exit the Onsap dialogue.
- Temporarily turn off the background reference image by typing the command: **HideBackgroundBitmap** at the command prompt.
- Starting with point (**b.**) zoom in on a small group of points (about 3 is good) and "snap" each curve point to its associated point on the guide curve, it's important that you re-snap each point -- be sure not to miss any!
- When you've finished working of the first group of 3 points choose and use the Pan View icon  from the toolbar and pan the view a bit further along the contour of the curve. Now start working on the next group of 3 points and continue snapping. Continue this procedure until you've snapped all the remaining points ( **b - u** ).
- Zoom out by choosing the *Zoom Extents All icon*  from the toolbar and **clicking** on it or typing the command: **ZoomExtentsAll** at the command line.
- Minimise the Right Viewport by Double left clicking on its label.
- Carefully check over your work in all viewports.

- Restore the background reference image by typing the command: **ShowBackgroundBitmap** at the command prompt.
  - Congratulations -- you've now completed editing the 2nd Curve.
  - Don't forget to save your work, if you've not done so already!
- 



**View an example movie of how it's done**

[Click Here](#)

---

**Table Two - A list of points & coordinates  
for the completed 2nd Curve -- [Click Here](#)**

---

## Shutting Down the Scene

- Confirm that no Osnaps are currently active, disable any that are.
  - Open the Edit Layers Dialogue box and turn off Guide\_02.
  - Confirm that the layer(s): Interp\_01 is ON, Interp\_02 is ON.
  - Left click on the Layer Info box at the Lower Status Bar, highlight the layer entitled SCENE START UP and click on it -- it should now become the active layer and its name should appear in the box.
  - Confirm the newly created curve (Interp\_02) has in fact been associated with the correct layer.
  - Hide any edit points that are currently displayed.
  - Zoom Extents All.
  - Last but not least be certain to **SAVE YOUR WORK**.
-

# Summary of Lesson -- Curves 1 & 2

Wow, that was a lot of work but it was certainly worth it. You've now learned some of the most fundamental skills required to successfully create models in 3D space using Rhinoceros. If you come away with anything from this particular stage in the tutorial it should be the importance of working systematically in multiple viewports. As you've clearly seen its not enough to just move a point and be done with it. Remember what you "think" you're seeing on your screen and what is actually happening in reality may be very different and the only way to confirm if your work is heading in the correct direction is to constantly switch between multiple viewports during the course of your modelling session.

[Go To Next Lesson - Drawing the 3rd Curve](#)

RETURN to Top of Page -- [Click Here](#)

Written by Joseph R. Saltzman.

Co-produced in association with Steven Ståhlberg

©1998-1999 Cinemagic Productions Limited. All Rights Reserved.

Duplication of this document including images and text by any means is expressly forbidden without prior written consent of Cinemagic Productions Limited.

Web Site: <http://www.cmagic.co.uk> Telephone: +44 (0)1753 733 190 Fax: +44 (0)1753 736 619 email: [cmagic@cmagic.co.uk](mailto:cmagic@cmagic.co.uk)

# MOVIE CREATING THE 2ND CURVE

To **PLAY** the example movie, double click below:

To **RETURN** to the head shape tutorial -- [click here](#).

# MOVIE EDITING THE 2ND CURVE PART ONE

To **PLAY** the example movie, double click below:

To watch **PART TWO** of this movie -- [click here](#).

To **RETURN** to the head shape tutorial -- [click here](#).

# MOVIE EDITING THE 2ND CURVE PART TWO

To **PLAY** the example movie, double click below:

To **RETURN** to the head shape tutorial -- [click here](#).



## MOVIE SNAPPING UP THE 2ND CURVE

To **PLAY** the example movie, double click below:

To **RETURN** to the head shape tutorial -- [click here](#).

## TABLE TWO

POINT	X AXIS	Y AXIS	Z AXIS
a - North Pole	0.000	0.000	0.000
Phantom point 1	1.144	-5.634	-6.294
b - Head top 1	5.993	-30.283	-29.280
c - Head top 2	11.164	-54.773	-42.179
d - Head top 3	15.150	-72.832	-59.269
e - Hairline	18.872	-87.729	-80.282
f - Temple	18.505	-91.011	-106.413
g - Browbone	17.824	-89.694	-129.615
h - Crease of top eyelid	11.492	-72.796	-138.167
i - Eye centre line	10.688	-70.950	-147.382
j - Under-eye area	11.771	-69.949	-154.471
k - Bridge of nose	13.170	-70.571	-163.202
l - Cheek apple	14.439	-70.130	-174.146
m - Nose base, cheek bone	14.756	-69.623	-189.856
n - Upr lip, cheek hollow	15.846	-70.596	-199.831
o - Centre of mouth, cheek hollow	15.313	-64.775	-209.844
p - Lwr lip under, cheek hollow	16.208	-60.086	-221.310
q - Tip of chin	17.344	-54.239	-232.723
r - Jawline	16.662	-46.713	-241.940
s - Nape of neck	11.326	-30.719	-240.422
t - Neck	8.589	-10.904	-239.598
Phantom point 2	6.992	11.080	-258.690
u - Base of neck	6.557	17.953	-266.390

**RETURN** to tutorial -- [Click Here](#)

**RETURN** to previous lesson -- [Click Here](#)





## THE 3RD CURVE

### Contents:

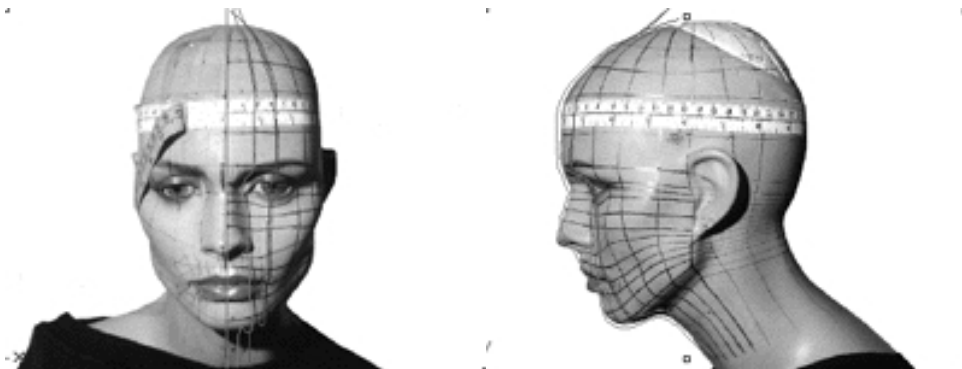
- [Scene Setup](#)
  - [Creating the 3rd curve](#)
  - [Example Movie -- Creating the 3rd Curve](#)
  - [Editing the 3rd curve](#)
  - [Moving from Right View to Front View -- 1st](#)
  - [Return to the Right View -- 2nd](#)
  - [Return to the Front View -- 3rd](#)
  - [Take it to the Top View -- 4th](#)
  - [Example Movie -- Editing the 3rd Curve](#)
  - [Snapping things up on the 3rd curve](#)
  - [Table Three - A list of points & coordinates for the completed 3rd Curve](#)
  - [Testing the Surface](#)
  - [Shutting Down the Scene](#)
  - [Summary of Lesson -- Curve 3](#)
- 

## Scene Setup

- If you've not done so already start a Rhinoceros session by **double clicking** on the desktop icon  the application will begin.
- Choose File, Open from the menu bar and double click on **START\_A.3DM** in the file list, it will load and open.
- Confirm at the Lower Status Bar the currently active layer is entitled SCENE START UP. If it is active proceed to the next step, if it's not then make it active by left clicking on the layer box, highlighting the correct layer and clicking on it.
- Again, at the Layers Box on the Lower Status Bar this time Right click on the box, the Edit Layers Dialogue box will open. Confirm the following switches have been enabled or disabled:
- The Layer entitled Annotated Dots\_1 should be OFF.


- The Layer entitled Interp\_01 (the Profile Curve) should be ON.
- The Layer entitled Interp\_02 should be ON.
- The Layer entitled Guide\_03 should be LOCKED.
- The Layer entitled Photopoints should be ON.
- The Layer entitled Frozen should be LOCKED.
- The Layer entitled SCENE START UP should be ON.
- When you've finished making your changes ( if any ) click on OK.
- All other layers should be set to OFF.
- Confirm that you can see the background image in the Front and Right viewports.
- Confirm that the grid display in the viewports has been disabled, if not turn it off now.
- Confirm that no Osnaps are currently enabled, if any are disable them.
- Confirm that no edit points are currently displayed, if any are hide them.
- Zoom out all the viewports by selecting the Zoom Extents All icon  or by typing the command ZoomExtentsAll at the command line and pressing ENTER.

## Creating the 3rd curve.





Now that we've completed the 1st and 2nd curves the procedure from here on in is mostly just a matter of copying the profile curve, rotating it about the centre point into a new position, and making necessary adjustments to the new rotated curve by moving/editing the points.

**Description:** The 3rd curve begins at the top pole and runs along the top & front of the head, over the brow bone (at about the centre point of the eyebrow) directly across the pupil and eye socket (dead centre) and down along the cheek plane continuing over to define the lips outermost extents of the mouth and lips then following on over the side corner of the chin, under the forward jaw and ending at the base of the neck.

- First, select the **Interp\_02** curve by **left clicking** on it, then lock the curve by typing the command: Lock at the command line and then press **Enter**.
- Now let's create a new layer -- At the bottom of your screen you will see the *Lower Status Bar*, **Right click** on the *Layer info box* -- the *Edit Layers dialogue box* will open.
- **Left click** on the **New** button and in the *Name field* type: **Interp\_03**.
- Move the cursor to the *colour field*, **left click** on the *colour field*, the "*Select a colour*" dialogue and colour wheel will appear, choose a nice bright blue (i.e. **R:0 G:0 B:255**) then click **OK**.
- You will be returned to the *Edit Layers dialogue box* again, **left click** on **OK** to exit.
- Return your cursor to the *Status Bar* at the bottom of the screen and **left click** on the *Layer info box* -- the Layers list will appear.
- Locate **Interp\_03** in the list (the one you created a few moments ago) and move your cursor over its name (it will highlight) **left click** on it to make the layer currently active.
- Open the *Osnap dialogue box* by moving your cursor to the *lower status bar* and **left clicking** on its title. The *Osnap dialogue box* will open, enable the *End snap* by **left clicking** on End -- a check will appear indicating that it is now active. If any boxes are checked/active other than "End" disable them now.
- Close the *Osnap dialogue box* by clicking on **X**.
- In **Any Viewport** Select the 1st curve (i.e. Interp\_01) by **left clicking** on it -- it will highlight.
- From the toolbar **left click** on the Rotate 2D icon  or type the command: **Rotate** at the command line.
- At the command line you will receive the following prompt: **Choose centre of rotation (copy)**
- Type: **copy** at the command line and press **Enter**.
- In the **Right Viewport** Move your cursor to point (a. -- X:0, Y:0, Z:0) on the first profile curve (i.e. Interp\_01) -- the cursor should snap to it, when it does **left click**.
- At the command line the system will respond with the following prompt: **Angle or first reference point:**
- Now, move your cursor into the **Top Viewport** and bring the cross hairs to about the 6 o'clock position (near the bottom of the window) once you've done this **press and hold down the Shift Key** on your keyboard -- the curve should align itself perfectly along the Y axis.
- While still **holding the Shift Key down**, drag the cursor along the -Y axis about 130 units and **left click**.
- The system will then respond with the following prompt at the command line: **Second reference point:**
- Rotate the curve anti-clockwise about **22 degrees** and **left click**.
- Press **Esc** on your keyboard to complete the operation.


- In the **Perspective Viewport** select the newly rotated curve by **left clicking** on it -- it will highlight.

- Choose the *Layer Control Icon*  from the toolbar by **left clicking** on it and **holding down the key** -- select the *Change Layer Icon*  from the flyout.

- Select **Interp\_03** from the *Pick layer for object dialogue* -- it will highlight. This will make certain that Interp\_03 has been associated with the correct layer.

- click **OK**.

- Disable any currently active Osnaps.

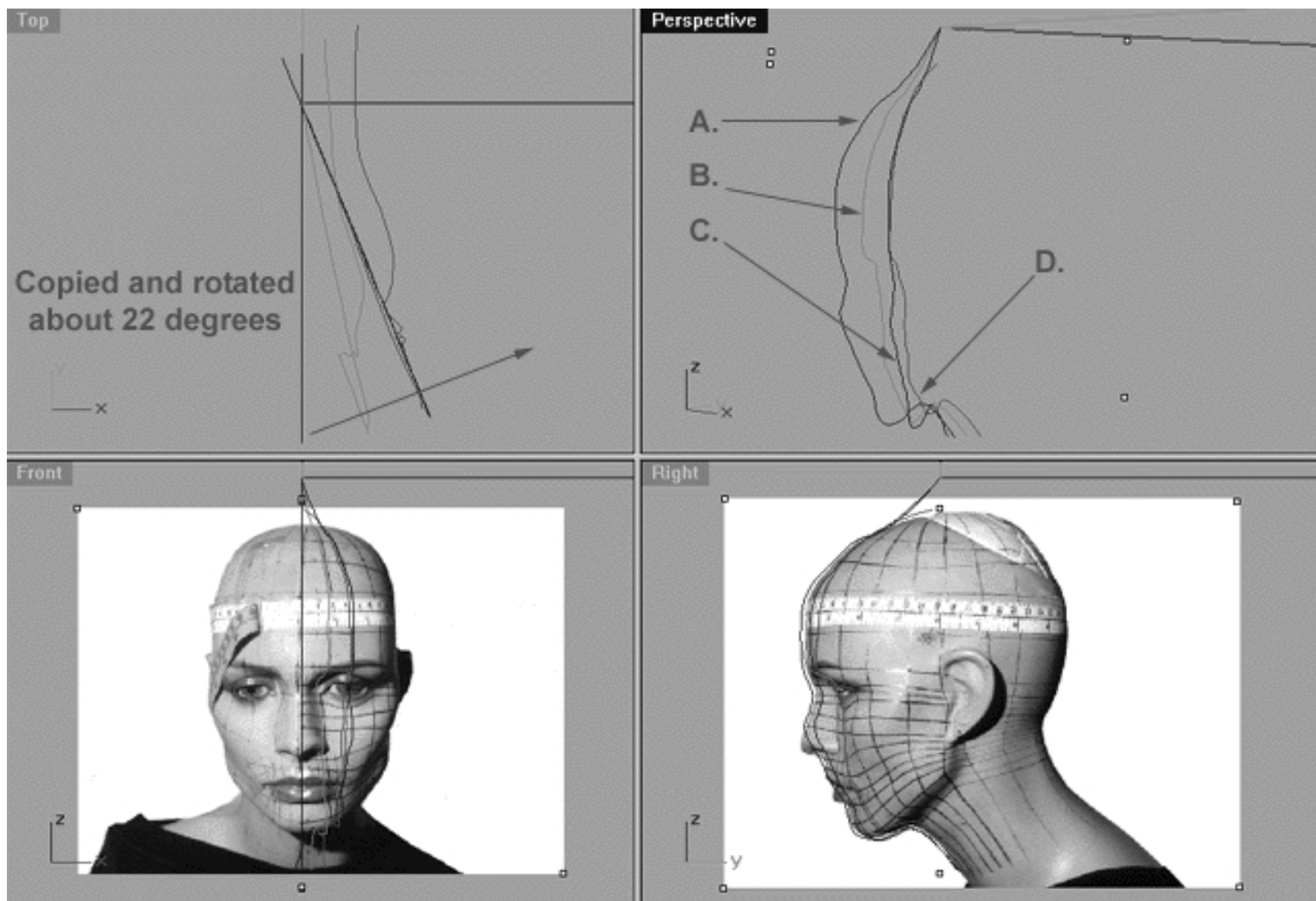
- Choose the *Zoom: Extents All Viewports icon*  from the toolbar or type the command: **ZoomExtentsAll** at the command line.



To view an example movie of how it's done

[Click Here](#)

---





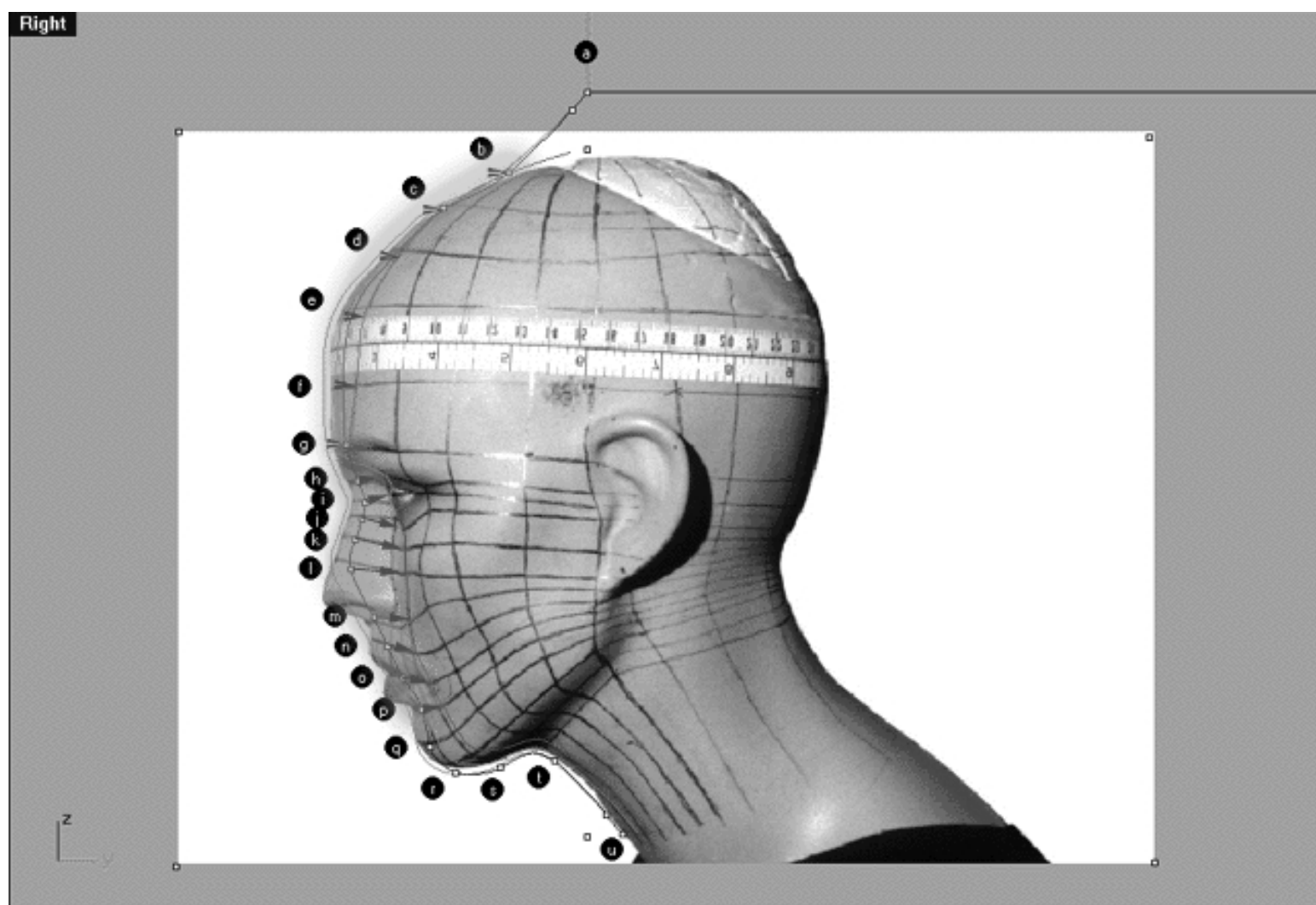
This **All Viewport** screenshot shows our original profile curve (A), after having been copied and rotated about 22 degrees on its *centre* and now located at position (C). (B) represents the now ghosted 2nd curve and (D) in red represents where our new rotated curve (C) should be positioned once the points have been appropriately edited. As you can see, one very important aspect to this 3rd curve is that it begins to define the eye socket, cheek plane and outermoust corner of the mouth.

## Editing the 3rd Curve

- Maximise the **Right Viewport** if you've not done so already by **double left clicking** on its label.
- Turn ON the annotated dot labels. At the bottom of your screen you will see the *Status Bar*, **Right click** on the Layer info box -- the Edit Layers dialogue box will open.
- If you've not done so already, in the Name field list find the layer called *Annotated Dots* and select the **ON** radio button -- click on **OK** to **Exit**.
- Now let's lock the profile curve ( **Interp\_01** ) Select the **Interp\_01** curve by **left clicking** on it, then *lock* the curve by typing the command: **Lock** at the command line and then press **Enter**.
- Display the edit points for the newly rotated curve (Interp\_03), select the curve by **left clicking** on it -- it will highlight.






- Then choose the *Show edit points icon*  from the toolbar by **left clicking** on it or type the command: EditPtOn at the command line.
- Begin by moving edit points ( **b - g** ) to do this, **left click** on a point -- it will highlight, then drag the point inward toward the red guide curve (Guide\_03) along the Y axis. **Tip** -- you may find zooming in a bit very helpful. **\*Note** -- Use your own discretion as to whether or not you feel it necessary to hold down the shift key or not whilst dragging the points.
- Pan the view by choosing the pan icon  from the toolbar and drag it within the Right window to expose more of the viewport and the edit points of the lower face and jaw area. Now concentrate on moving the next group of points ( **h - p** ) inward toward the red guide curve in the same manner as you've previously done. **\*Note** -- For these points holding down the shift key while dragging is NOT recommended. **Why?** Their final resting position is not exactly parallel to the current placement (i.e, some points will be moved up, down or on a bit of an angle).

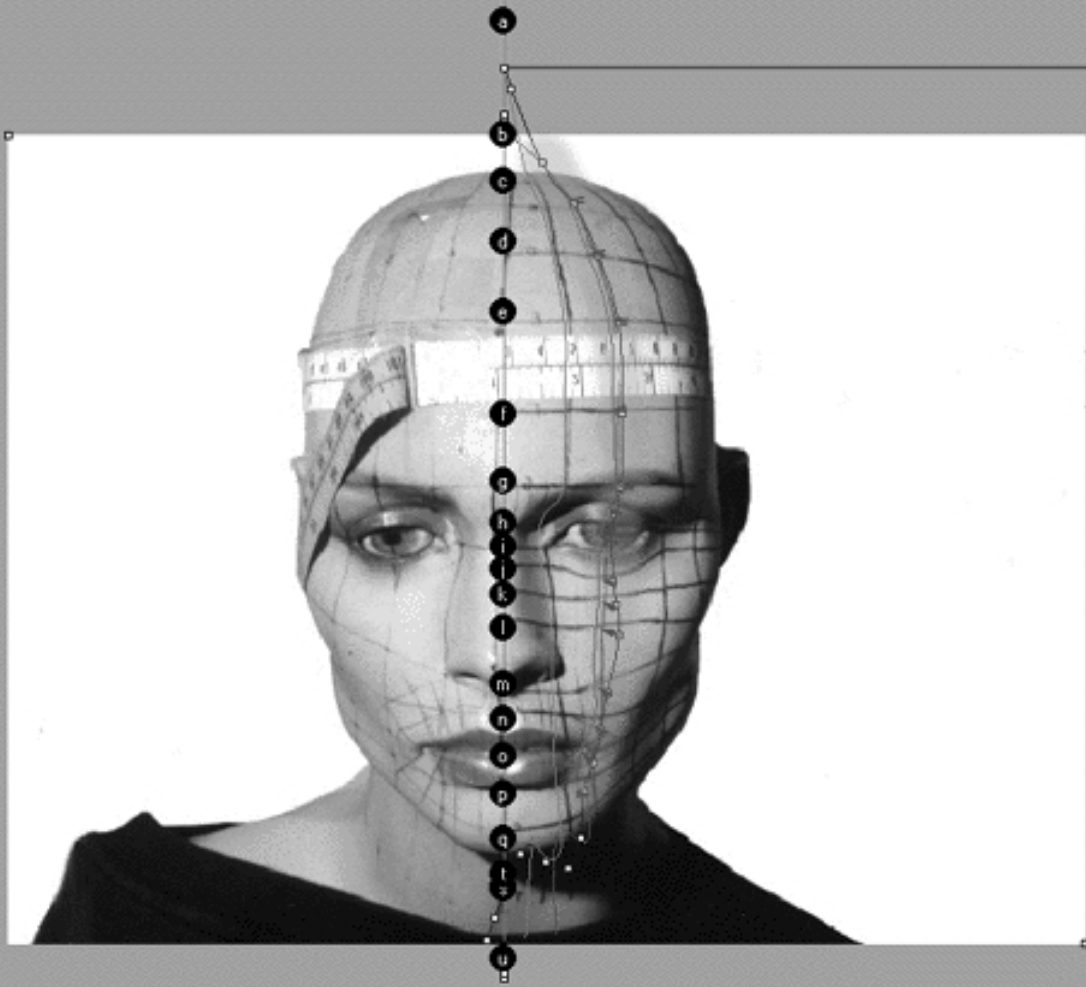


This **Right Viewport** screenshot shows points ( **b - p** ) on the 3rd curve (Interp\_03) prior to being dragged inward toward the red guide curve ( Guide\_03 ) along the Y axis. The orange highlight indicates the 1st group of curves to be moved ( b - g ) and the green highlight indicates the 2nd group of curves ( h - p ).

# Moving from Right View to Front View -- 1st

- **Double left click** on the **Right Viewport** label -- the Viewport will minimise.
- **Double left click** on the **Front Viewport** label -- the Front Viewport will maximise.
- It's a good idea to zoom in tightly on points ( **b - g** ) to do this choose the Zoom Window icon  from the toolbar. Then in the Front Viewport choose a start point for the zoom window by left clicking and holding the mouse key down. Now drag the zoom "fence" out at a diagonal to encompass the points you wish to magnify, once you've done so release the mouse key.
- Now once again, start by moving edit points ( **b - g** ) to do this, **left click** on a point -- it will highlight. Then **left click** on the highlighted point(s) and drag the them toward the red guide curve ( Guide\_03 ) along the X axis. *\*Note* -- holding down the Shift key while dragging is optional, so use your own discretion. *\*Tip* -- At this stage you might be thinking, hey wait a minute how am I supposed to figure just where I should be dragging the point to anyway, after all the background image isn't really accurate so what am I supposed to do? Well this is a fair point, to get around problems of placement such as these I recommend you try the following:
  - Temporarily un-lock all the curves by typing the command: Unlock at command prompt. The 2nd curve, (Interp\_02) should now become active again.
  - Select the 2nd curve (Interp\_02) by left clicking on it with your mouse -- it will highlight.
  - Now Display it's edit points by choosing the display edit points icon  and left clicking on it.
  - Okay, now select a point that you're having trouble with on the curve you're editing and move it just to one side of its "sister" point on the opposite curve, in this case the 2nd curve (Interp\_02). Now here is a little tip, you'll notice that your cursor is a cross hair type, use one side of the cross to accurately align the point you're moving with it's sister.
  - Once you've that, hold down the SHIFT key on your keyboard and drag the point back into alignment with the red guide curve. By using this method you will find that you can keep your points in really good alignment with each other. Obviously this method will not always be appropriate or even work because of the curvature of the head, but in this case it works great and it's a technique well worth trying.
- When you've finished working on points ( **b - g** ) from the toolbar choose the Pan View icon  and pan the view so that points ( **h - p** ) are clearly visible.
- Now concentrate on moving this next group of points ( **h - p** ) inward toward the red guide curve in the same manner as previously done. *\*Note* -- For these points holding down the shift key while dragging may or may not be of help, experiment.


Front

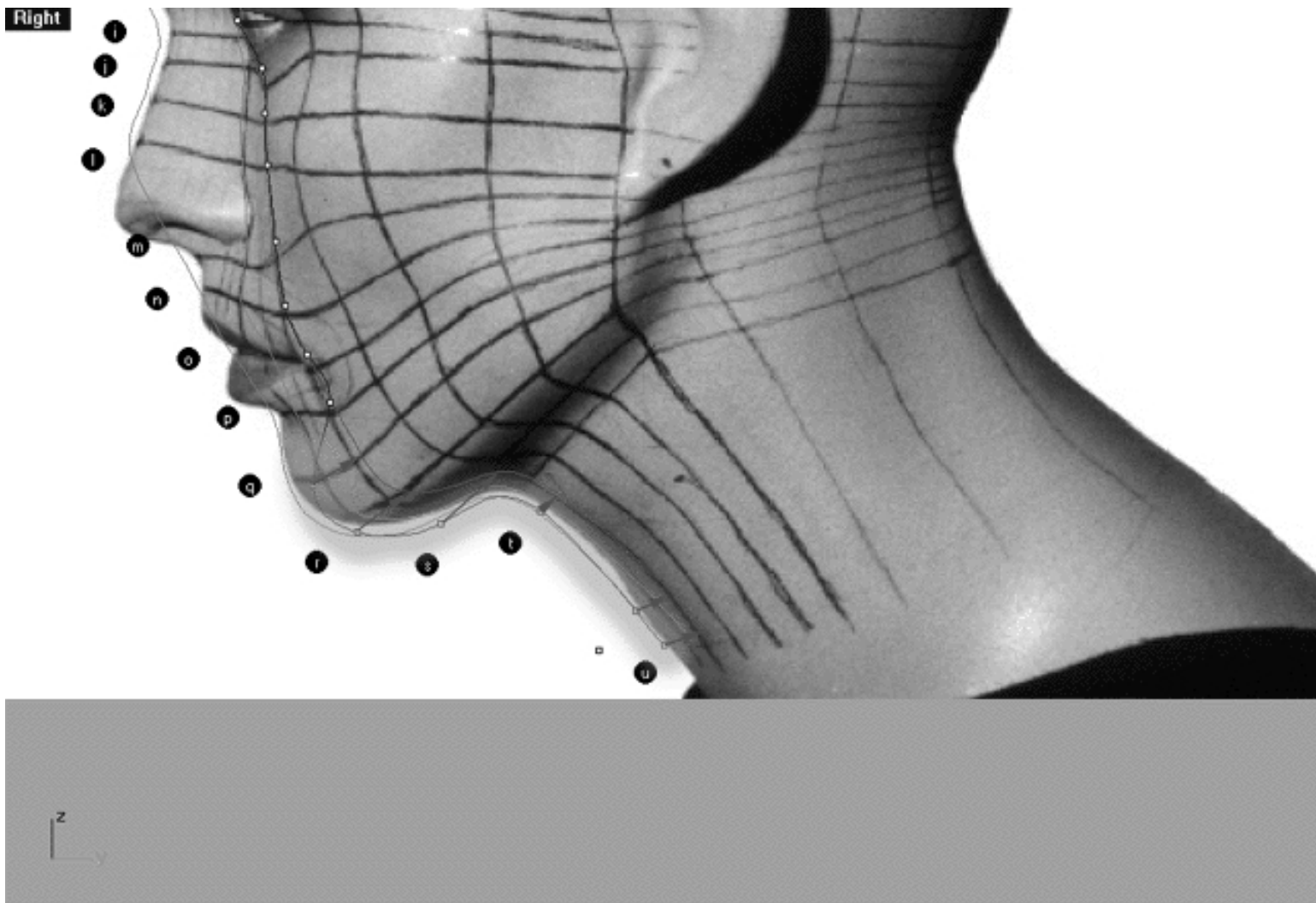


This **Front Viewport** screenshot shows points ( **h - p** ) on the 3rd curve (Interp\_03) prior to being dragged toward the red guide curve ( Guide\_03 ) along the X axis.

## Return to the Right View -- 2nd

- Once completed, check your work and return to the Right Viewport.
- Maximise the **Right Viewport** if you've not done so already by **double left clicking** on its label.
- Zoom in tightly on edit points ( **q - u** ).
- Before proceeding, confirm that no *Osnaps* are currently active if they are disable them.
- To be on the safe side let's re-lock the 2nd curve (Interp\_02) just to avoid messing anything up. Select it by left clicking on it with your mouse, then type the command: Lock at the command line.
- Starting with point ( **q** ) to do this, **left click** on it -- it will highlight. Then drag it across and up slightly towards the guide curve using the background rotoscope image for reference.
- Now move on to point ( **r** ) again **left click** on the point -- it will highlight. Then drag it across and up slightly as you did in the last step.

- With the next few points ( **s - u** ) things get a little bit more complex and once again that blasted shadow on the background reference image is making life more difficult than it need be. Despite this you can figure it out just be careful and take your time and try and match up the shapes of the two curves as best you can.
- Once completed, zoom out by choosing the *Zoom Extents icon*  from the toolbar and **clicking** on it.




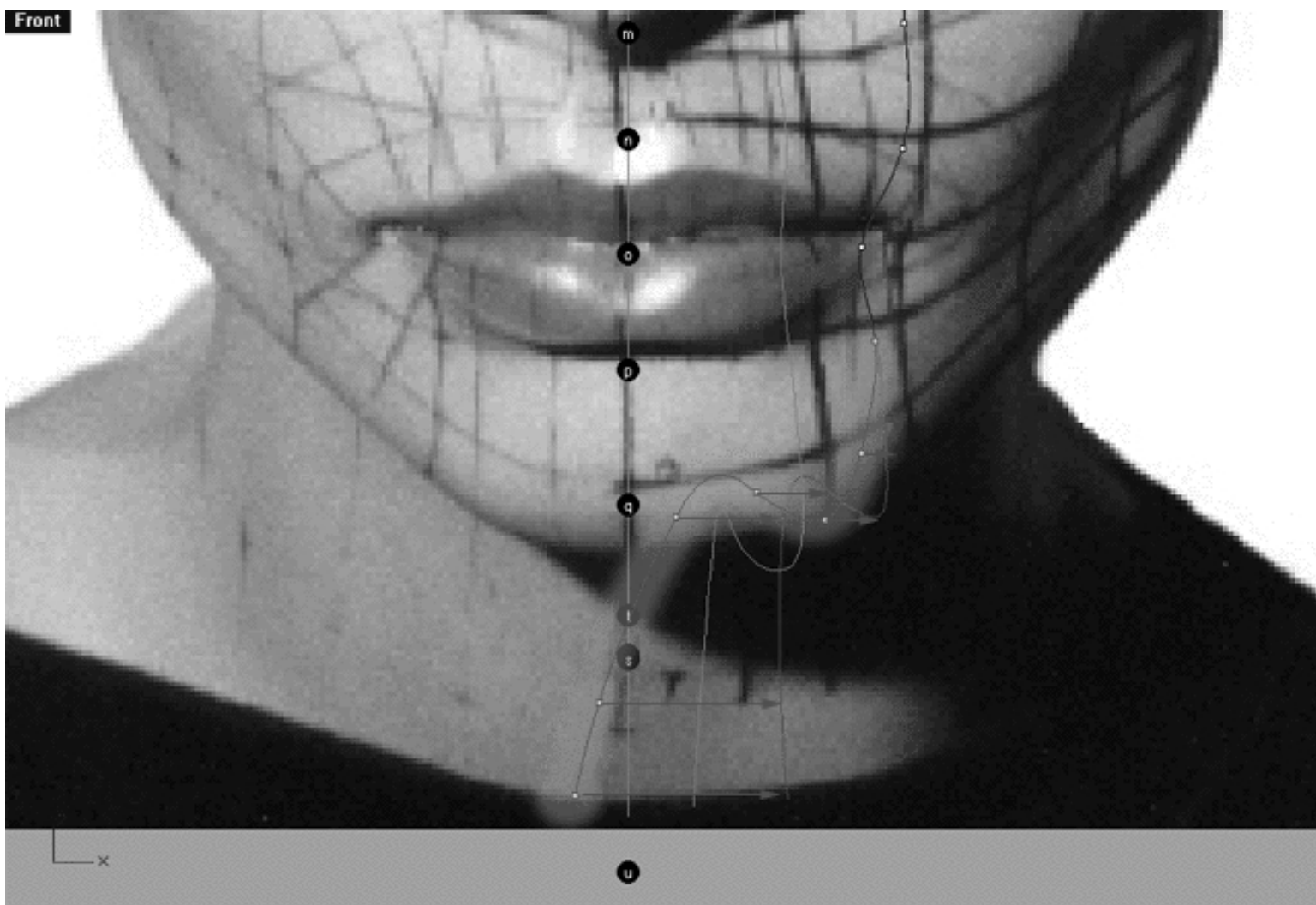
This **Right Viewport** screenshot shows points ( **q - u** ) on the 3rd curve (Interp\_03) just prior to being dragged toward the red guide curve (Guide\_03 ) along the Y axis.

## Return to the Front View -- 3rd

- Once you've completed the prior step, check over your work and then minimise the **Right Viewport** by **double left clicking** its label.
- Maximise the **Front Viewport** by **double left clicking** on its label.
- Zoom in on edit points ( **q - u** ) you should know how to do this by now.



- We will now move points ( **q - u** ) into position. To do this, start with point ( **u.** ) **left click** on the point -- it will highlight. Then, **hold down the Shift Key, left click** on the highlighted point and drag the point until it meets with the red guide curve ( Guide\_03 ) along the X axis while **continuing to hold down the Shift key**.
- Next move the phantom point and repeat the previous procedure.
- Next move point ( **t.** ) and repeat the procedure for the remaining points ( **s - r** )
- That was pretty easy, don't you think..?
- Once completed, zoom out by choosing the *Zoom Extents icon*  from the toolbar and **clicking** on it.

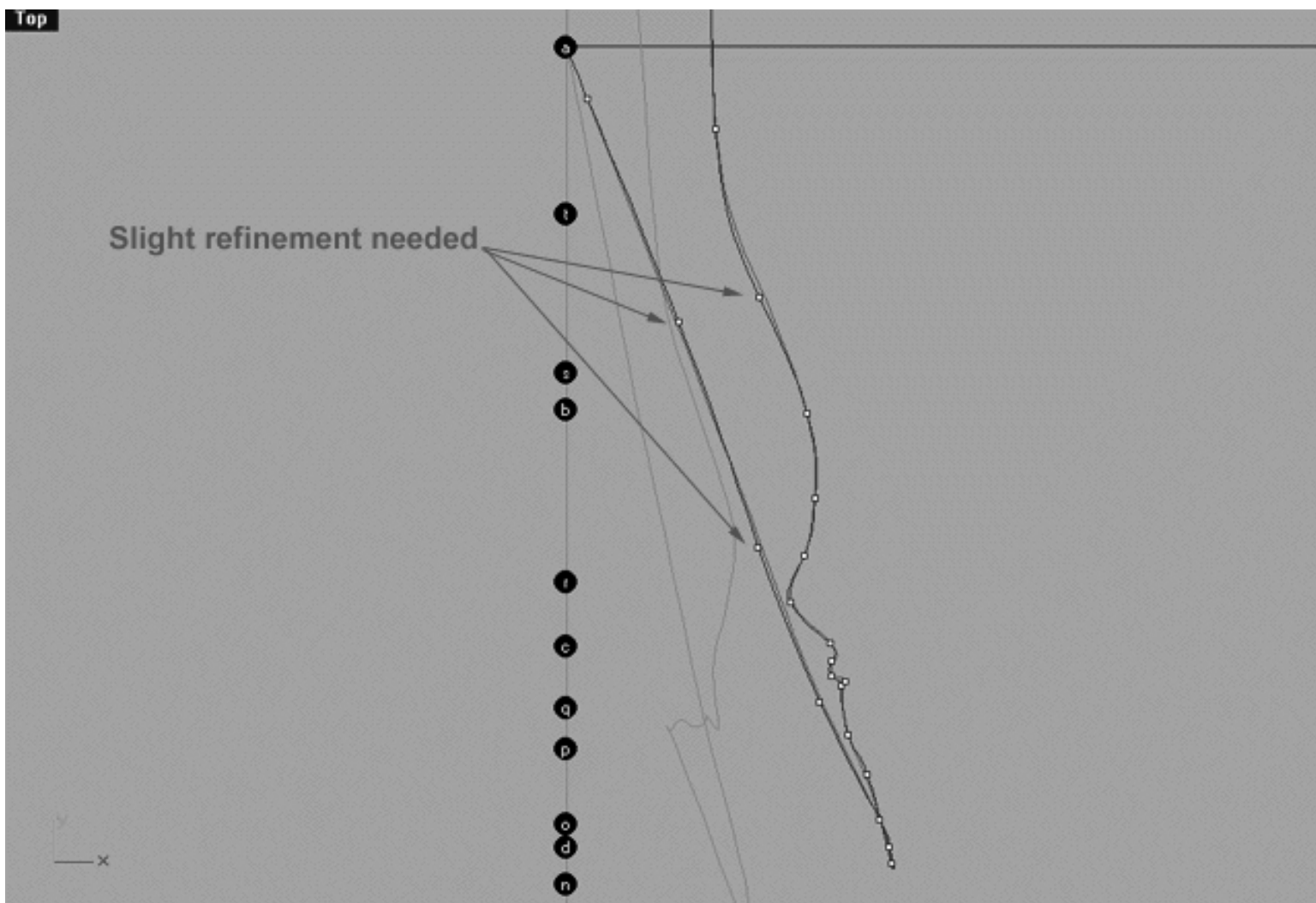


This **Front Viewport** screenshot shows points ( **q - u** ) on the 3rd curve (Interp\_03) just prior to being dragged toward the red guide curve ( Guide\_03 ) along the X axis.

## Take it to the Top View -- 4th

- Check your work and then minimise the **Front Viewport** by **double left clicking** on its label.

- Maximise the **Top Viewport** by **double left clicking** on its label.
- Turn off the annotated dot labels. At the bottom of your screen you will see the *Status Bar*, **Right click** on the Layer info box -- the Edit Layers dialogue box will open.
- In the Name field list find the layer called *Annotated Dots* and select the **Off** radio button -- click on **OK** to **Exit**.
- Zoom in very tightly on the curve panning as necessary, carefully check to see how well the curve conforms to the guide.
- Correct any misalignment along the **X AXIS ONLY** -- to do so, **left click** on the misaligned point -- it will highlight. Then, **hold down the Shift Key**, **left click** on the highlighted point and drag the point until it meets with the red guide curve ( Guide\_03 ) along the X axis while **continuing to hold down the Shift key**.



This **Top Viewport** screenshot shows an example of slightly misaligned points (*\*Note -- your results may vary*) on the 3rd curve (Interp\_03) just prior to being dragged toward the red guide curve ( Guide\_03 ) along the X axis.

If you're confused about any of this and would like to see how I went about creating this curve then watch the movie on the next page:




## Editing the 3rd Curve



View an example movie of how it's done -- [Click Here](#)

# Snapping things up on the 3rd curve

The 3rd curve has now completed. Once again, let's test how well you've done overall at aligning the 3rd curve to the guide. Display the points on the guide curve and see how close you came with your edited points. Once done we will "snap" all of the 3rd curves edit points to the guide just to stay in sync.

- Minimise the **Front Viewport** by **double left clicking** on its label.
- Maximise the **Right Viewport** by **double left clicking** on its label.
- Now we must unlock the Guide\_03 curve so that we may select and display its points. At the bottom of your screen you will see the *Status Bar*, **Right click** on the Layer info box -- the Edit Layers dialogue box will open.
- In the *Name field list* find the layer called Guide\_03 and select the **ON** radio button -- click on **OK** to **Exit**.
- In any Viewport select the Guide\_03 curve by left clicking on it -- it will highlight.
- Hold down the Ctrl Key and in any Viewport select the 3rd curve (Interp\_03) by left clicking on it -- it will highlight too. \*Tip -- When you want to select more than one object at a time in Rhino hold down the Ctrl Key as you left click on the object.
- Display their edit points by choosing the *Show edit points icon*  from the toolbar by **left clicking** on it or type the command: **EditPtOn** at the command line.
- Okay, here comes your test -- take a close look, how close did you manage to come?
- Let's refine the points still more. Once again lock the Guide\_03 curve so that we don't mess things up while snapping. At the bottom of your screen you will see the *Status Bar*, **Right click** on the Layer info box -- the Edit Layers dialogue box will open.
- In the *Name field list* find the layer called Guide\_03 and select the **Lock** radio button -- click on **OK** to **Exit**.
- Open the *Osnap dialogue box* by moving your cursor to the lower *status bar* and **left clicking** on its title. The *Osnap dialogue box* will open, enable the *Point snap* by **left clicking** on **Point** -- a check will appear indicating that it is now active. If any boxes are checked/active other than "Point" disable them now.
- **Left click** on the **X** to Exit the Onsap dialogue.



- Temporarily turn off the background reference image by typing the command: **HideBackgroundBitmap** at the command line.
- Starting with point (**b.**) zoom in on a small group of points (about 3 is good) and "snap" each curve point to its associated point on the guide curve, it's important that you re-snap each point -- be sure not to miss any!
- When you've finished working of the first group of 3 points choose and use the Pan View icon  from the toolbar and pan the view a bit further along the contour of the curve. Now start working on the next group of 3 points and continue snapping. Continue this procedure until you've snapped all the remaining points ( **b - u** ).
- Zoom out by choosing the *Zoom Extents All icon*  from the toolbar and **clicking** on it or typing the command: **ZoomExtentsAll** at the command line.
- Minimise the Right Viewport by double left clicking on its label.
- Carefully check over your work in all viewports.
- Restore the background reference image by typing the command: **ShowBackgroundBitmap** at the command prompt and pressing Enter.
- Disable any Osnaps that may be currently active.
- Congratulations! -- you've now completed editing the 3rd Curve.



View an example movie -- [Click Here](#)

---

**Table Three - A list of points & coordinates  
for the completed 3rd Curve -- [Click Here](#)**


---

## Testing the Surface


Now that you've successfully created a few curves to work with, this would be an excellent opportunity to create a surface over the curves. One of the many ways you can create a surface with Rhino is by using a command called Loft. Lofting is also known by such terms as skinning or surfacing in some other 3D applications. Lofting is perhaps the primary method for creating 3D objects within Rhino and something that you will become very familiar with indeed. The basic idea behind lofting is that you can produce any number of curves acting as cross-sectional shapes along a given path. These cross-sectional curves act as a frame over which a surface or skin is created producing a renderable object.

The term lofting has its origins based in the ship building process. An enormous "jig" of sorts known as a loft was created in order to hold firm the ships hull while it was constructed. When the huge cross-sectional ribs of the ship were lifted and slotted into the loft this process became known as lofting. In much the same way, you can think of the curves that will comprise our head as "ribs" of sorts and the surface that we will create by lofting over the ribs the skin of the face.

- In the **Perspective Viewport**, zoom in on points ( **a - e** ) this will make it easier to select the curves.

- Show all curves by choosing the Hide/Show icon  and **Right clicking** on it or by typing the command: Show at the command line. Once done, the curves should revert to their normal state.

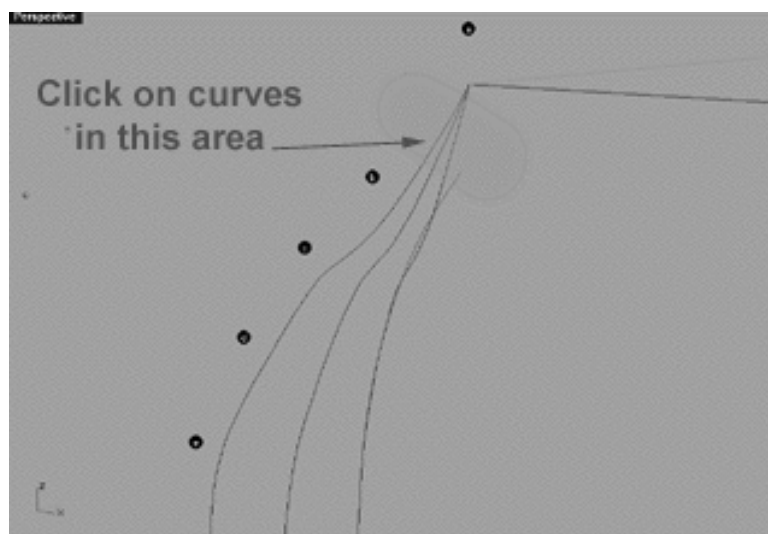
- Hide any edit points that may be currently displayed.

- From the toolbar choose the Loft icon  or type the command: **Loft** at the command line.

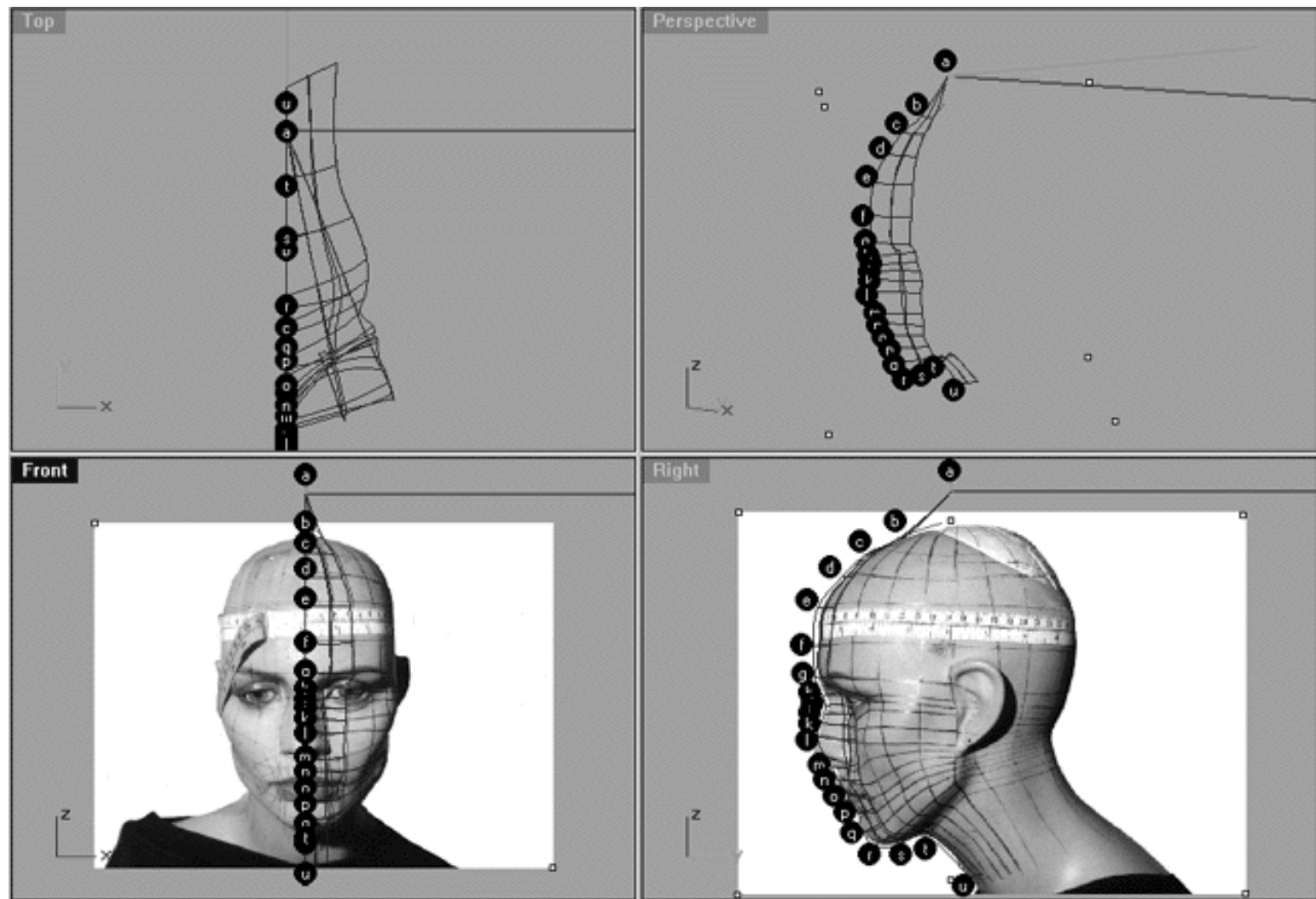
- At the command line you will receive the following prompt: **Select curves to loft (point):**

- Now, in the **Perspective Viewport** click directly on curves 1, 2, and 3 near their origin (between points a - b is a good place) *\*Update* -- It used to be a requirement within Rhino that curves for lofting had to be selected near their point of origin for reliable results -- this is no longer the case. As at the writing of these tutorials it is now perfectly all right to make your selection at any point on the curve as Rhino is now much more intelligent. I still feel better about selecting curves near their origins, however if you do decide to select them elsewhere than I'd recommend that you at least try and pick them near the same location on each curve.

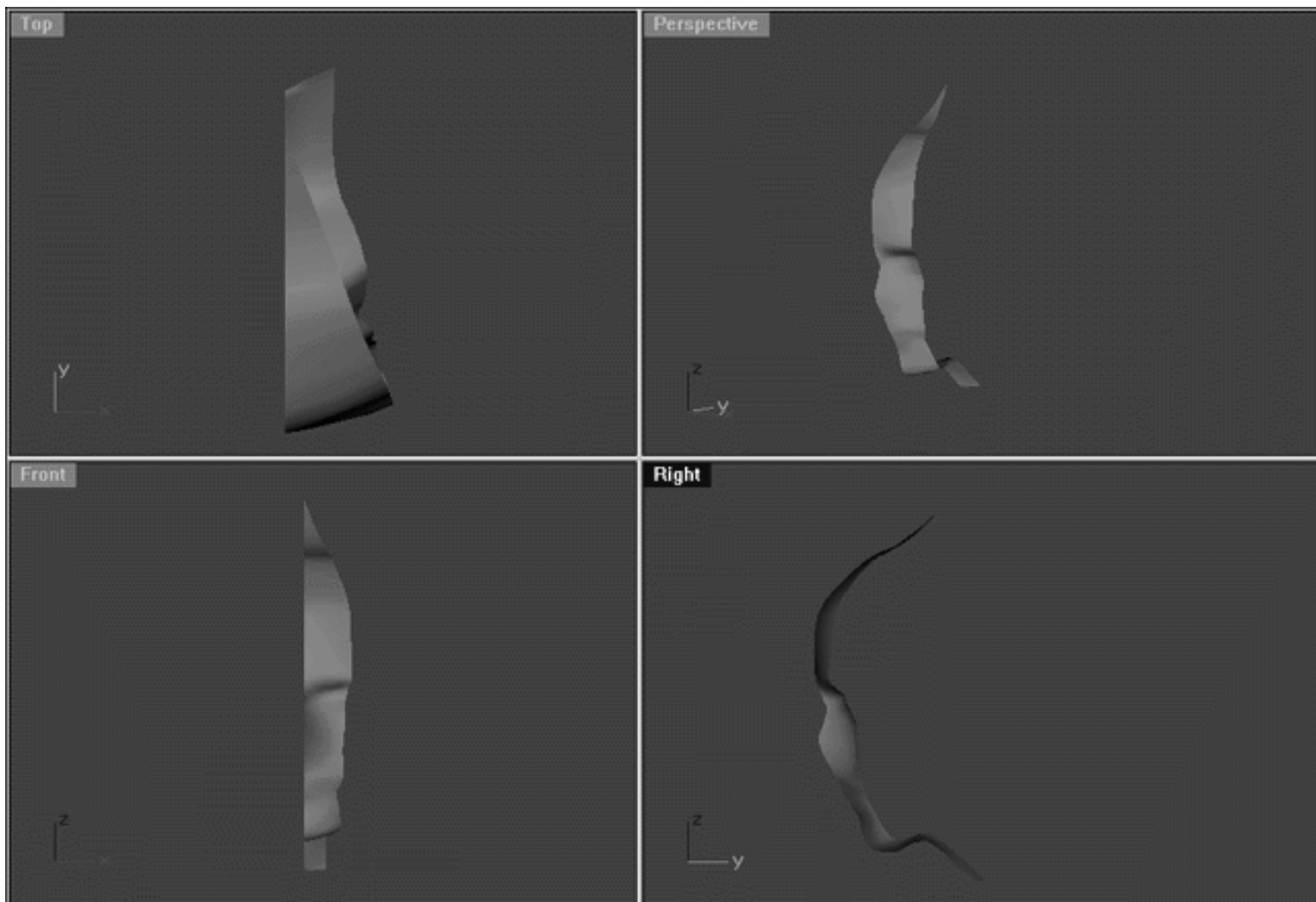
- As you select each curve they should highlight, when you've finished selecting all 3 curves press **Enter**.
- The Loft Options dialogue box should appear. Set the Style drop down box to **Loose**. **click** on the **Shaded Preview** box, a tick should appear. Make sure the Do Not Simplify radio button is active and **click** on the **Preview button**.



This **Perspective Viewport** screenshot shows an example of a good place to click on the curves when selecting them during the lofting procedure.



This **All Viewport** screenshot shows an example of a loose loft applied to the curves without a quick rendered shaded preview.



This **All Viewport** screenshot shows an example of a surface created by lofting curves 1, 2 and 3 using the "loose" type parameter with a quick rendered shaded preview.

A few words about the "loose" type of loft. I make no secret of the fact that the loose loft is one of my very favourite types of surface creation types within Rhino. Why? Well, because in my view loose lofting creates a simple, uncluttered and elegant surface that I find preferable for purposes of organic modelling and especially when creating human body parts. I prefer almost without exception to use loose lofting over that of the normal type.

Yes, it is true that a loose loft will not be as "tight" to the curves surface as that of a normal type loft, but that is just the very idea. When creating human heads or any other complex organic form where lots of control points are used it is inevitable that a certain degree of surface rippling will occur. There are several good techniques for avoiding such rippling. The first of these is not to use so many points, this is always a good idea but in practice is not always possible or practical. The second is to create a duplicate surface, extract the offending curves and rebuild the surface. This works really well, but the problem is that in order to pull this technique off you really must have a constantly shaded viewport and preferably one that offers colour, something sadly that Rhino does not offer at this time. Last but not least, perhaps the best way to avoid rippling it to minimise its incorporation in your surfaces in the first place by using a loose type loft. To see what I'm getting at try experimenting on your own with different lofting parameters. You'll notice straight away that the normal type of loft will produce a far more bumpy surface than the loose type. Don't get me wrong, loose lofting is not a magic bullet or perfect for every modelling situation but something certainly well worth your further investigation.

Another good "habit" that you should get into is that of doing little "test lofts" often during the course of your modelling sessions. This can be an invaluable method for figuring out just where you should locate your points while editing, especially if you're having difficulty doing so. By doing a test loft every so often (and the more often the better) you can see more easily how the surface is running and make adjustments far more interactive manner. It's a million times easier to build your model up on a curve by curve basis making adjustments along the way to point placement and surface contour. When I first started creating human heads I used to start to build them by revolving a surface or deforming a sphere or cylinder on a point by point basis. Do things this way you wind up with a couple of hundred control points that all have to be dragged into place, one by one -- trust me it will drive you bonkers! Talk about doing things the hard way, sure you can do it and I've seen some people produce really great results using this method. I can't speak for them but I've got enough things to worry about in my life with out adding self inflicted torture to the list ;-)

---

## Shutting Down the Scene

- Confirm that no Osnaps are currently active, disable any that are.
  - Open the Edit Layers Dialogue box and turn off Guide\_03
  - Confirm that Layer(s): Interp\_01, Interp\_02 and Interp\_03 are ON.
  - Left click on the Layer Info box at the Lower Status Bar, highlight the layer entitled SCENE START UP and click on it -- it should now become the active layer and its name should appear in the box.
  - Confirm that the newly created curve (Interp\_03) has in fact been associated with the correct layer.
  - Hide any points that are currently displayed.
  - Zoom Extents All.
  - And SAVE YOUR WORK -- unless you're completely daft.
-

# Summary of Lesson -- Curve 3

As in the previous lesson you've been working systematically in multiple viewports and switching with regularity between multiple viewports during the course of your modelling session. You've learned how to create a surface by lofting and the reason why strong coffee is the preferred drink of 9 out of 10 CGI artists ;-)

[Go To Next Lesson - Drawing the 4th Curve](#)

RETURN to Top of Page -- [Click Here](#)

Written by Joseph R. Saltzman.

Co-produced in association with Steven Ståhlberg

©1998-1999 Cinemagic Productions Limited. All Rights Reserved.

Duplication of this document including images and text by any means is expressly forbidden without prior written consent of Cinemagic Productions Limited.

Web Site: <http://www.cmagic.co.uk> Telephone: +44 (0)1753 733 190 Fax: +44 (0)1753 736 619 email: [cmagic@cmagic.co.uk](mailto:cmagic@cmagic.co.uk)

# MOVIE CREATING THE 3RD CURVE

To **PLAY** the example movie, double click below:

To **RETURN** to the head shape tutorial -- [click here](#).



# MOVIE EDITING THE 3RD CURVE PART ONE

To **PLAY** the example movie, double click below:

To watch **PART TWO** of this movie -- [click here](#).

To **RETURN** to the head shape tutorial -- [click here](#).

# MOVIE EDITING THE 3RD CURVE PART TWO

To **PLAY** the example movie, double click below:

To **RETURN** to the head shape tutorial -- [click here](#).

# MOVIE SNAPPING UP THE 3RD CURVE

To **PLAY** the example movie, double click below:

To **RETURN** to the head shape tutorial -- [click here](#).

TABLE THREE

POINT	X AXIS	Y AXIS	Z AXIS
a - North Pole	0.000	0.000	0.000
Phantom point 1	2.175	-5.321	-6.294
b - Head top 1	11.526	-28.710	-29.367
c - Head top 2	20.251	-51.670	-42.382
d - Head top 3	26.636	-68.028	-59.327
e - Hairline	32.568	-80.015	-79.974
f - Temple	33.572	-83.349	-105.734
g - Browbone	34.099	-84.979	-126.995
h - Crease of top eyelid	31.612	-76.799	-135.572
i - Eye centre line	29.573	-71.959	-144.303
j - Under-eye area	28.754	-67.060	-153.982
k - Bridge of nose	29.073	-65.645	-162.685
l - Cheek apple	27.942	-65.279	-173.032
m - Nose base, cheek bone	27.809	-63.952	-187.863
n - Upr lip, cheek hollow	27.647	-61.896	-200.440
o - Centre of mouth, cheek hollow	23.484	-57.550	-210.114
p - Lwr lip under, cheek hollow	24.847	-52.797	-219.837
q - Tip of chin	25.743	-47.296	-229.146
r - Jawline	25.501	-40.205	-236.881
s - Nape of neck	20.937	-26.573	-235.477
t - Neck	15.533	-8.089	-237.556
Phantom point 2	15.406	14.490	-257.498
u - Base of neck	15.937	21.871	-265.518

**RETURN** to tutorial -- [Click Here](#)

**RETURN** to previous lesson -- [Click Here](#)




## THE 4TH CURVE


### Contents:

- [Scene Setup](#)
- [Creating the 4th curve](#)
- [Example Movie -- Creating the 4th Curve](#)
- [Editing the 4th curve](#)
- [Moving from Right View to Front View -- 1st](#)
- [Return to the Right View -- 2nd](#)
- [Return to the Front View -- 3rd](#)
- [Take it to the Top View -- 4th](#)
- [Example Movie -- Editing the 4th Curve](#)
- [Snapping things up on the 4th curve](#)
- [Table Four - A list of points & coordinates for the completed 4th Curve](#)
- [Testing the Surface](#)
- [Shutting Down the Scene](#)
- [Summary of Lesson -- Curve 4](#)

---

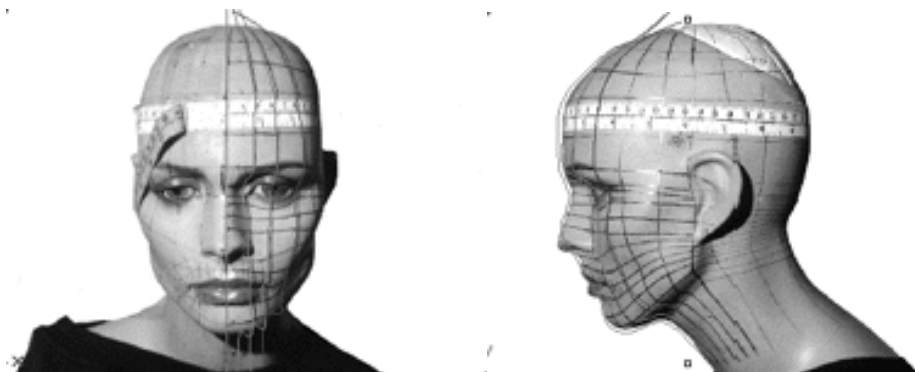
## Scene Setup

- If you've not done so already start a Rhinoceros session by **double clicking** on the desktop icon  the application will begin.
- Choose File, Open from the menu bar and double click on **START\_A.3DM** in the file list, it will load and open.
- Confirm at the Lower Status Bar the currently active layer is entitled SCENE START UP. If it is active proceed to the next step, if it's not then make it active by left clicking on the layer box, highlighting the correct layer and clicking on it.
- Again, at the Layers Box on the Lower Status Bar this time right click on the box, the Edit Layers Dialogue box will open. Confirm the following switches have been enabled or disabled:

- The Layer entitled Annotated Dots\_1 should be OFF.
- The Layer entitled Interp\_01 (the Profile Curve) should be ON.
- The Layer entitled Interp\_02 should be ON.
- The Layer entitled Interp\_03 should be ON.
- The Layer entitled Guide\_04 should be LOCKED.
- The Layer entitled Photopoints should be ON.
- The Layer entitled Frozen should be LOCKED.
- The Layer entitled SCENE START UP should be ON.
- When you've finished making your changes ( if any ) click on OK.
- All other layers should be set to OFF.
- Confirm that you can see the background image in the Front and Right viewports.
- Confirm that the grid display in the viewports has been disabled, if not turn it off now.
- Confirm that no Osnaps are currently enabled, if any are disable them.
- Confirm that no edit points are currently displayed, if any are hide them.
- Zoom out all the viewports by selecting the Zoom Extents All icon  or by typing the command: ZoomExtentsAll at the command line and pressing ENTER.



---

## Creating the 4th curve






**Description:** The 4th curve begins at the top pole and runs along the top & side crest of the head, over the brow bone (near the end of the eyebrow) into the end corner of the eye socket (at about the outer corner of the eye) and down along the centre of the cheek apple straight on on over the centre of the cheek hollow and following on over the centre part of the jaw and ending at the base of the neck.

You will create the 4th curve in much the same way as the 3rd -- and aren't you happy about that ;-)

- Hold down the **Ctrl** key and in **Any Viewport** select the **Interp\_02** and **Interp\_03** curves by **left clicking** on them, then *hide* the curves by choosing the *Hide icon*  from the toolbar or type the command: **Hide** at the command line and then press **Enter**.
- Now let's create a new layer -- At the bottom of your screen you will see the *Status Bar*, **right click** on the *Layer info box* -- the *Edit Layers dialogue box* will open.
- If you've not already done so ( and you should have ) locate the layer named **Guide\_04** in the list, use the scroll bar to move up or down as needed. Once found, **left click** on the **LOCK** radio button -- this will "turn-on" the layer and lock it at the same time.
- **Left click** on the **New** button and in the *Name field* type: **Interp\_04**.
- Move the cursor to the *colour field*, **left click** on the *colour field*, the "*Select a colour*" dialogue and colour wheel will appear, choose a nice bright blue (i.e. **R:0 G:0 B:255**) then click **OK**
- You will be returned to the *Edit Layers dialogue box* again, **left click** on **OK** to exit.
- Return your cursor to the *Status Bar* at the bottom of the screen and **left click** on the *Layer info box* -- the Layers list will appear.
- Locate **Interp\_04** in the list (the one you created a few moments ago) and move your cursor over its name (it will highlight) **left click** on it to make the layer currently active.
- Open the *Osnap dialogue box* by moving your cursor to the lower status bar and **left clicking** on its title. The *Osnap dialogue box* will open, enable the *End snap* by **left clicking** on End -- a check will appear indicating that it is now active. If any boxes are checked/active other than "End" disable them now.
- Close the *Osnap dialogue box* by clicking on **X**.
- In **Any Viewport** Select the 1st curve (i.e. Interp\_01) by **left clicking** on it -- it will highlight.
- From the toolbar **left click** on the Rotate 2D icon  or type the command: **Rotate** at the command line.
- At the command line you will receive the following prompt: **centre of rotation (copy)**
- Type: **copy** at the command line and press **Enter**.
- In the **Right Viewport** Move your cursor to point (a. -- X:0, Y:0, Z:0) on the first profile curve (i.e. Interp\_01) -- the cursor should snap to it, when it does **left click**.
- The system will respond with the following prompt at the command line: **Angle or first reference point:**



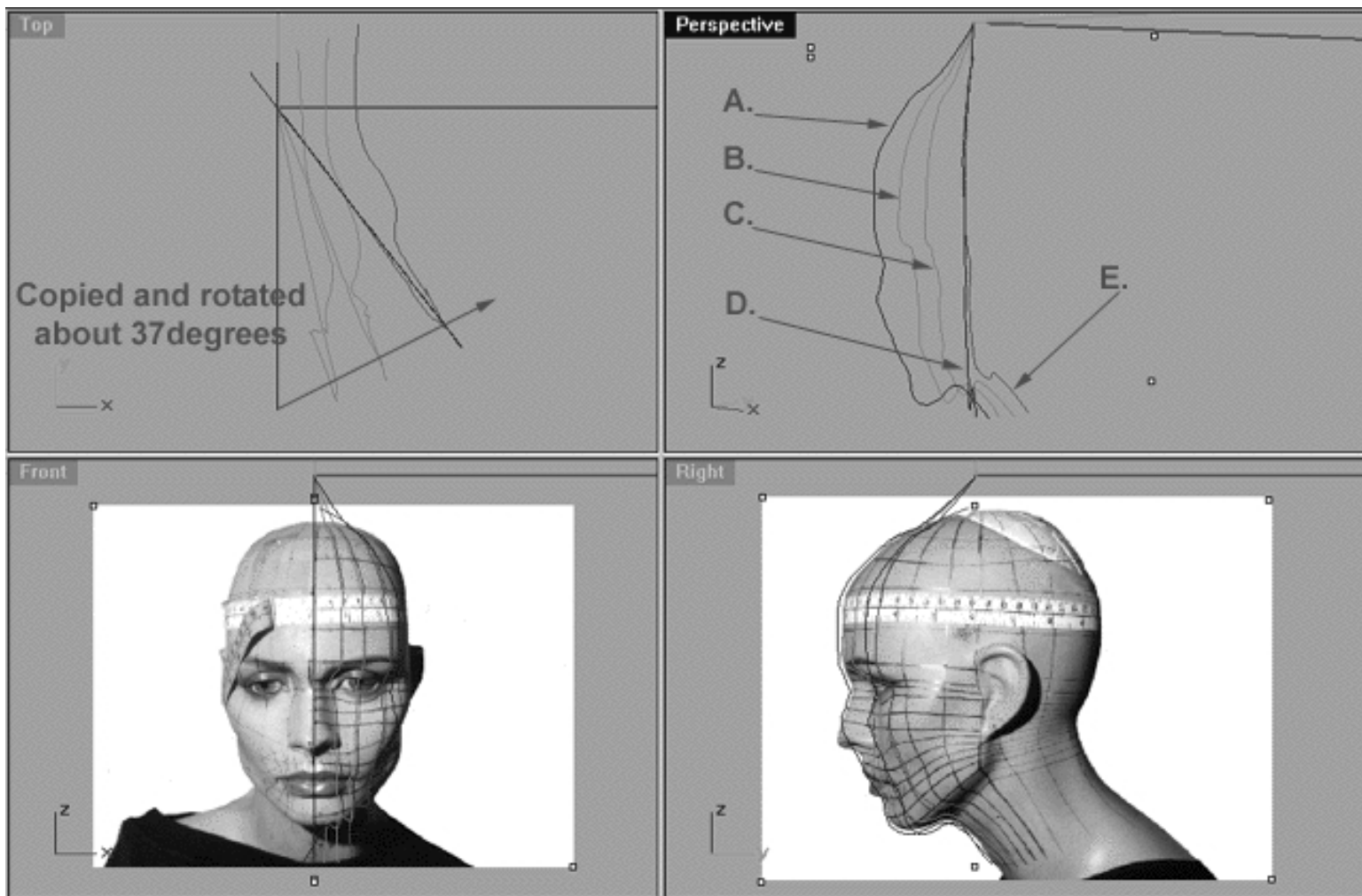
- Now, move your cursor into the **Top Viewport** and bring the cross hairs to about the 6 o'clock position (near the bottom of the window) once you've done this **press and hold down the Shift Key** on your keyboard -- the curve should align itself perfectly along the Y axis.
- While still **holding the Shift Key down**, drag the cursor along the -Y axis about 130 units and **left click**.
- The system will then respond with the following prompt at the command line: **Second reference point:**
- Rotate the curve anti-clockwise about **37 degrees** and **left click**.
- Press **Esc** on your keyboard to complete the operation.
- In the **Any Viewport** select the newly rotated curve by **left clicking** on it -- it will highlight.
- Choose the *Layer Control Icon*  from the toolbar by **left clicking** on it and **holding down the key** -- select the *Change Layer Icon*  from the flyout.
- Select **Interp\_04** from the *Pick layer for object dialogue* -- it will highlight. This will make certain that Interp\_04 has been associated with the correct layer.
- Click **OK**
- Disable any currently active Osnaps.
- Choose the Zoom Extents All Viewports icon  from the toolbar or type the command: ZoomExtentsAll at the command line.



**View an example movie**


[Click Here](#)


---



This **All Viewport** screenshot shows our original profile curve (A), after having been copied and rotated about 37 degrees on its centre and now located at position (D). (B) represents the now locked 2nd curve, (C) represents the now locked 3rd curve and (E) in red represents where our new rotated curve (D) should be positioned once the points have been appropriately edited.

## Editing the 4th Curve

- Maximise the **Right Viewport** if you've not done so already by **double left clicking** on its label.
- Turn ON the annotated dot labels. At the bottom of your screen you will see the *Status Bar*, **right click** on the Layer info box -- the Edit Layers dialogue box will open.
- Now, find the layer called *Annotated Dots* and select the **ON** radio button -- click on **OK** to **Exit**.
- Now let's hide the profile curve ( **Interp\_01** ) Select the **Interp\_01** curve by **left clicking** on it, then *hide* the curve by choosing the *Hide icon*  from the toolbar or type the command: Hide at the command line and then press **Enter**.
- Display the edit points for the new rotated curve (Interp\_04), select the curve by **left clicking** on it -- it will highlight.
- Zoom in on edit points ( b - i ).

- Then choose the *Show edit points icon*  from the toolbar by **left clicking** on it or type **EditPtOn** at the command line.
- Begin by moving edit points ( **b - i** ) to do this, **left click** on a point -- it will highlight, then drag the point inward toward the red guide curve (Guide\_04) along the Y axis.
- **\*Tip** -- If you're having trouble trying to calculate the point placement don't forget the technique of dragging the point you're working on over to its sister on the previous curve and then dragging it back to the red guide curve while holding down the Shift key that you learned in the last lesson. Of course, you'll have to unlock the curves and display the edit points on the 3rd curve (Interp\_03) and then again hide curves 1 & 2 before proceeding. **\*WARNING** -- if you decide to do this, be certain that after you display the edit points on the 3rd curve that you go into the Edit Layers dialogue box and **LOCK** the Interp\_03 layer to prevent it being disturbed.
- Once you've completed moving the first set of edit points ( **b - i** ) pan the view to expose more of the lower face and neck area.
- Now begin moving the second set of edit points ( **j - p** ) into alignment. \*Note -- because of the curvature of the face and the inherent inaccuracy of the background image, attempting to align the points with their "sisters" by holding down the Shift key and dragging won't really work on this set of points.

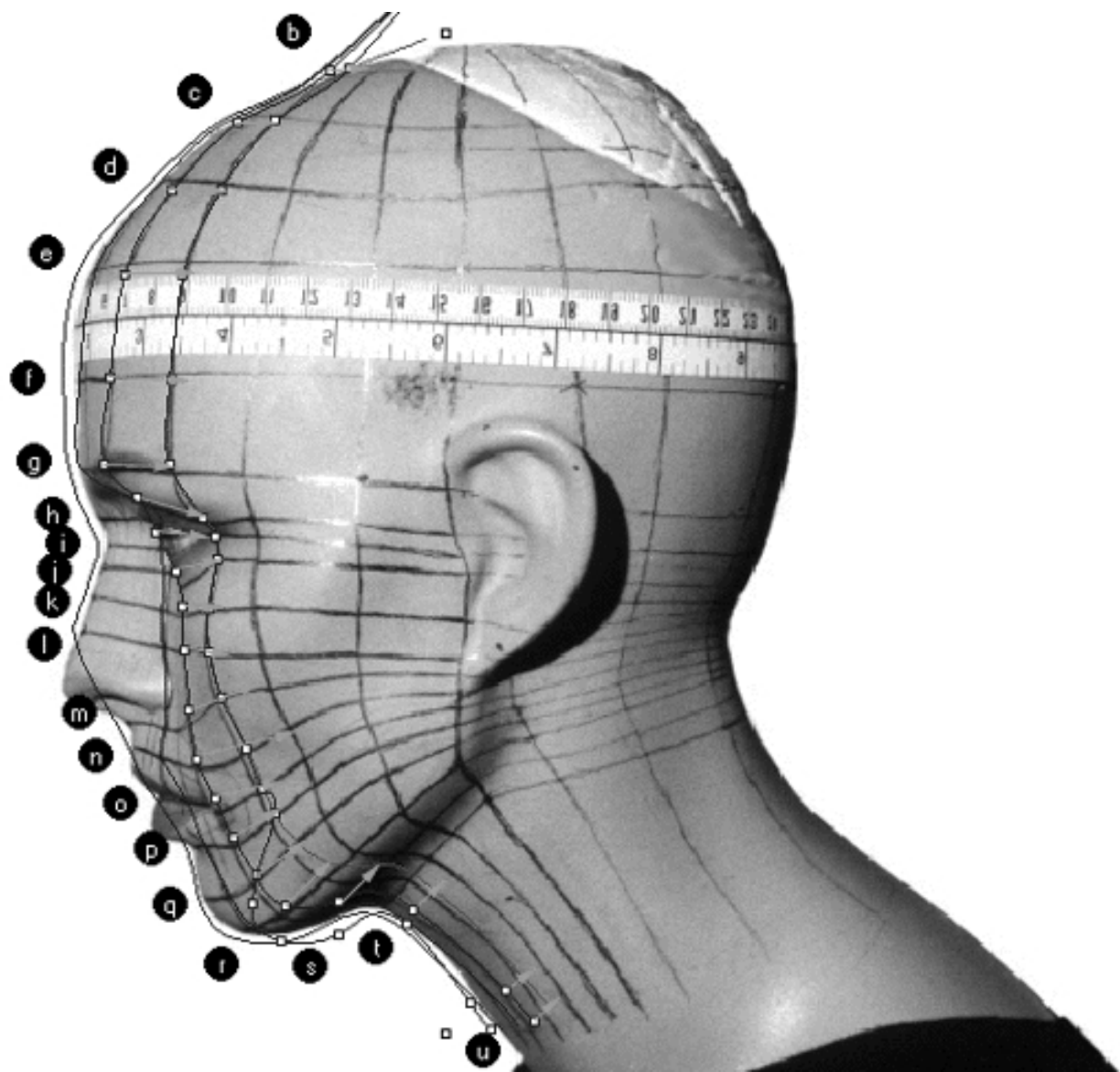


By now you may have discovered that it's becoming harder to determine where you should actually be moving the edit points to in space. Since you can't rely on the background image for accurate information as to point placement, (remember it's only a "rough" guide) then how are you supposed to figure out where they should go?

The answer is that you have to use your eyes and make an educated guess. The best way to do this is to look at where the points lay on the earlier curves you've created. Again, I recommend that you unlock all the curves, then select the last curve you created and display its edit points. Now make a comparison and ask yourself this question, do the points you've just moved seem to be in alignment with the previous curve?

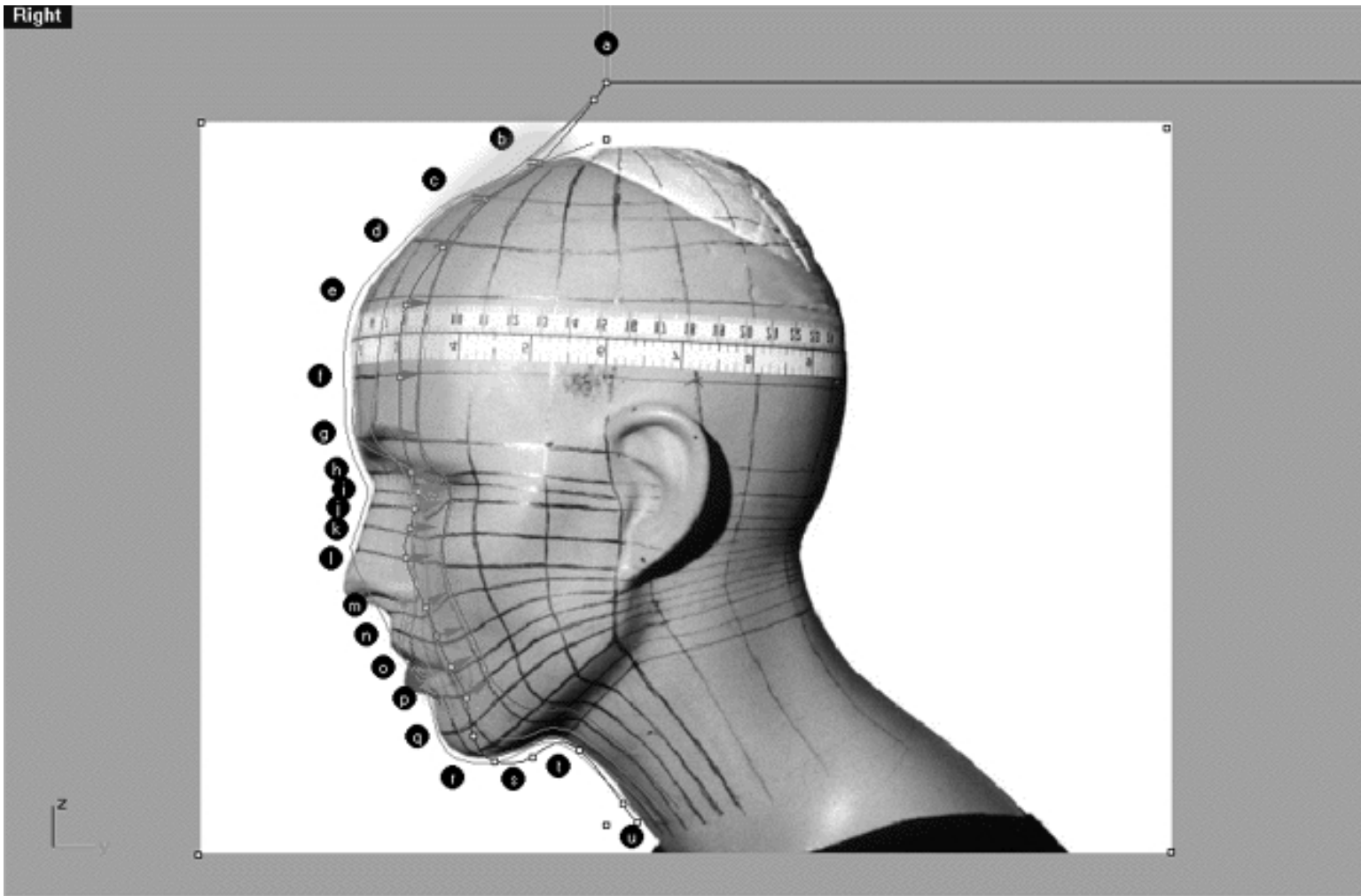
Remember it is very important that you take into account the curvature of the face and the way you've planned the manner in which your "grid" of curves will run. So it's crucial then that points should be in some sort of logical alignment with each other. For example, looking at our background image in the right view it's clear the horizontal curves running along the Y axis become increasingly more squashed together as they approach the back of the head. Of course under most circumstances such squashing would not be desirable, however, because we've designed our model so the "squashing" takes place at the back of the head where it will be covered up by hair it should not be a problem.

Therefore, on our model the points at the front of the face ( **h - r** ) are going to become increasingly compacted with each successive curve we create. Obviously, if all the points were in perfect alignment with each other then this "squashing" could not occur and we would wind up with a pretty boring looking cylinder shape rather than the human head shape we are after.




In this screenshot, all the curves have been unhidden and the edit points are displayed for the 3rd (Interp\_03) and 4th (Interp\_04) curves. Points ( b-p ) on the 4th curve have been dragged to their correct locations on the red guide curve. The green arrows represent imaginary "lines of sight" based on the location of the previous curves edit points (Interp\_03) and give some idea where the 4th curves (Interp\_04) points should be dragged to on the red guide curve. Get in the habit of turning the point display on and off often while you work in respect the curves you created previously. **\*Warning** -- Again, if you intend to move/edit points when they are displayed on more than one curve simultaneously make certain that you protect your earlier curves by **LOCKING** the previous layers. In respect to the above example, make sure that you have locked layers (Interp\_01, Interp\_02, Interp\_03) before moving any points on Curve 4 (Interp\_04).

Right



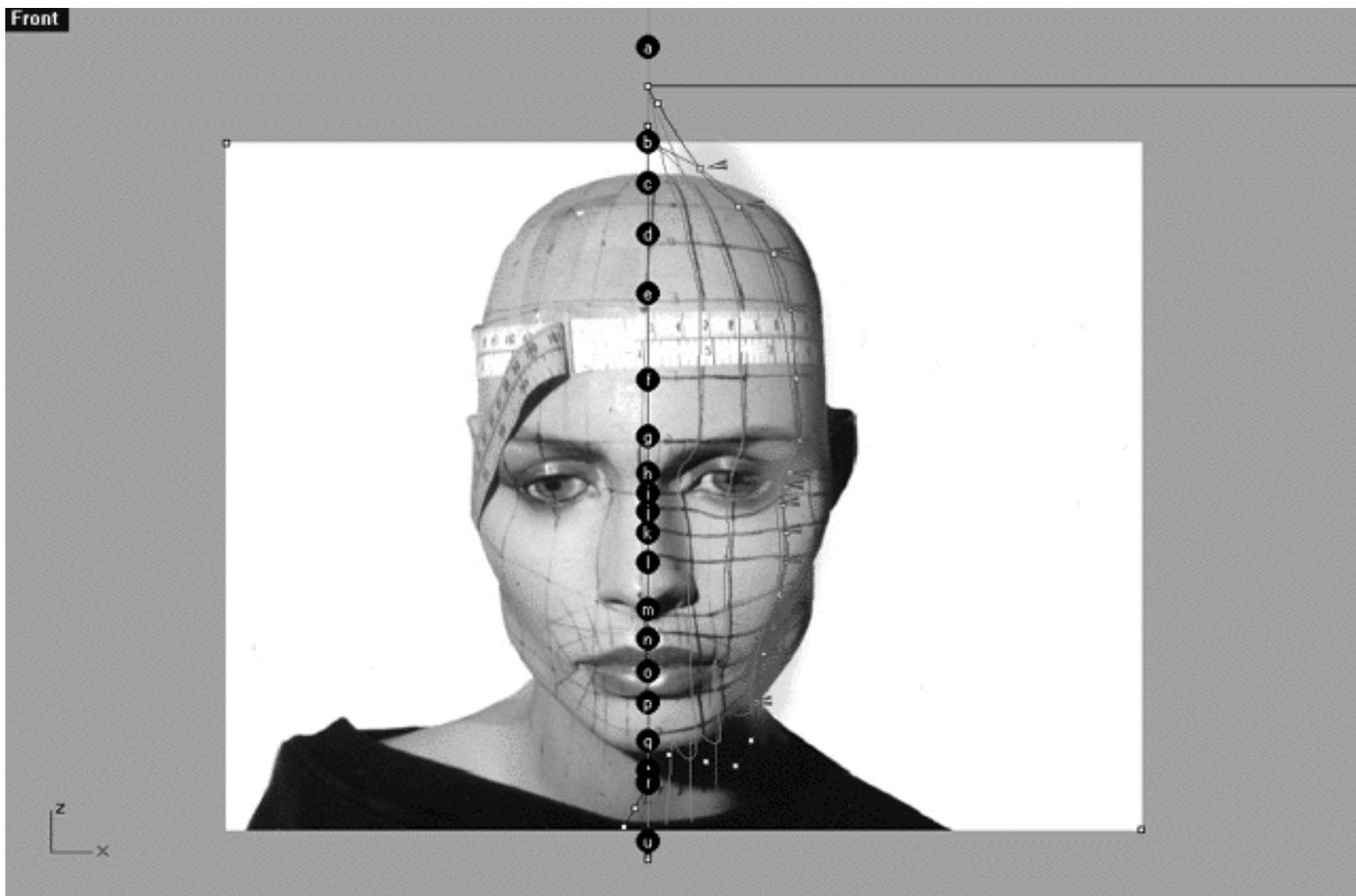
This **Right Viewport** screenshot shows points ( **b - p** ) on the 4th curve (Interp\_04) **prior** to being dragged inward toward the red guide curve ( Guide\_04 ) along the Y axis. The orange highlight indicates the 1st group of curves to be moved ( b - i ) and the green highlight indicates the 2nd group of curves ( j - p ).

## Moving from Right View to Front View -- 1st

- **Double left click** on the **Right Viewport** label -- the Viewport will minimise.
- **Double left click** on the **Front Viewport** label -- the Front Viewport will maximise.
- Zoom in on edit points ( b - i ).
- Once again, start by moving edit points ( **b - i** ) to do this, **left click** on a point -- it will highlight. Then **left click** on the highlighted point(s) and drag them toward the red guide curve ( Guide\_04 ) along the X axis.  
**Tip** -- It's probably a very good idea to display the points on the 3rd curve if you've not done so already just to give you an idea of where they are located and to help you calculate about where you should be placing your points on the 4th curve in relation. *\*Note* -- holding down the Shift key while dragging is optional, so use your own discretion but it will probably be helpful at least for the first set of points ( b - i ).
- When you've finished working on points ( b - i ) from the toolbar choose the Pan View icon  and pan the view so that points ( h - p ) are clearly visible.



- Now concentrate on moving this next group of points ( **j - p** ) inward toward the red guide curve in the same manner as previously done. *\*Note* -- For these points holding down the shift key while dragging is optional but something that I wouldn't recommend because it's likely to do more harm than good due to the more radical curvature of the face in this particular area.
- When you've finished, Zoom out with a ZoomExtentsAll.



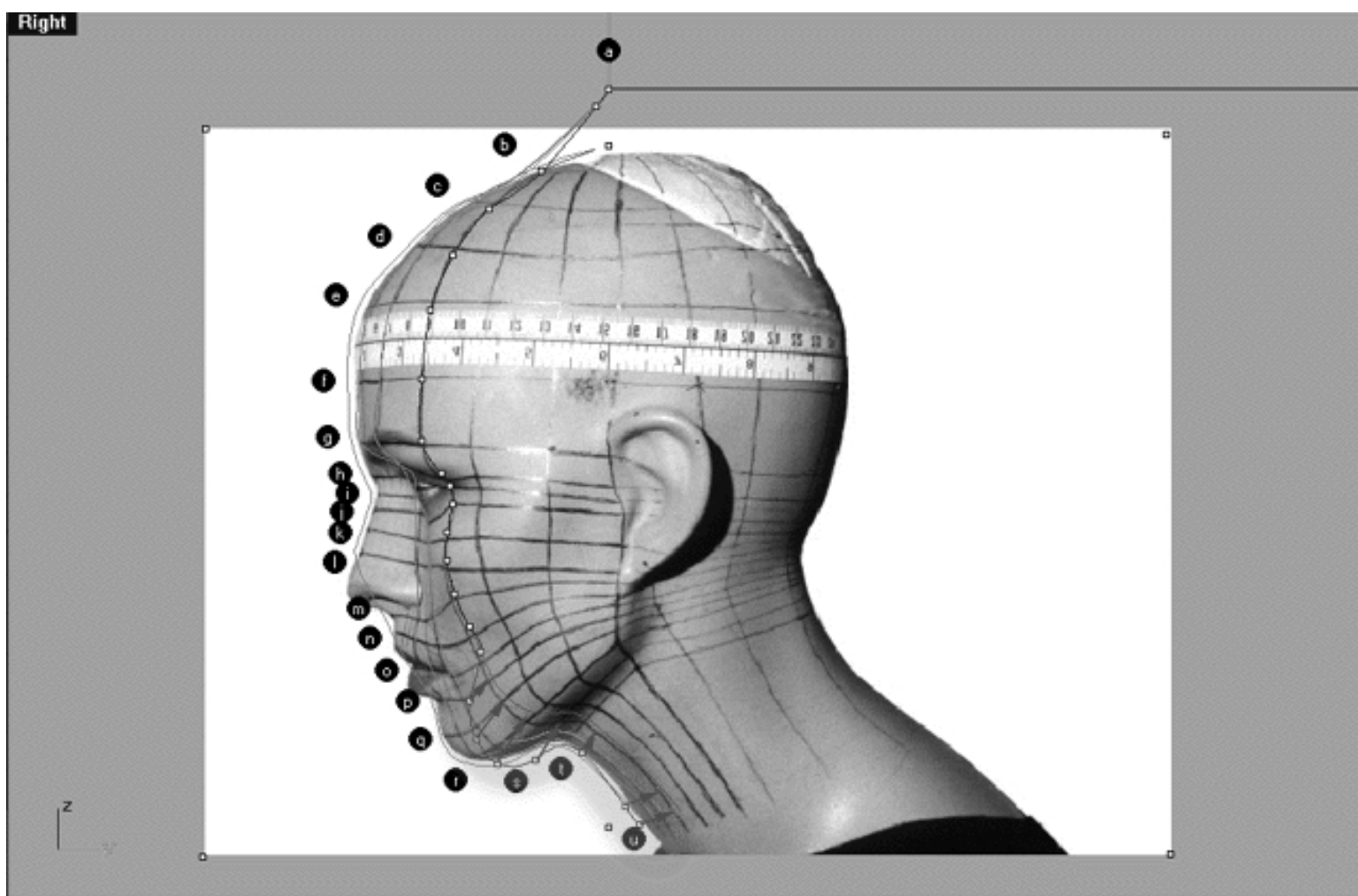
This **Front Viewport** screenshot shows points ( **b - p** ) on the 4th curve (Interp\_04) prior to being dragged toward the red guide curve ( Guide\_04 ) along the X axis.

## Return to the Right View -- 2nd

- Once completed, check your work and return to the Right Viewport.
- Maximise the **Right Viewport** if you've not done so already by **double left clicking** on its label.
- Zoom in tightly on edit points ( q - u ).
- Just to be safe, before proceeding, confirm that no *Osnaps* are currently active if they are disable them now.
- Start with point ( **q** ) to do this, **left click** on it -- it will highlight. Then drag it across and up slightly towards the guide curve placing the point just at the very end of the guide curve.

- Now move on to point ( r ) again **left click** on the point -- it will highlight. Then drag it across and up slightly.
- With the next few points ( s - u ) things get a little bit more complex not to mention that deep shadow still bugging things up again. My best advice here is just to be careful and take your time and try not to allow yourself to get overly anxious. *\*Tip--*If you're having a hard time and feeling flustered and anxious it's a good idea to save what you've done and to step away from things for a little while. More often than not if you try and too hard to get something right you're never, ever going to do it. It's better that you should take a break, get away from the computer for a while and take in some fresh air. You will find that 9 times out of 10 when you return things will fall into place much easier than before and you'll wonder what all the fuss was about :-)

- Once completed, zoom out by choosing the *Zoom Extents icon*  from the toolbar and **clicking** on it.




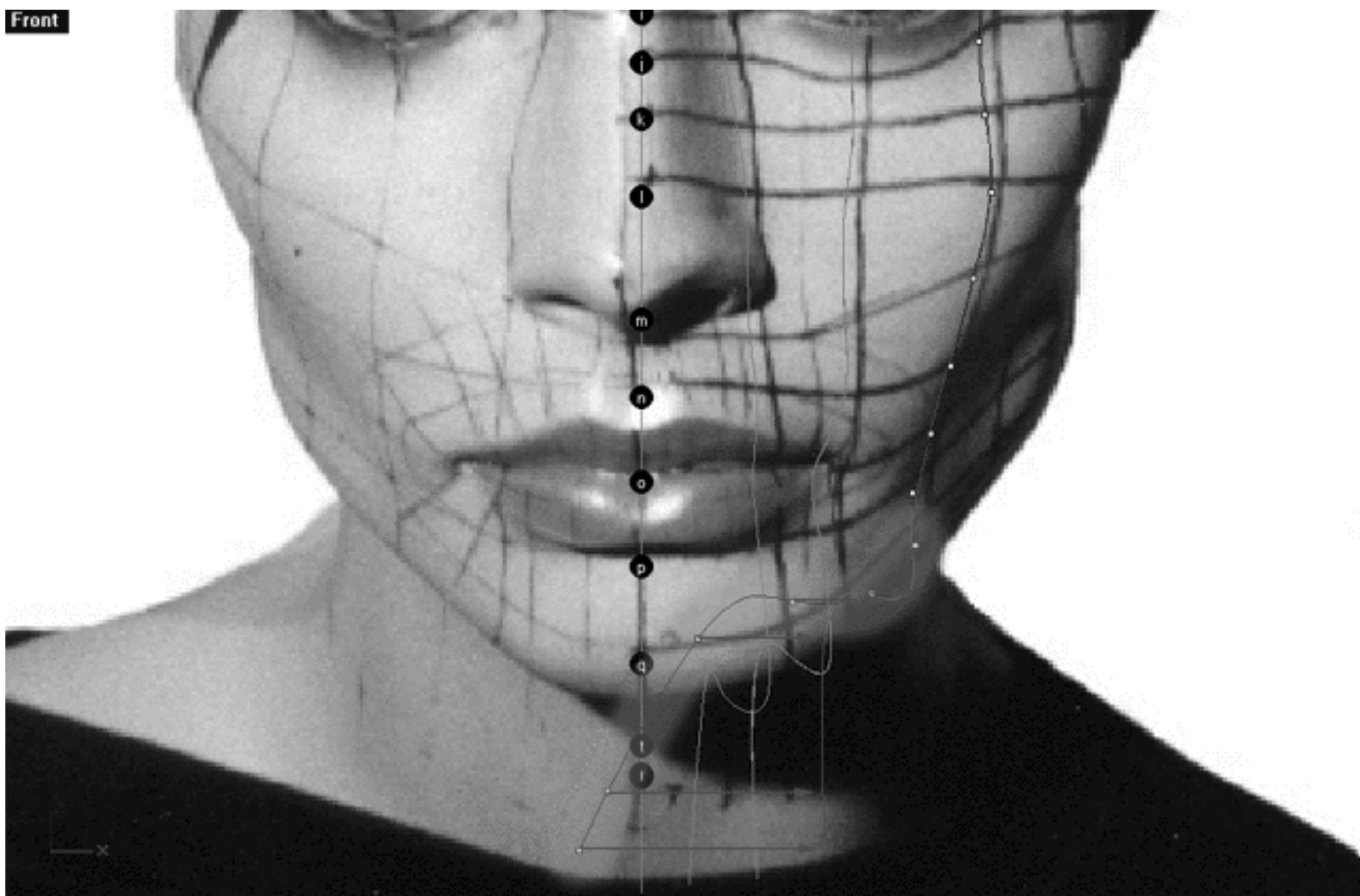
This **Right Viewport** screenshot shows points ( q - u ) on the 4th curve (Interp\_04) just prior to being dragged toward the red guide curve (Guide\_04 ) along the Y axis.

## Return to the Front View -- 3rd

- Once you've completed the prior step, check your work and then minimise the **Right Viewport** by **double left clicking** its label.



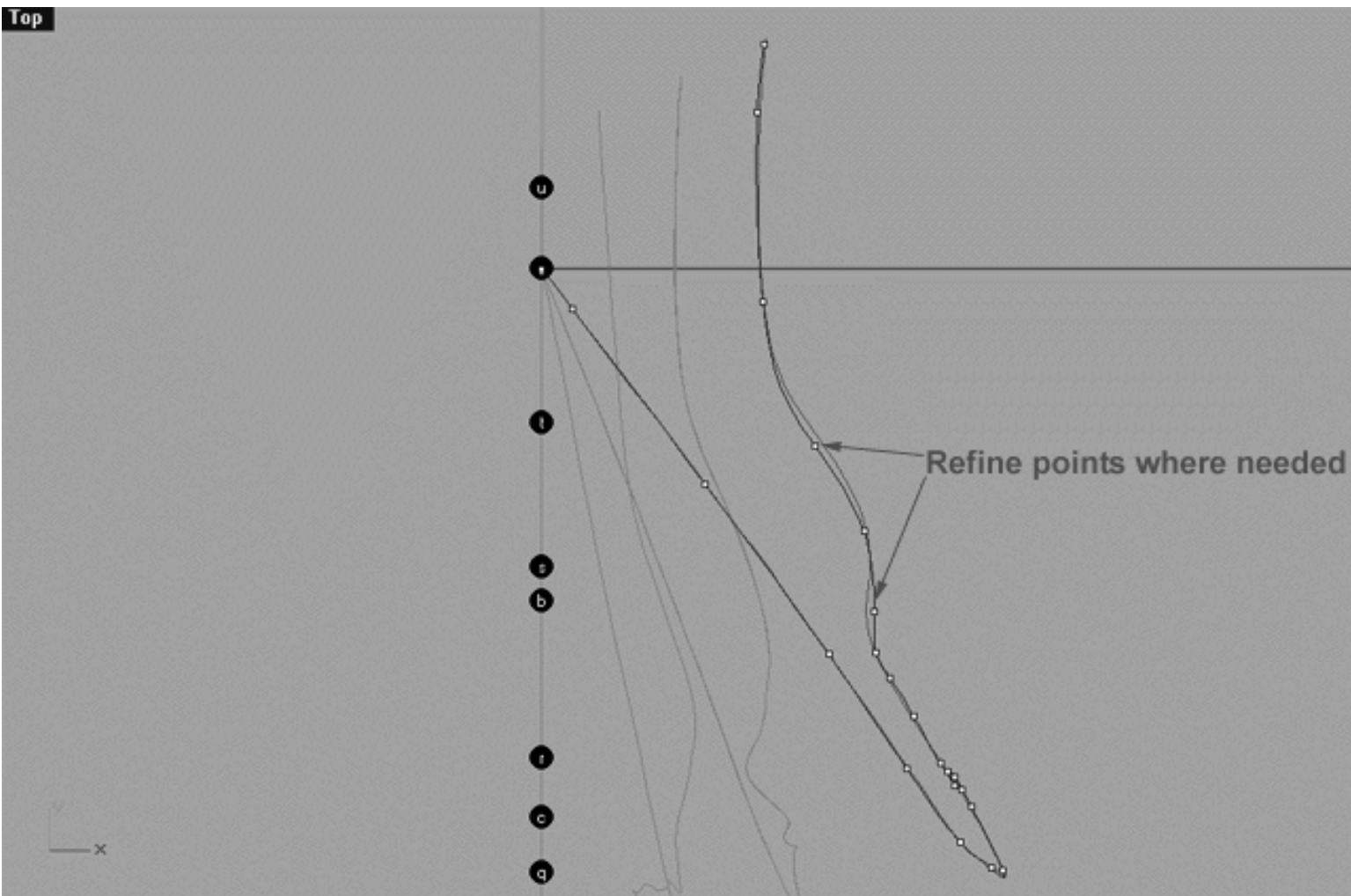
- Maximise the **Front Viewport** by **double left clicking** on its label.
- Zoom in tightly on edit points ( q - u ).
- We will now move points ( q - u ) into position. To do this, start with point ( u. ) **left click** on the point -- it will highlight. Then, **hold down the Shift Key, left click** on the highlighted point and drag the point until it meets with the red guide curve ( Guide\_04 ) along the X axis while **continuing to hold down the Shift key**.
- Next move the phantom point and repeat the previous procedure.
- Next move point ( t. ) and repeat the procedure for the remaining points ( s - r )
- Once completed, zoom out by choosing the *Zoom Extents icon*  from the toolbar and **clicking** on it.



This **Front Viewport** screenshot shows points ( q - u ) on the 4th curve (Interp\_04) just prior to being dragged toward the red guide curve ( Guide\_04 ) along the X axis.

# Take it to the Top View -- 4th

- Check your work and then minimise the **Front Viewport** by **double left clicking** on its label.
- At this point it would be a good idea to turn off all the edit points and then turn them back on for the 4th curve only, this will prevent any possible confusion.
- Maximise the **Top Viewport** by **double left clicking** on its label.
- Turn off the annotated dot labels. At the bottom of your screen you will see the *Status Bar*, **right click** on the Layer info box -- the Edit Layers dialogue box will open.
- In the Name field list find the layer called *Annotated Dots\_1* and select the **Off** radio button -- click on **OK** to **Exit**.
- Zoom in tightly on the curve, carefully check to see how well the curve conforms to the guide.
- Correct any misalignment along the **X AXIS ONLY** -- to do so, **left click** on the misaligned point -- it will highlight. Then, **hold down the Shift Key, left click** on the highlighted point and drag the point until it meets with the red guide curve ( Guide\_04 ) along the X axis while **continuing to hold down the Shift key**. **\*WARNING** use extreme caution when editing points in this view, it's really easy to make a mess of things if you are not careful -- remember that the Undo key is your friend! Yes, you should correct any a major misalignment along the X axis but if the curve is just a little bit off leave it alone and don't worry about it. Remember also that the tighter that you zoom in on a curve the more apparent misalignment will appear so don't let a little one freak you out.
- When you've finished Zoom Out with a ZoomExtentsAll.



This **Top Viewport** screenshot shows an example of slightly misaligned points (*\*Note -- your results may vary*) on the 4th curve (Interp\_04) just prior to being dragged toward the red guide curve ( Guide\_04 ) along the X axis.

If you're confused about any of this and would like to see how I went about creating this curve then watch the following movie:






### Editing the 4th Curve

View an example movie -- [Click Here](#)

## Snapping things up on the 4th curve

The 4th curve has now completed -- you may now do the dance of joy! Once again, test how well you've done overall at aligning the 4th curve to the guide. Display the points on the guide curve and see how close you came with your edited points. Once done "snap" all of the 4th curves points to the guide just to stay in sync.

- Minimise the **Front Viewport** by **double left clicking** on its label.
- Maximise the **Right Viewport** by **double left clicking** on its label.

- Now we must unlock the Guide\_04 curve so that we may select and display its points. At the bottom of your screen you will see the *Status Bar*, **right click** on the Layer info box -- the Edit Layers dialogue box will open.
- In the *Name field list* find the layer called Guide\_04 and select the **ON** radio button -- click on **OK** to **Exit**.
- In any Viewport select the Guide\_04 curve by left clicking on it.
- Display its edit points by choosing the *Show edit points icon*  from the toolbar by **left clicking** on it or type the command: **EditPtOn** at the command line.
- Okay, here comes the test -- take a close look, how close did you manage to come?
- Let's refine the points still more. Once again lock the Guide\_04 curve so that we don't disturb anything up while snapping. At the bottom of your screen you will see the *Status Bar*, **right click** on the Layer info box -- the Edit Layers dialogue box will open.
- In the *Name field list* find the layer called Guide\_04 and select the **Lock** radio button -- click on **OK** to **Exit**.
- Open the *Osnap dialogue box* by moving your cursor to the lower status bar and **left clicking** on its title. The *Osnap dialogue box* will open, enable the *Point snap* by **left clicking** on **Point** -- a check will appear indicating that it is now active. If any boxes are checked/active other than "Point" disable them now.
- **Left click** on the **X** to Exit the Onsap dialogue.
- Temporarily turn off the background reference image by typing **HideBackgroundBitmap** at the command prompt.
- Starting with point (**b.**) zoom in on a small group of points (about 3 is good) and "snap" each curve point to its associated point on the guide curve, it's important that you re-snap each point -- be sure not to miss any!
- When you've finished working of the first group of 3 points choose and use the Pan View icon  from the toolbar and pan the view a bit further along the contour of the curve. Now start working on the next group of 3 points and continue snapping. Continue this procedure until you've snapped all the remaining points ( **b - u** ).
- Zoom out by choosing the *Zoom Extents All icon*  from the toolbar and **clicking** on it or typing the command: **ZoomExtentsAll** at the command line.
- Minimise the Right Viewport by double left clicking on its label.
- Carefully check over your work in all viewports.
- Restore the background reference image by typing **ShowBackgroundBitmap** at the command prompt.

- Disable any Osnaps that may currently be active.
- Congratulations! -- you've now completed editing the 4th Curve.




**View an example movie**

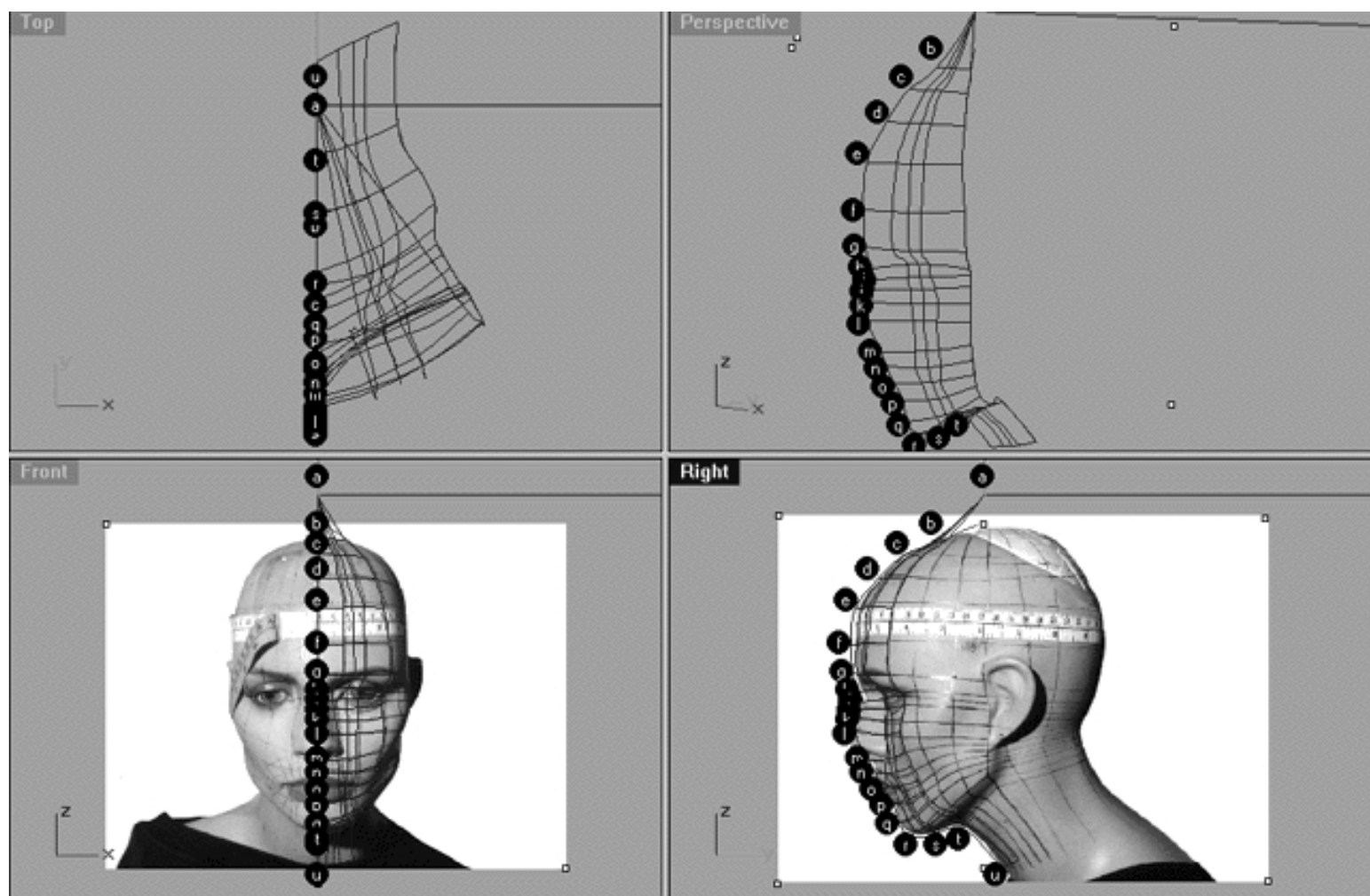
[Click Here](#)

**Table Four - A list of points & coordinates  
for the completed 4th Curve -- [Click Here](#)**

## Testing the Surface

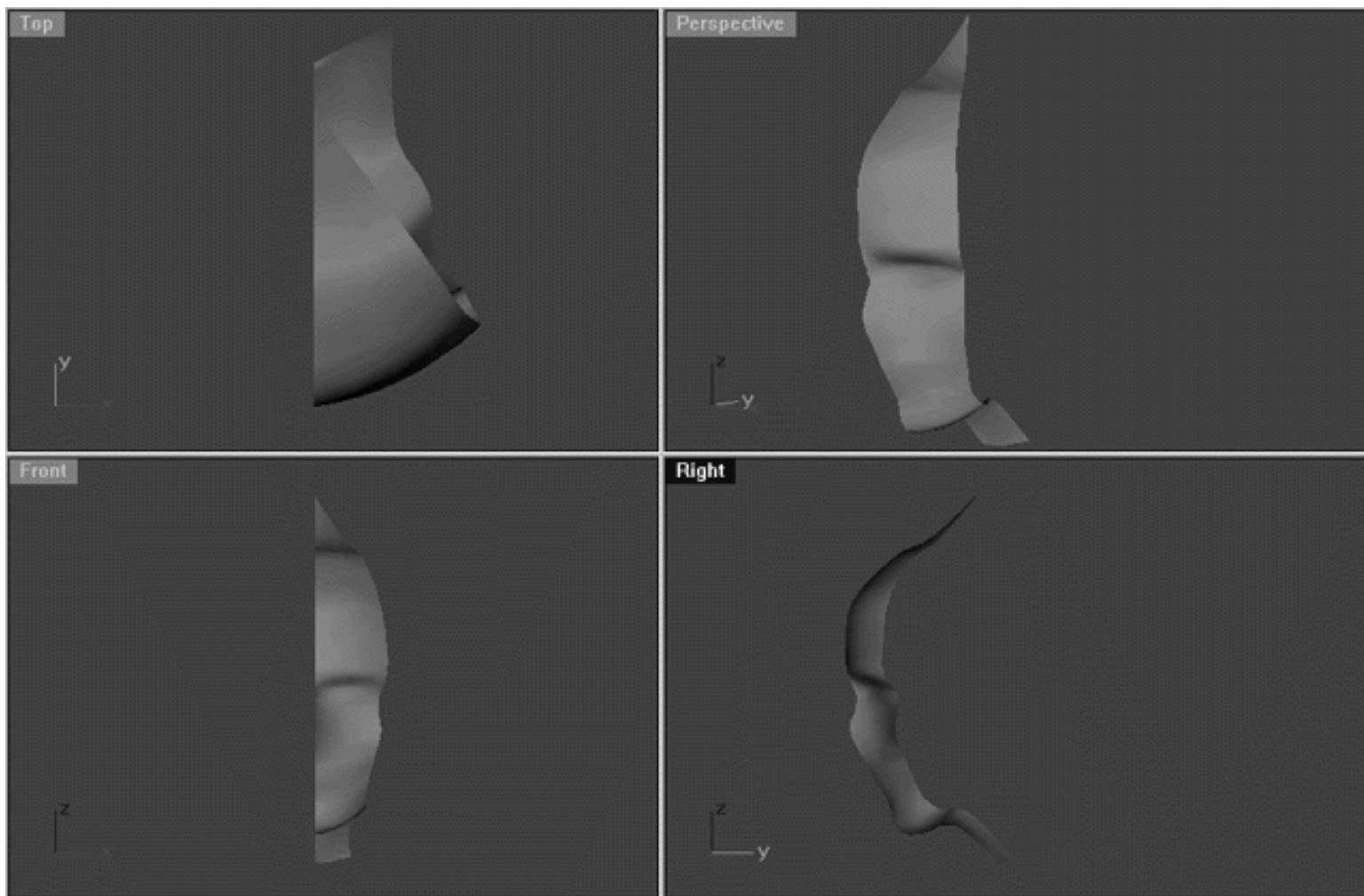
Now is a good time to see how things are progressing by doing a test loft. The truth is that you could have and should have done a few of them earlier on in this lesson, especially when you were trying to figure out where to place you points. Again, get in the habit of doing a lot of test lofts whilst you work, it really helps you to visualize how your model is shaping up.

- In the **Perspective Viewport**, zoom in on points ( **a - e** ) this will make it easier to select the curves.
- Unlock any curves by typing **Unlock** at the command line. Once done, the curves should revert to their normal state.
- From the toolbar choose the Loft icon  or type the command: **Loft** at the command line.
- At the command line you will receive the following prompt: **Select curves to loft (point):**
- Now, in the **Perspective Viewport** click directly on curves 1, 2, 3, and 4
- As you select each curve they should highlight, when you've finished selecting all 4 curves press **Enter**.
- The Loft Options dialogue box should appear. Set the Style drop down box to **Loose**. **click** on the **Shaded Preview** box, a tick should appear. Make sure the Do Not Simplify radio button is active and **click** on the **Preview button**.



This **All Viewport** screenshot shows an example of a loose loft applied to the curves without a quick rendered shaded preview.





This **All Viewport** screenshot shows an example of a surface created by lofting curves 1, 2, 3 and 4 using the "loose" type parameter with a quick rendered shaded preview.

## Shutting Down the Scene

- Confirm that no Osnaps are currently active, disable any that are.
- Open the Edit Layers Dialogue box and turn off Guide\_04
- Confirm that Layer(s): Interp\_01, Interp\_02, Interp\_03 and Interp\_04 are ON.
- Left click on the Layer Info box at the Lower Status Bar, highlight the layer entitled SCENE START UP and click on it -- it should now become the active layer and its name should appear in the box.
- Confirm that the newly created curve (Interp\_04) has in fact been associated with the correct layer.
- Hide any points that are currently displayed.
- Zoom Extents All.
- And SAVE YOUR WORK -- unless you like tempting fate or don't mind doing things over, and over, and over and over and over... :-(



# Summary of Lesson - Curve 4

In this lesson you should have continued to improve and expand your knowledge and overall confidence of editing points in multiple viewports in a calculated and systematic manner. You will have created yet another important curve that will help to define several key structural areas of the face including the outer corner of the eye and the cheek apple. By now you should have begun to get a pretty good feel for when it is and is not possible to use the Shift key to in order to constrain movement to a given axis whilst dragging points.

[Go To Next Lesson - Drawing the 5th Curve](#)

RETURN to Top of Page -- [Click Here](#)

Written by Joseph R. Saltzman.

Co-produced in association with Steven Ståhlberg

©1998-1999 Cinemagic Productions Limited. All Rights Reserved.

Duplication of this document including images and text by any means is expressly forbidden without prior written consent of Cinemagic Productions Limited.

Web Site: <http://www.cmagic.co.uk> Telephone: +44 (0)1753 733 190 Fax: +44 (0)1753 736 619 email: [cmagic@cmagic.co.uk](mailto:cmagic@cmagic.co.uk)

## MOVIE CREATING THE 4TH CURVE

To **PLAY** the example movie, double click below:

To **RETURN** to the head shape tutorial -- [click here](#).

# MOVIE EDITING THE 4TH CURVE PART ONE

To **PLAY** the example movie, double click below:

To watch **PART TWO** of this movie -- [click here](#).

To **RETURN** to the head shape tutorial -- [click here](#).

# MOVIE EDITING THE 4TH CURVE PART TWO

To **PLAY** the example movie, double click below:

To **RETURN** to the head shape tutorial -- [click here](#).

## MOVIE SNAPPING UP THE 4TH CURVE

To **PLAY** the example movie, double click below:

To **RETURN** to the head shape tutorial -- [click here](#).

TABLE FOUR

POINT	X AXIS	Y AXIS	Z AXIS
a - North Pole	0.000	0.000	0.000
Phantom point 1	3.503	-4.558	-6.294
b - Head top 1	18.705	-24.486	-29.579
c - Head top 2	32.782	-43.819	-43.341
d - Head top 3	41.860	-56.755	-60.486
e - Hairline	47.697	-65.072	-80.431
f - Temple	51.630	-68.079	-105.090
g - Browbone	52.697	-68.316	-127.585
h - Crease of top eyelid	48.751	-61.087	-139.285
i - Eye centre line	46.915	-57.702	-143.934
j - Under-eye area	46.617	-57.070	-150.581
k - Bridge of nose	47.371	-58.696	-160.764
l - Cheek apple	47.730	-59.147	-171.394
m - Nose base, cheek bone	45.666	-56.158	-183.302
n - Upr lip, cheek hollow	42.068	-50.826	-195.219
o - Centre of mouth, cheek hollow	39.473	-46.464	-204.548
p - Lwr lip under, cheek hollow	37.912	-43.351	-211.865
q - Tip of chin	37.035	-38.795	-218.971
r - Jawline	37.072	-29.889	-225.810
s - Nape of neck	31.593	-19.318	-226.832
t - Neck	25.173	-3.155	-232.376
Phantom point 2	24.913	18.689	-253.522
u - Base of neck	25.609	26.204	-262.072

**RETURN** to tutorial -- [Click Here](#)

**RETURN** to previous lesson -- [Click Here](#)




## THE 5TH CURVE

### Contents:


- [Scene Setup](#)
- [Creating the 5th curve](#)
- [Example Movie -- Creating the 5th Curve](#)
- [Editing the 5th curve](#)
- [Moving from Front View to Right View -- 1st](#)
- [Keep to the Right View -- 2nd](#)
- [Back to Front View -- 3rd](#)
- [Take it to the Top View -- 4th](#)
- [Example Movie -- Editing the 5th Curve](#)
- [Snapping things up on the 5th curve](#)
- [Example Movie -- Snapping](#)
- [Table Five - A list of points & coordinates for the completed 5th Curve](#)
- [Testing the Surface](#)
- [Shutting Down the Scene](#)
- [Summary of Lesson -- Curve 5](#)

---

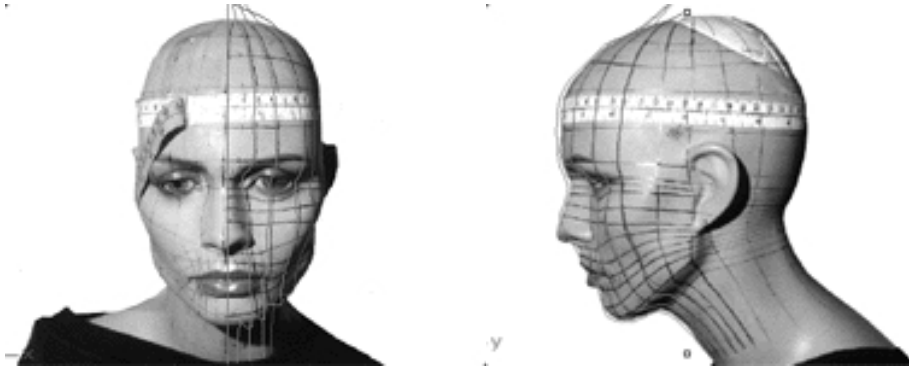
## Scene Setup

- If you've not done so already start a Rhinoceros session by **double clicking** on the desktop icon  the application will begin.
- Choose File, Open from the menu bar and double click on **START\_A.3DM** in the file list, it will load and open.
- Confirm at the Lower Status Bar the currently active layer is entitled SCENE START UP. If it is active proceed to the next step, if it's not then make it active by left clicking on the layer box, highlighting the correct layer and clicking on it.
- Again, at the Layers Box on the Lower Status Bar this time right click on the box, the Edit Layers Dialogue box will open. Confirm the following switches have been enabled or disabled:




- The Layer entitled Annotated Dots\_1 should be OFF
  - The Layer entitled Interp\_01 (the Profile Curve) should be ON
  - The Layer entitled Interp\_02 should be ON
  - The Layer entitled Interp\_03 should be ON
  - The Layer entitled Interp\_04 should be ON
  - The Layer entitled Guide\_05 should be LOCKED
  - The Layer entitled Photopoints should be ON
  - The Layer entitled Frozen should be LOCKED
  - The Layer entitled SCENE START UP should be ON
  - When you've finished making your changes ( if any ) click on OK
  - All other layers should be set to OFF
  - Confirm that you can see the background image in the Front and Right viewports
  - Confirm that the grid display in the viewports has been disabled, if not turn it off now.
  - Confirm that no Osnaps are currently enabled, if any are disable them.
  - Confirm that no edit points are currently displayed, if any are hide them.
  - Zoom out all the viewports by selecting the Zoom Extents All icon  or by typing the command: ZoomExtentsAll at the command line and pressing ENTER.
-





# Creating the 5th curve



**Description:** The 5th curve begins at the top pole and runs along the top & side of the head, near the temple (between the eyebrow end and the ear, but closer to the eyebrow than the ear) down along the rear of the cheek apple straight on over the rear of the cheek hollow and following on over near the mid part of the jaw and ending at the base of the neck.

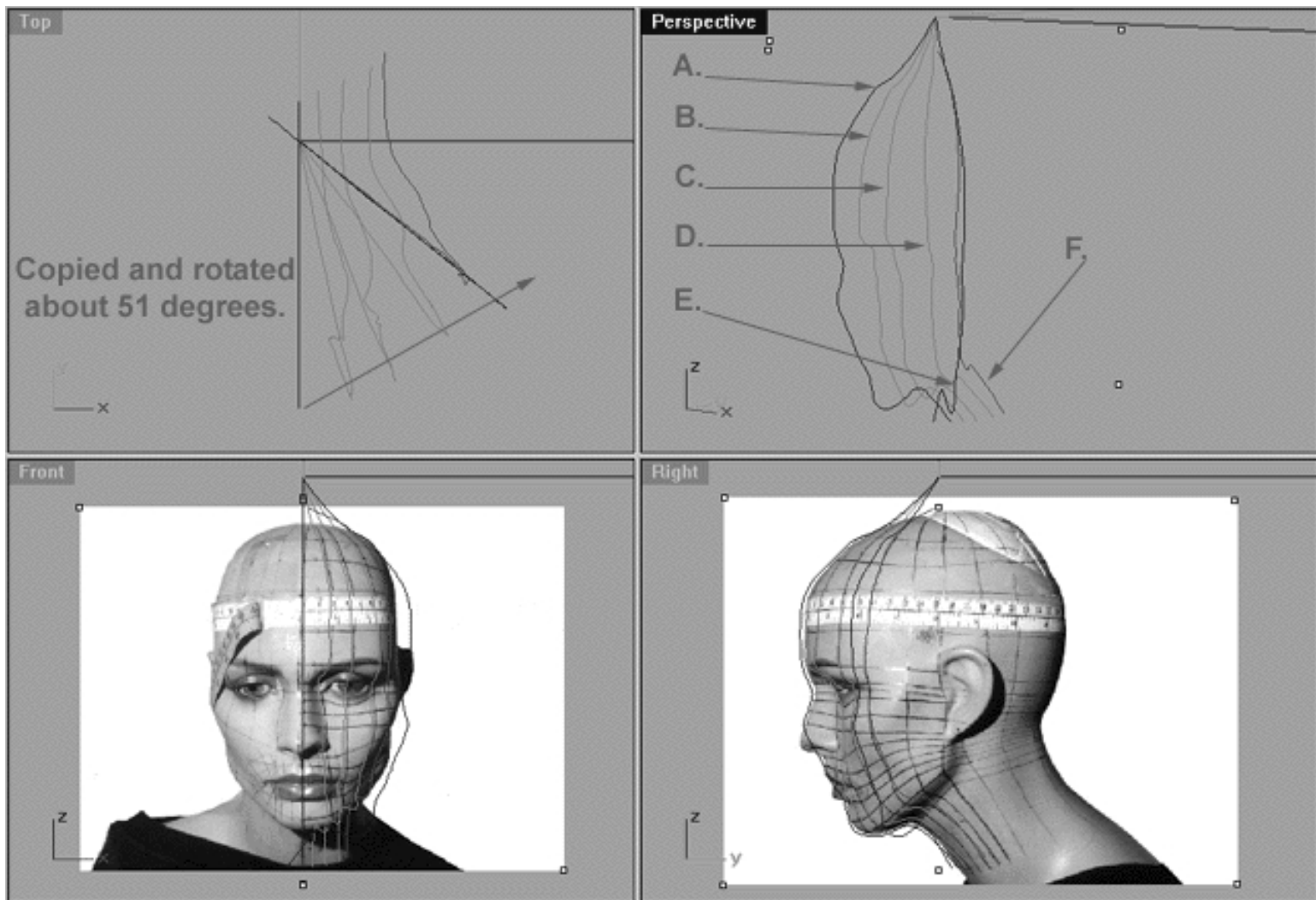
You will create the 5th curve in much the same way as the 4th and you should be starting to get the feeling of déjà vu by now ;-)

- If you've not done so already, choose the *Zoom: Extents All Viewports icon*  from the toolbar or type **zea** at the command line.
- Hold down the **Ctrl** key and select the **Interp\_02, Interp\_03 and Interp\_04** curves by **left clicking** on them, then lock the curves by typing **Lock** at the command line and then press **Enter**.
- Now let's create a new layer -- At the bottom of your screen you will see the *Lower Status Bar*, **right click** on the *Layer info box* -- the *Edit Layers dialogue box* will open.
- **Left click** on the **New** button and in the *Name field* type: **Interp\_05**.
- Move the cursor to the *colour field*, **left click** on the *colour field*, the "*Select a colour*" dialogue and colour wheel will appear, choose a nice bright blue (i.e. **R:0 G:0 B:255**) then click **OK**
- You will be returned to the *Edit Layers dialogue box* again, **left click** on **OK** to exit.
- Return your cursor to the *Status Bar* at the bottom of the screen and **left click** on the *Layer info box* -- the Layers list will appear.
- Locate **Interp\_05** in the list (the one you created a few moments ago) and move your cursor over its name (it will highlight) **left click** on it to make the layer currently active.
- Open the *Osnap dialogue box* by moving your cursor to the *lower status bar* and **left clicking** on its title. The *Osnap dialogue box* will open, enable the *End snap* by **left clicking** on End -- a check will appear indicating that it is now active. If any boxes are checked/active other than "End" disable them now.
- Close the *Osnap dialogue box* by clicking on **X**.
- In **Any Viewport** Select the 1st curve (i.e. Interp\_01) by **left clicking** on it -- it will highlight.

- From the toolbar **left click** on the Rotate 2D icon  or type: **Rotate** at the command line.
- At the command line you will receive the following prompt: **Choose centre of rotation (copy)**
- Type: **copy** at the command line and press **Enter**.
- In the **Right Viewport** Move your cursor to point (a. -- X:0, Y:0, Z:0) on the first profile curve (i.e. Interp\_01) -- the cursor should snap to it, when it does **left click**.
- The system will respond with the following prompt at the command line: **Angle or first reference point:**
- Now, move your cursor into the **Top Viewport** and bring the cross hairs to about the 6 o'clock position (near the bottom of the window) once you've done this **press and hold down the Shift Key** on your keyboard -- the curve should align itself perfectly along the Y axis.
- While still **holding the Shift Key down**, drag the cursor along the -Y axis about **130** units and **left click**.
- The system will then respond with the following prompt at the command line: **Second reference point:**
- Rotate the curve anti-clockwise about **51 degrees** and **left click**.
- Press **Esc** on your keyboard to complete the operation.
- In the **Any Viewport** select the newly rotated curve by **left clicking** on it -- it will highlight.
- Choose the *Layer Control Icon*  from the toolbar by **left clicking** on it and **holding down the key** -- select the *Change Layer Icon*  from the flyout.
- Select **Interp\_05** from the *Pick layer for object dialogue* -- it will highlight. This will make certain that Interp\_05 has been associated with the correct layer.
- Click **OK**
- Disable any currently active Osnaps
- Choose the Zoom Extents All Viewports icon  from the toolbar or type the command: ZoomExtentsAll at the command line.



View an example movie [Click Here](#)




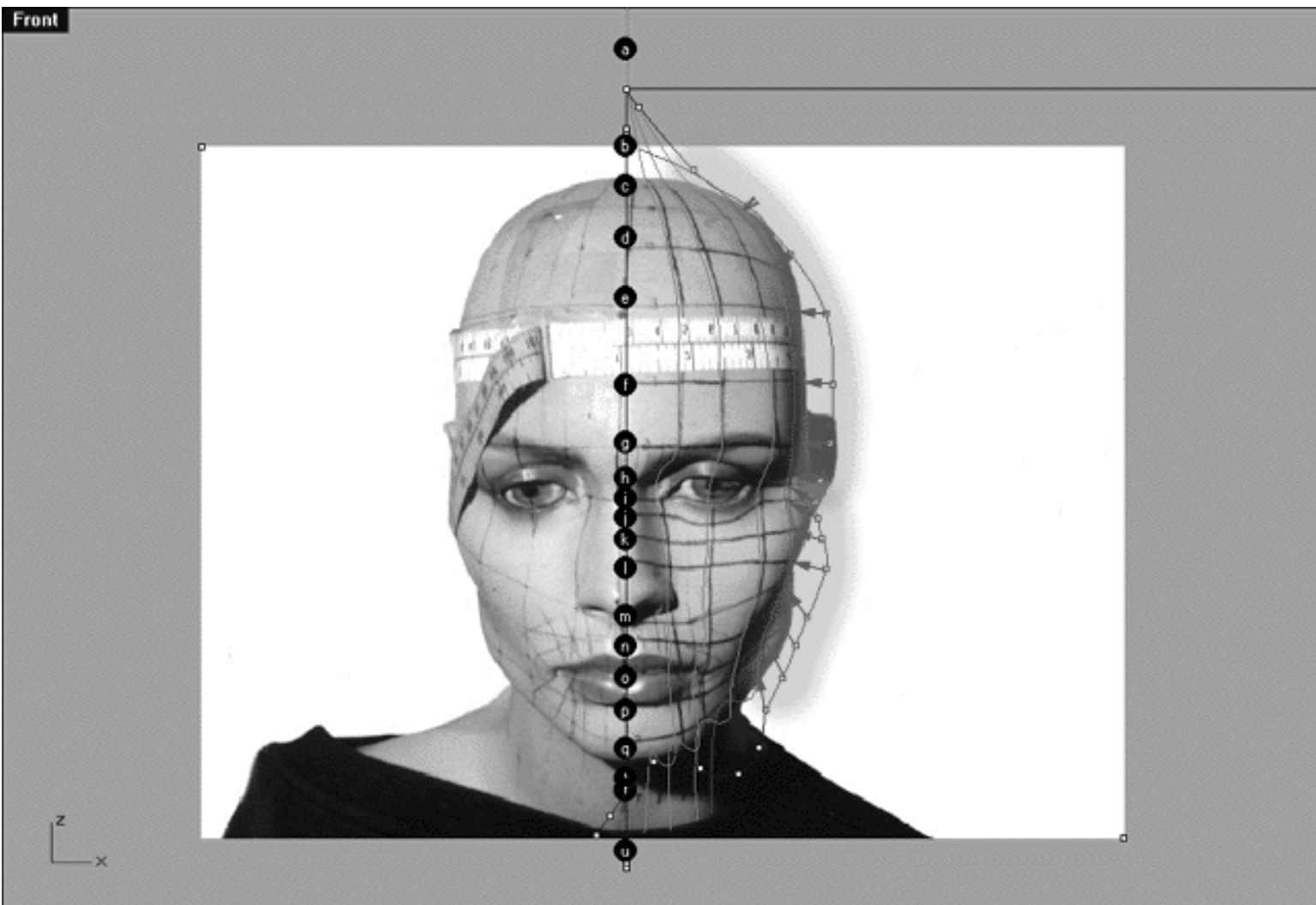
The above screenshot shows our original profile curve (A), after having been copied and rotated about 51 degrees on its centre and now located at position (E). (B) represents the now locked 2nd curve, (C) represents the now locked 3rd curve, (D) represents the now locked 4th curve, (F) in red represents where our newly rotated curve (E) should be positioned once the points have been appropriately edited.

## Editing the 5th Curve

Just when you were starting to get bored guess what, this time we are going to start off in the Front Viewport for a change..!


- Maximise the **Front Viewport** if you've not done so already by **double left clicking** on its label.
- Turn ON the annotated dot labels. At the bottom of your screen you will see the *Status Bar*, **right click** on the Layer info box -- the Edit Layers dialogue box will open.

- If you've not done so already, in the Name field list find the layer called *Annotated Dots\_1* and select the **ON** radio button -- click on **OK** to **Exit**.
- Unlock all the curves by typing the command: **Unlock** at the command line and pressing **Enter**.
- Hold down the **Ctrl** key and select the 4th curve (Interp\_04) and 5th Curve (Interp\_05) by left clicking on them -- they will highlight.
- Display their edit points by choosing the *Show edit points icon*  from the toolbar by **left clicking** on it or type the command: **EditPtOn** at the command line.
- Now while holding down the **Ctrl** key select the 1st curve (Interp\_01) the 2nd curve (Interp\_02) and the 3rd curve (Interp\_03) by left clicking on them - they will highlight.
- Lock the curves by typing the command: **Lock** at the command line and then press **Enter**.
- Again, return to the bottom of your screen where you will see the *Status Bar*, **right click** on the Layer info box -- the Edit Layers dialogue box will open.
- Find the layer entitled Interp\_04 and **LOCK** it, then press **OK** to exit.
- Zoom in tightly on points ( b - i )
- Using the "sister point" alignment technique you learned in the previous lesson, begin by moving edit points ( b - i ). To do this, **left click** on a point -- it will highlight, then drag the point inward toward its "sister" on the previous curve (in this case Interp\_04) using the cross hairs of your mouse to help with alignment. Once you've come close to the sister point, hold down the **Shift** key and drag the point back on and into alignment with the red guide curve (Guide\_05) along the X axis.
- Once you've completed moving the first set of edit points ( b - i ) pan the view to expose more of the lower face.
- Now begin moving the second set of edit points ( j - p ) into alignment using the same procedure as above.  
**\*Note:** Edit points ( n - p ) will be harder to place due to the shadow in the background image. Don't worry, just try and guess where they should go for now. It will be pretty easy to sort them out in the next step when we switch into the Right viewport.
- Zoom out with a **Zoom Extents All**.



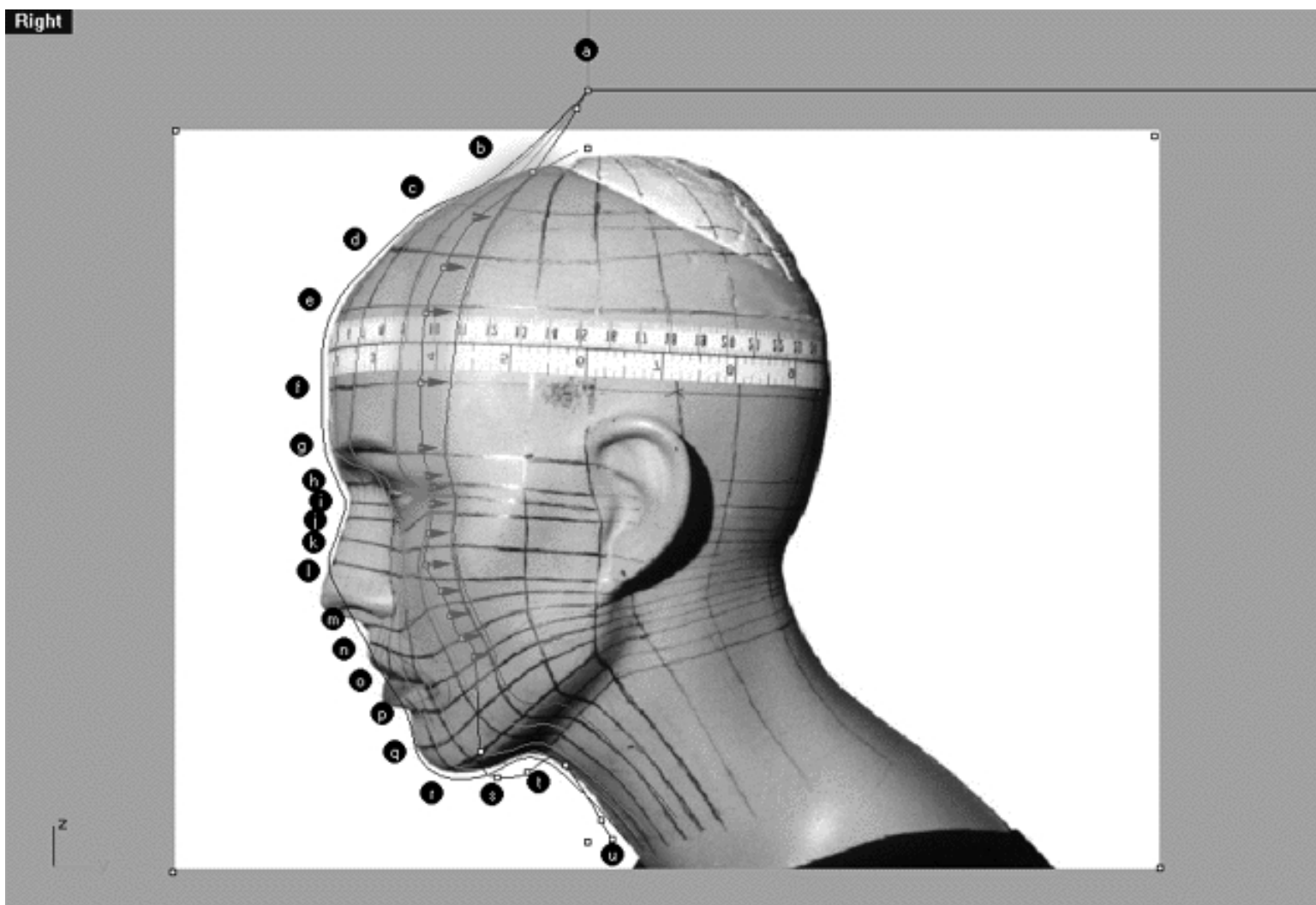
This **Front Viewport** screenshot shows points ( **b - p** ) on the 5th curve (Interp\_05) **prior** to being dragged inward toward the red guide curve ( Guide\_05 ) along the Y axis. The orange highlight indicates the 1st group of curves to be moved ( b - i ) and the green highlight indicates the 2nd group of curves ( j - p ).

## Moving from Front View to Right View -- 1st

- **Double left click** on the **Front Viewport** label -- the Viewport will minimise.
- **Double left click** on the **Right Viewport** label -- the Front Viewport will maximise.
- Zoom in tightly on points ( b - i ).
- Once again, start by moving edit points ( **b - i** ) to do this, **left click** on a point -- it will highlight. Then **left click** on the highlighted point(s) and drag them toward the red guide curve ( Guide\_05 ) along the Y axis.  
*Tip* -- you may find that it's a good idea to hold down the Shift key while moving this first set of points.
- When you've finished working on points ( b - i ) from the toolbar choose the Pan View icon  and pan the view to expose more of the lower face and jaw area and so that points ( h - p ) are clearly visible.




- Now concentrate on moving the next group of points ( **j - p** ) inward toward the red guide curve. *\*Warning* -- when moving this set you should NOT hold down the Shift key while dragging! Due to the contour of the face in this area each of the points will have their final resting points higher and at an at a slight angle from where they are now. Since you can't rely on the background reference image in this instance because it is inaccuracies you will have to make an educated guess as to where to move the points to based on the way in which the contours of the face seem to be running overall. Since in this case they appear to be heading upward and over at an angle in general, that's going to be your best initial indicator for placement.

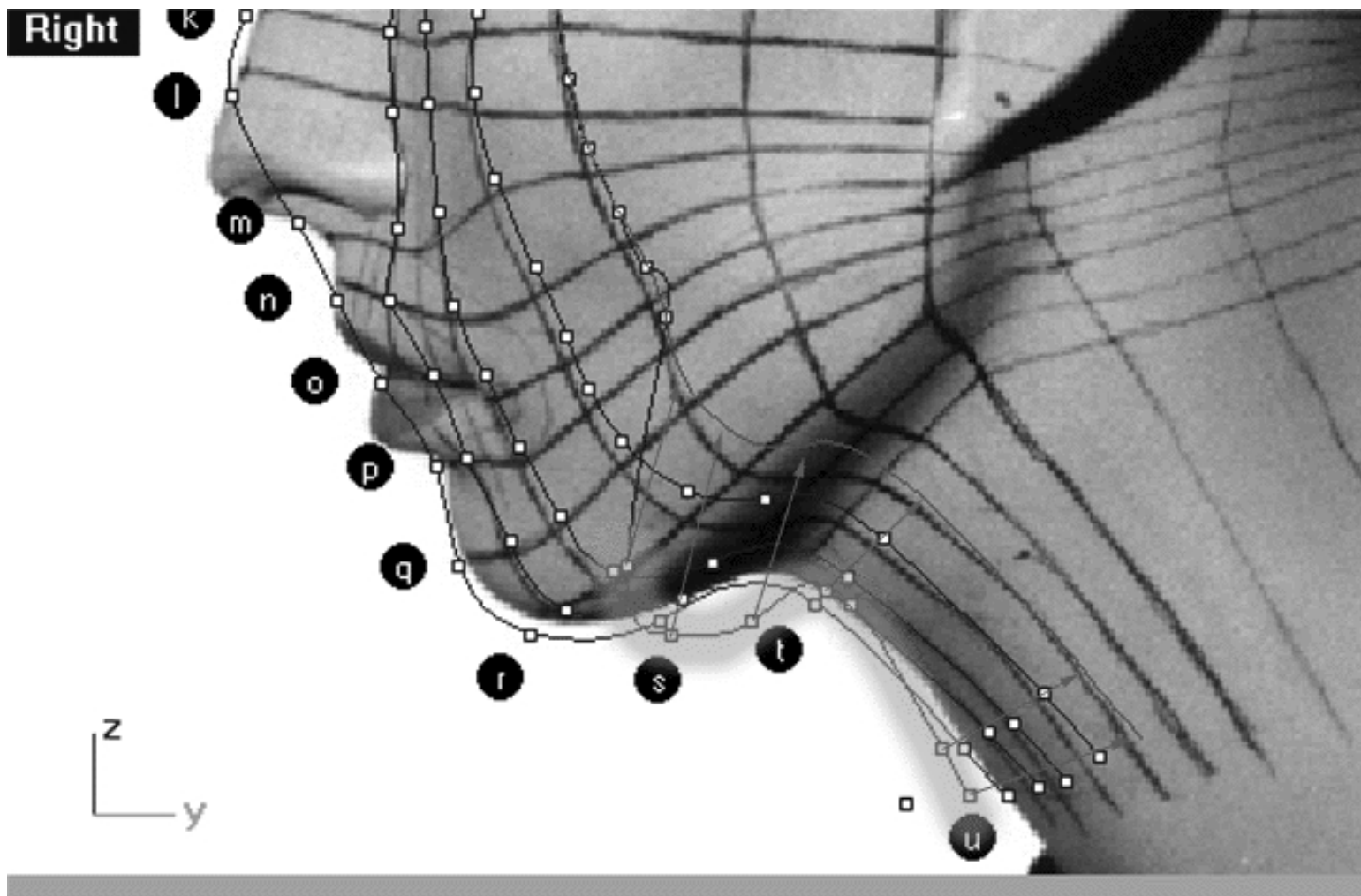


This **Right Viewport** screenshot shows points ( **b - p** ) on the 5th curve (Interp\_05) prior to being dragged toward the red guide curve ( Guide\_05 ) along the Y axis.

## Keep to the Right -- 2nd

- Once completed, check your work and stay in the Right Viewport.
- Pan the viewport to expose more of the mouth, jaw and neck area.
- Zoom in tightly on points ( q - u ).


- Before proceeding, confirm that no *Osnaps* are currently active if they are disable them.
- \*Tip -- At this stage I strongly suggest that you unghost curves 1,2, and 3. Then while holding down the Ctrl key, select them and display their edit points. Be certain that you then LOCK the layers for curves 1,2,3, and 4 before proceeding with any further point dragging. By displaying the edit points on the previous curves it will be much easier to determine how you should align your points along the red guide curve.
- Start with point ( **q** ) to do this, **left click** on it -- it will highlight. Then drag it across and up at a rather steep angle.
- Now move on to point ( **r** ) again **left click** on the point -- it will highlight. Then drag it across and up steeply as you did in the last step.
- With the next few points ( **s - u** ) things are even more complex so be really careful and take your time. Remember to make judgements about where you should drag the points to along the red guide curve based mainly on the location of those displayed on the previous curves. Keep in mind that the background image is only a very rough guide at this stage, so don't worry if the points seem to be falling between those drawn on the face in black pen. The main idea here is that the points should be kept in good logical alignment with each other while using the background image only to give an idea as to the direction you are trying to head in overall.
- If your still having a hard time remember that you can always do a test loft to see if your heading in the right direction. Remember that before you can do this you will have to unlock and turn on all the curves, with the exception of the red guide curve of course. When you've finished your test lofts be sure that you RE-LOCK the curves and either delete or hide the temporary surface created by the loft. *\*Caution--*When deleting your lofted surface be sure to actually pick the surface and not one of the underlying curves. One good way to make sure that you've choosen the surface and not something else to to select a spot between the curves, above all do be careful!
- When you are done and happy with the results, turn off all the displayed edit points.
- Select the curve you are currently working on (Interp\_05) and display its edit points. Had you not done this you would have had to contend with a confusing mass of edit points when we switch to the front view in a few moments.
- While holding down the Ctrl key, select the 1st, 2nd, 3rd and 4th curves and once again lock them.
- Once completed, zoom out by choosing the *Zoom Extents icon*  from the toolbar and **clicking** on it.



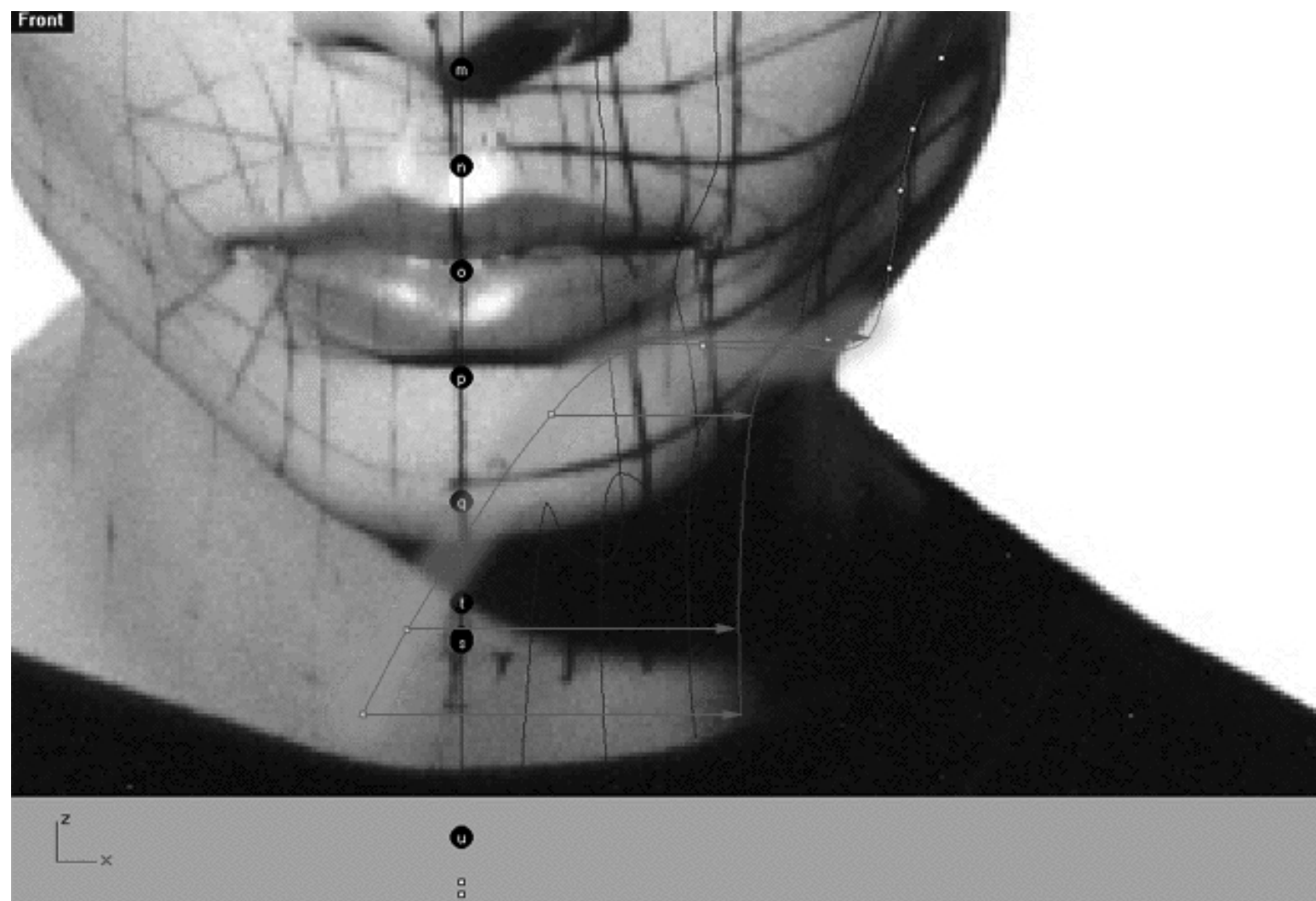
The above **Right Viewport** screenshot shows points ( **q - u** ) on the 5th curve (Interp\_05) just prior to being dragged toward the red guide curve (Guide\_05 ) along the Y axis.

## Back to Front -- 3rd

- Once you've completed the prior step, check your work and then minimise the **Right Viewport** by **double left clicking** its label.
- Maximise the **Front Viewport** by **double left clicking** on its label.
- Zoom in tightly on points ( **q - u** ).
- We will now move points ( **q - u** ) into position. To do this, start with point ( **u.** ) **left click** on the point -- it will highlight. Then, **hold down the Shift Key**, **left click** on the highlighted point and drag the point until it meets with the red guide curve ( Guide\_05 ) along the **X** axis while **continuing to hold down the Shift key**.
- Next move the phantom point and repeat the previous procedure.
- Next move point ( **t.** ) and repeat the procedure for the remaining points ( **s - r** )
- Refine any misaligned points you might come across on the 5th curve along the **X** axis **ONLY**.

- Once completed, zoom out by choosing the *Zoom Extents icon*  from the toolbar and **clicking** on it.

Now wasn't that a piece of cake, just like shooting fish in a barrel compared with the previous steps ;-)



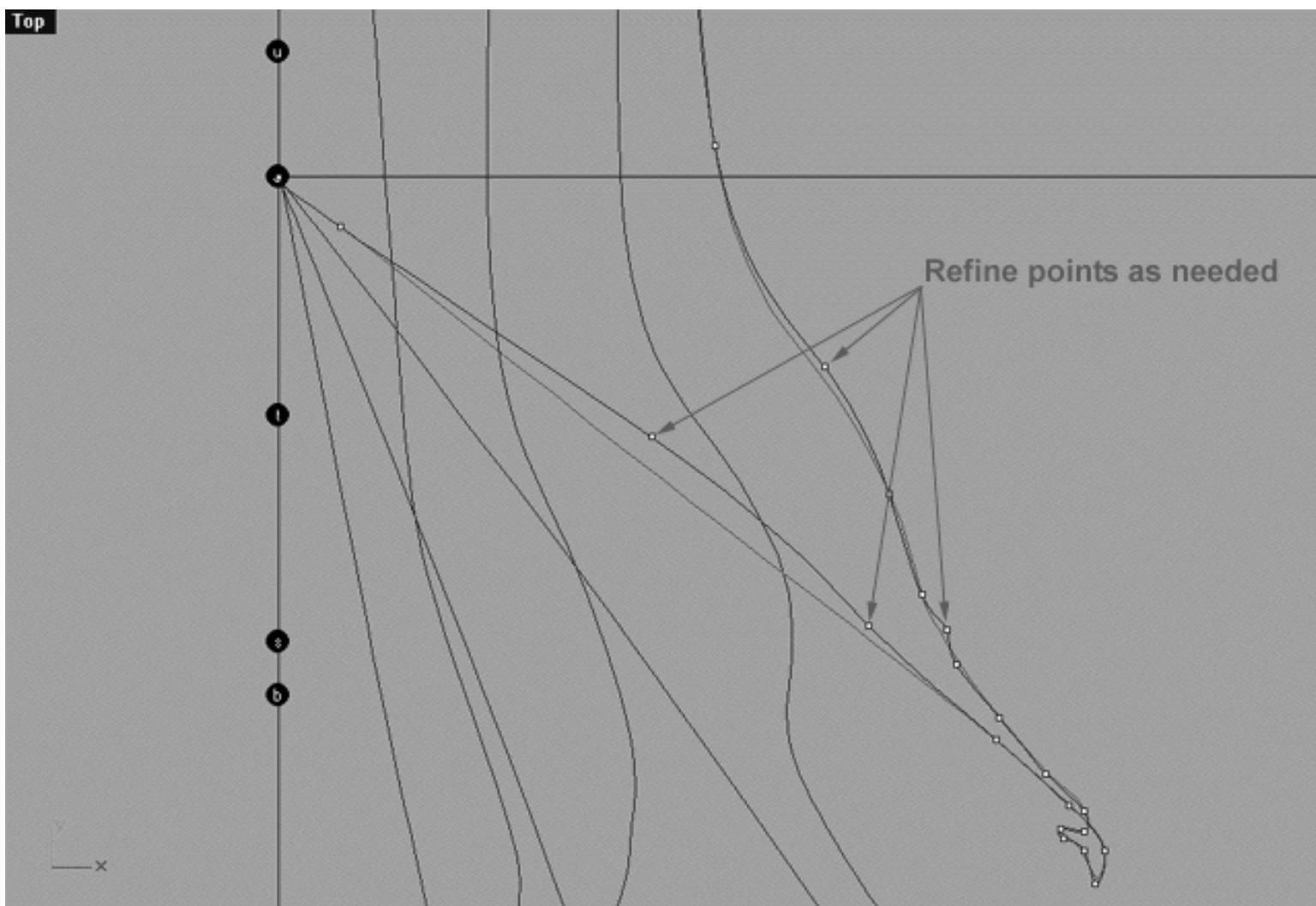
The above **Front Viewport** screenshot shows points ( **q - u** ) on the 5th curve (Interp\_05) just prior to being dragged toward the red guide curve ( Guide\_05 ) along the X axis. **\*Note** -- In this screenshot I haven't locked curves 1,2,3, and 4 but that doesn't mean you shouldn't..!

## Take it to the Top View -- 4th

- Check your work and then minimise the **Front Viewport** by **double left clicking** on its label.
- If you've not done so already, at this stage it would be a good idea to turn off all the edit points and then turn them back on for the 5th curve only, this will prevent any possible confusion.
- Maximise the **Top Viewport** by **double left clicking** on its label.



- If you've not done so already, turn off the annotated dot labels. At the bottom of your screen you will see the *Status Bar*, **right click** on the Layer info box -- the Edit Layers dialogue box will open.
- In the Name field list find the layer called *Annotated Dots\_1* and select the **Off** radio button -- click on **OK** to **Exit**.
- Zoom in tightly on the curve, carefully check to see how well the curve conforms to the guide.
- Correct any misalignment along the **X AXIS ONLY** -- to do so, **left click** on the misaligned point -- it will highlight. Then, **hold down the Shift Key, left click** on the highlighted point and drag the point until it meets with the red guide curve ( Guide\_05 ) along the X axis while **continuing to hold down the Shift key**. **\*Note -- Your results may vary!** Whether or not any adjustment is needed in the top view at all will depend on how accurately your point editing went in the front and right views previously. **\*WARNING--** Again, use extreme caution when editing points in this view, I can't stress often enough how easy it is to ruin all your hard work by not paying attention.
- When you've finished carefully check your work and then Zoom out with a Zoom Extents All.



This **Top Viewport** screenshot shows an example of slightly misaligned points (*\*Note -- your results may vary*) on the 5th curve (Interp\_05) just prior to being dragged toward the red guide curve ( Guide\_05 ) along the X axis.

If you're feeling confused about any of this and would like to see how we go about creating this curve then watch the following movie:




## Editing the 5th Curve



View an example movie [Click Here](#)

# Snapping things up on the 5th curve

The 5th curve has now been completed. Once again, test how well you've done overall at aligning the 5th curve to the guide. Display the points on the guide curve and see how close you came with your edited points. Once done, "snap" all of the 5th curves points to the guide just to stay in sync.

- Minimise the **Top Viewport** by **double left clicking** on its label.
- Maximise the **Right Viewport** by **double left clicking** on its label.
- Now we must unlock the Guide\_05 curve so that we may select and display its points. At the bottom of your screen you will see the *Status Bar*, **right click** on the Layer info box -- the Edit Layers dialogue box will open.
- In the *Name field list* find the layer called Guide\_05 and select the **ON** radio button -- click on **OK** to **Exit**.
- In any Viewport select the Guide\_05 curve by left clicking on it.
- Display its edit points by choosing the *Show edit points icon*  from the toolbar by **left clicking** on it or type the command: **EditPtOn** at the command line.
- Okay, here comes the test -- take a close look, how close did you manage to come this time?
- Let's refine the points still more. Once again lock the Guide\_05 curve so that we don't disturb things up while snapping. At the bottom of your screen you will see the *Status Bar*, **Right click** on the Layer info box -- the Edit Layers dialogue box will open.
- In the *Name field list* find the layer called Guide\_05 and select the **Lock** radio button -- Click on **OK** to **Exit**.
- Open the *Osnap dialogue box* by moving your cursor to the lower status bar and **left clicking** on its title. The *Osnap dialogue box* will open, enable the *Point snap* by **left clicking** on **Point** -- a check will appear indicating that it is now active. If any boxes are checked/active other than "Point" disable them now.
- **Left click** on the **X** to Exit the Onsap dialogue.
- Temporarily turn off the background reference image by typing the command: **HideBackgroundBitmap** at the command prompt.



- Starting with point (**b.**) zoom in on a small group of points (about 3 is good) and "snap" each curve point to its associated point on the guide curve, it's important that you re-snap each point -- be sure not to miss any!
- When you've finished working of the first group of 3 points choose and use the Pan View icon  from the toolbar and pan the view a bit further along the contour of the curve. Now start working on the next group of 3 points and continue snapping. Continue this procedure until you've snapped all the remaining points ( **b - u** ).
- Zoom out by choosing the *Zoom Extents All icon*  from the toolbar and **clicking** on it or typing the command: `ZoomExtentsAll` at the command line.
- Minimise the Right Viewport by double left clicking on its label
- Carefully check over your work in all viewports
- Restore the background reference image by typing **ShowBackgroundBitmap** at the command prompt.
- Disable any currently active Osnaps.
- Congratulations! -- you've now completed editing the 5th Curve.




View an example movie [Click Here](#)

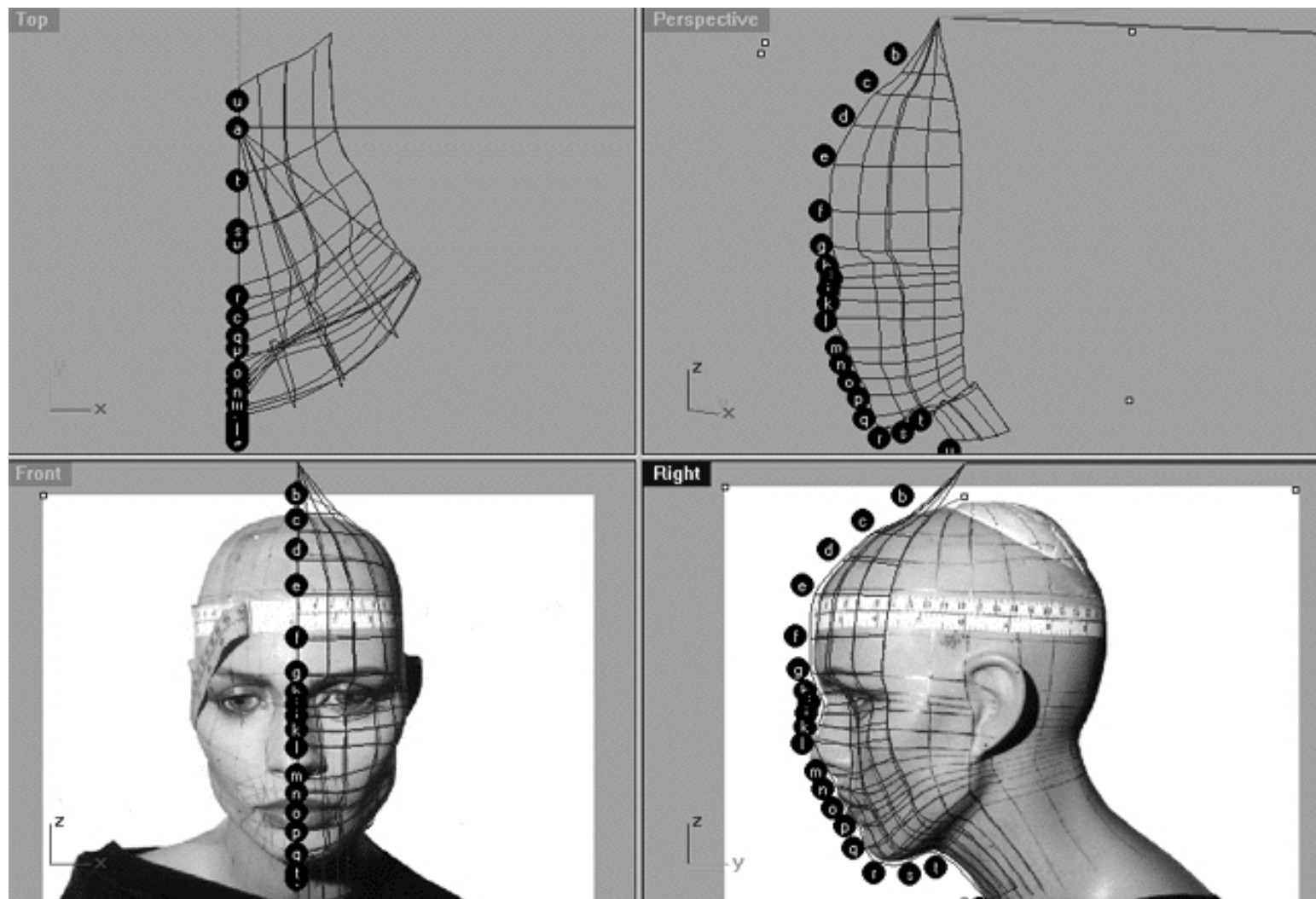
Table Five - A list of points & coordinates  
for the completed 5th Curve [Click Here](#)

## Testing the Surface

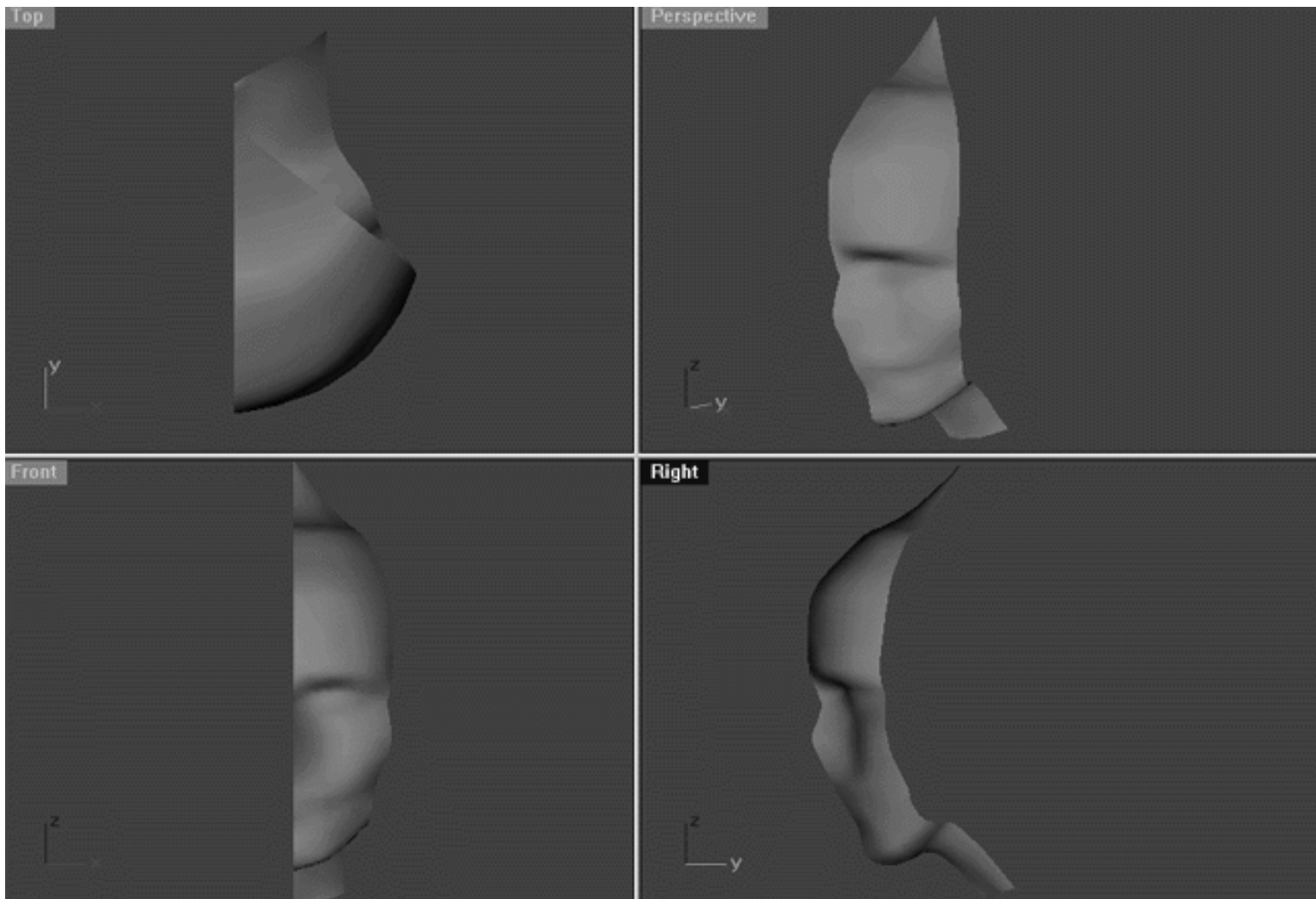
Now for the fun part, especially because now this is starting to really look like a head...

- In the **Perspective Viewport**, zoom in on points ( **a - e** ) this will make it easier to select the curves.
- Unlock any curves by typing the command: `Unlock` at the command line. Once done, the curves should revert to their normal state.
- From the toolbar choose the Loft icon  or type the command: **Loft** at the command line.
- At the command line you will receive the following prompt: **Select curves to loft (point):**

- Now, in the **Perspective Viewport** click directly on curves 1, 2, 3, 4, and 5.
- As you select each curve they should highlight, when you've finished selecting all 5 curves press **Enter**.
- The Loft Options dialogue box should appear. Set the Style drop down box to **Loose**. **click** on the **Shaded Preview** box, a tick should appear. Make sure the Do Not Simplify radio button is active and **click** on the **Preview button**.



This **All Viewport** screenshot shows an example of a loose loft applied to the first 5 curves without a quick rendered shaded preview.



This **All Viewport** screenshot shows an example of a surface created by lofting curves 1, 2, 3, 4 and 5 using the "loose" type parameter with a quick rendered shaded preview.

## Shutting Down the Scene

- Confirm that no Osnaps are currently active, disable any that are.
- Open the Edit Layers Dialogue box and turn off Guide\_05
- Confirm that Layer(s): Interp\_01, Interp\_02, Interp\_03, Interp\_04 and Interp\_05 are ON.
- Left click on the Layer Info box at the Lower Status Bar, highlight the layer entitled SCENE START UP and click on it -- it should now become the active layer and its name should appear in the box.
- Confirm that the newly created curve (Interp\_05) has in fact been associated with the correct layer.
- Hide any points that are currently displayed.
- Zoom Extents All.
- And SAVE YOUR WORK -- or trust me, you'll wish that you did.

## Summary of Lesson - Curve 5

As with the previous lessons you've been working systematically in multiple viewports and switching with regularity between multiple viewports during the course of your modelling session. You've seen that constraining the mouse movements to a given axis (i.e., holding the Shift key) whilst point dragging is not always effective under every circumstance, however it can be an enormous help under the right conditions. The technique of performing "test lofts" during your modelling session was also introduced and you've witnessed how it can be a valuable aid in determining point placement and gauging if you're heading in the right direction in terms of the overall contour and parameterisation of your surface.

[Go To Next Lesson - Drawing the 6th Curve](#)

RETURN to Top of page -- [Click Here](#)

Written by Joseph R. Saltzman.

Co-produced in association with Steven Ståhlberg

©1998-1999 Cinemagic Productions Limited. All Rights Reserved.

Duplication of this document including images and text by any means is expressly forbidden without prior written consent of Cinemagic Productions Limited.

Web Site: <http://www.cmagic.co.uk> Telephone: +44 (0)1753 733 190 Fax: +44 (0)1753 736 619 email: [cmagic@cmagic.co.uk](mailto:cmagic@cmagic.co.uk)



To **PLAY** the example movie, double click below:

To **RETURN** to the head shape tutorial -- [click here](#).

# MOVIE EDITING THE 5TH CURVE PART ONE

To **PLAY** the example movie, double click below:

To watch **PART TWO** of this movie -- [click here](#).

To **RETURN** to the head shape tutorial -- [click here](#).

# MOVIE EDITING THE 5TH CURVE PART TWO

To **PLAY** the example movie, double click below:

To watch **PART THREE** of this movie -- [click here](#).

To **RETURN** to the head shape tutorial -- [click here](#).



# MOVIE EDITING THE 5TH CURVE PART THREE

To **PLAY** the example movie, double click below:

To watch **PART FOUR** of this movie -- [click here](#).

To **RETURN** to the head shape tutorial -- [click here](#).

# MOVIE EDITING THE 5TH CURVE PART FOUR

To **PLAY** the example movie, double click below:

To **RETURN** to the head shape tutorial -- [click here](#).



To **PLAY** the example movie, double click below:

To **RETURN** to the head shape tutorial -- [click here](#).

TABLE FIVE

POINT	X AXIS	Y AXIS	Z AXIS
a - North Pole	0.000	0.000	0.000
Phantom point 1	4.521	-3.551	-6.294
b - Head top 1	23.958	-18.858	-30.079
c - Head top 2	41.653	-32.620	-44.962
d - Head top 3	51.972	-40.758	-62.285
e - Hairline	57.776	-45.882	-80.814
f - Temple	60.037	-49.707	-105.267
g - Browbone	59.644	-51.070	-126.624
h - Crease of top eyelid	58.163	-48.770	-138.212
i - Eye centre line	56.888	-47.763	-143.179
j - Under-eye area	57.417	-47.417	-149.366
k - Bridge of nose	58.631	-47.833	-159.292
l - Cheek apple	58.623	-45.829	-170.057
m - Nose base, cheek bone	56.289	-44.086	-178.966
n - Upr lip, cheek hollow	52.598	-39.413	-187.629
o - Centre of mouth, cheek hollow	49.607	-35.389	-195.236
p - Lwr lip under, cheek hollow	48.115	-32.900	-201.978
q - Tip of chin	46.900	-30.408	-210.486
r - Jawline	44.529	-22.969	-218.410
s - Nape of neck	38.832	-13.518	-219.363
t - Neck	31.797	2.114	-226.767
Phantom point 2	30.329	24.039	-250.129
u - Base of neck	30.057	31.802	-259.538

**RETURN** to tutorial -- [Click Here](#)

**RETURN** to previous lesson -- [Click Here](#)




## THE 6TH CURVE

### Contents:

- [Scene Setup](#)
- [Creating the 6th curve](#)
- [Example Movie -- Creating the 6th Curve](#)
- [Editing the 6th curve](#)
- [Moving from Front View to Right View -- 1st](#)
- [Keep to the Right View -- 2nd](#)
- [Back to Front View -- 3rd](#)
- [Take it to the Top View -- 4th](#)
- [Example Movie -- Editing the 6th Curve](#)
- [Snapping things up on the 6th curve](#)
- [Example Move -- Snapping up the 6th](#)
- [Table Six - A list of points & coordinates for the completed 6th Curve](#)
- [Testing the Surface](#)
- [Shutting Down the Scene](#)
- [Summary of Lesson -- Curve 6](#)

---

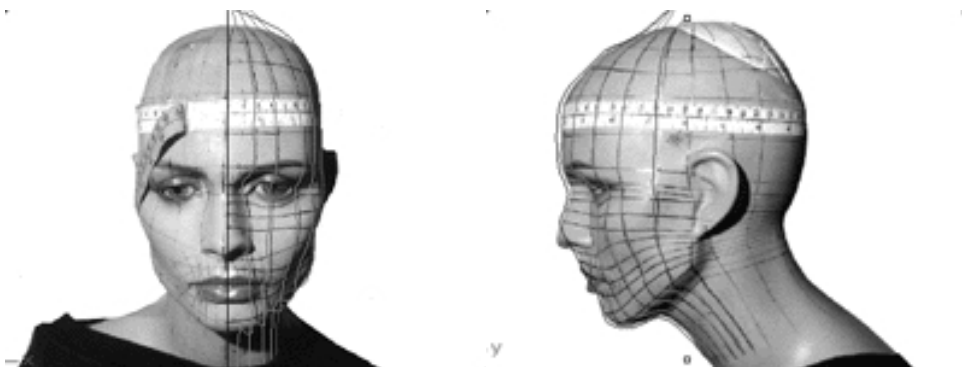
## Scene Setup

- If you've not done so already start a Rhinoceros session by **double clicking** on the desktop icon  the application will begin.
- Choose File, Open from the menu bar and double click on **START\_A.3DM** in the file list, it will load and open.
- Confirm at the Lower Status Bar the currently active layer is entitled SCENE START UP. If it is active proceed to the next step, if it's not then make it active by left clicking on the layer box, highlighting the correct layer and clicking on it.
- Again, at the Layers Box on the Lower Status Bar this time right click on the box, the Edit Layers Dialogue box will open. Confirm the following switches have been enabled or disabled:

- The Layer entitled Annotated Dots\_1 should be OFF
- The Layer entitled Interp\_01 (the Profile Curve) should be ON
- The Layer entitled Interp\_02 should be ON
- The Layer entitled Interp\_03 should be ON
- The Layer entitled Interp\_04 should be ON
- The Layer entitled Interp\_05 should be ON
- The Layer entitled Guide\_06 should be LOCKED
- The Layer entitled Photopoints should be ON
- The Layer entitled Frozen should be LOCKED
- The Layer entitled SCENE START UP should be ON
- When you've finished making your changes ( if any ) click on OK
- All other layers should be set to OFF
- Confirm that you can see the background image in the Front and Right viewports
- Confirm that the grid display in the viewports has been disabled, if not turn it off now.
- Confirm that no Osnaps are currently enabled, if any are disable them.
- Confirm that no edit points are currently displayed, if any are hide them.
- Zoom out all the viewports by selecting the Zoom Extents All icon  or by typing zea at the command line and pressing ENTER.



---

## Creating the 6th curve






**Description:** The 6th curve begins at the top pole and runs along the top & side of the head, (falling between the eyebrow end and the ear, but closer to the ear than the eyebrow) down along the rear of the cheek apple straight on over the rear of the cheek hollow and following on over near the mid back part of the jaw and ending at the base of the neck.

You will create the 6th curve in much the same way as the 5th, hey this is become rather a bit of a habit -- don't you think?

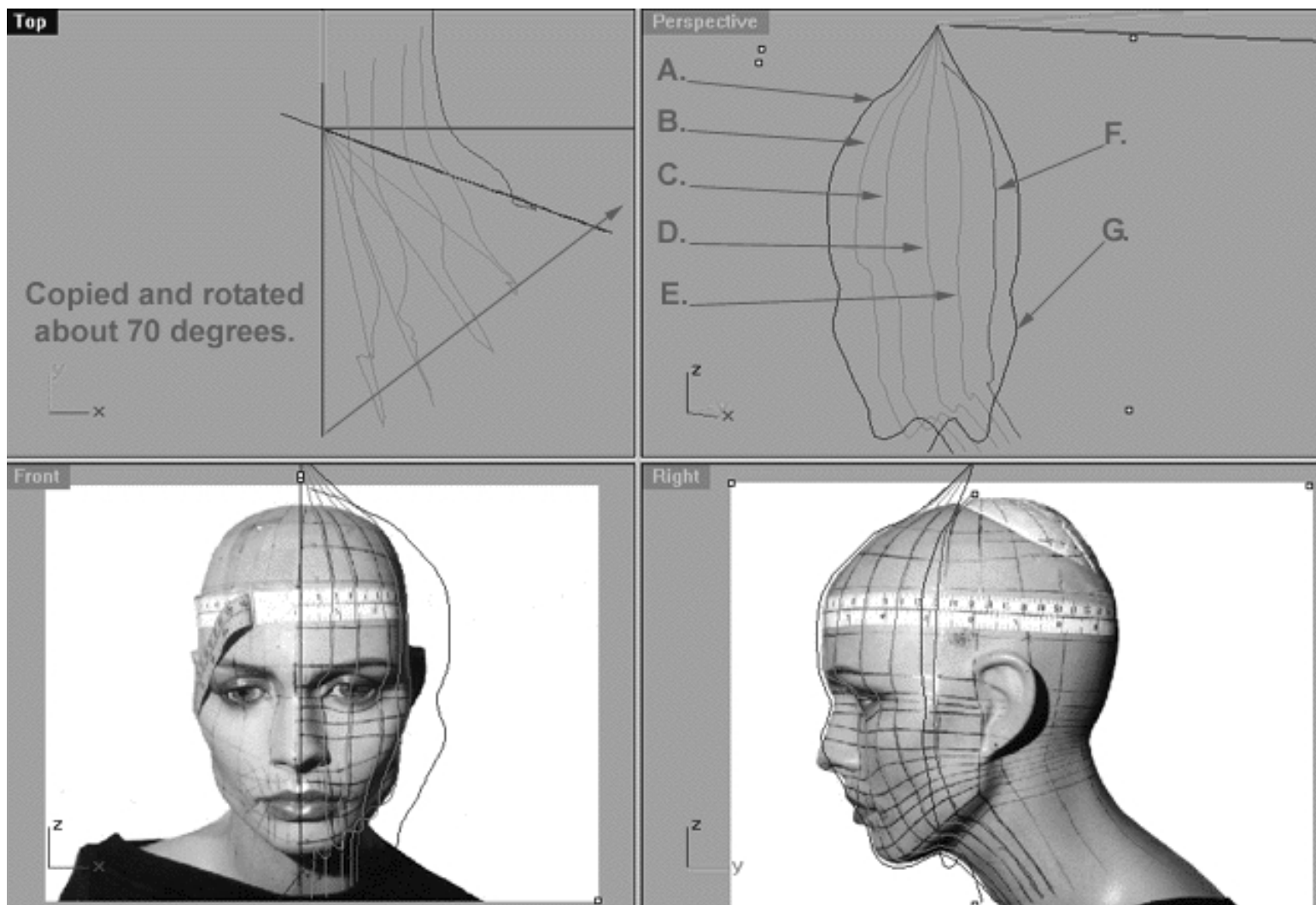
- Just in case you've forgotten, choose the *Zoom: Extents All Viewports icon*  from the toolbar or type the command: ZoomExtentsAll at the command line.
- Hold down the **Ctrl** key and in **Any Viewport** select the **Interp\_02, Interp\_03, Interp\_04 and Interp\_05** curves by **left clicking** on them, then *lock* the curves by typing Lock at the command line and then press **Enter**.
- Now let's create another new layer -- At the bottom of your screen you will see the *Lower Status Bar*, **right click** on the *Layer info box* -- the *Edit Layers dialogue box* will open.
- **Left click** on the **New** button and in the *Name field* type: **Interp\_06**.
- Move the cursor to the *colour field*, **left click** on the *colour field*, the "*Select a colour*" *dialogue* and colour wheel will appear, choose a nice bright blue (i.e. **R:0 G:0 B:255**) then click **OK**
- You will be returned to the *Edit Layers dialogue box* again, **left click** on **OK** to exit.
- Return your cursor to the *Status Bar* at the bottom of the screen and **left click** on the *Layer info box* -- the Layers list will appear.
- Locate **Interp\_06** in the list (the one you created a few moments ago) and move your cursor over its name (it will highlight) **left click** on it to make the layer currently active.
- Open the *Osnap dialogue box* by moving your cursor to the *lower status bar* and **left clicking** on its title. The *Osnap dialogue box* will open, enable the *End snap* by **left clicking** on End -- a check will appear indicating that it is now active. If any boxes are checked/active other than "End" disable them now.
- Close the *Osnap dialogue box* by clicking on **X**.
- In **Any Viewport** Select the 1st curve (i.e. Interp\_01) by **left clicking** on it -- it will highlight.
- From the toolbar **left click** on the Rotate 2D icon  or type the command: **Rotate** at the command line.
- At the command line you will receive the following prompt: **Choose centre of rotation (copy):**
- Type: **copy** at the command line and press **Enter**.
- In the **Right Viewport** Move your cursor to point (a. -- X:0, Y:0, Z:0) on the first profile curve (i.e. Interp\_01) -- the cursor should snap to it, when it does **left click**.



- The system will respond with the following prompt at the command line: **Angle or first reference point:**
- Now, move your cursor into the **Top Viewport** and bring the cross hairs to about the 6 o'clock position (near the bottom of the window) once you've done this **press and hold down the Shift Key** on your keyboard -- the curve should align itself perfectly along the Y axis.
- While still **holding the Shift Key down**, drag the cursor along the -Y axis about **130** units and **left click**.
- The system will then respond with the following prompt at the command line: **Second reference point:**
- Rotate the curve anti-clockwise about **70 degrees** and **left click**.
- Press **Esc** on your keyboard to complete the operation.
- In the **Any Viewport** select the newly rotated curve by **left clicking** on it -- it will highlight.
- Choose the *Layer Control Icon*  from the toolbar by **left clicking** on it and **holding down the key** -- select the *Change Layer Icon*  from the flyout.
- Select **Interp\_06** from the *Pick layer for object dialogue* -- it will highlight. This will make certain that Interp\_06 has been associated with the correct layer.
- Click **OK**
- Disable any currently active Osnaps
- Choose the Zoom Extents All Viewports icon  from the toolbar or type the command: ZoomExtentsAll at the command line



**View an example movie [Click Here](#)**




The above screenshot shows our original profile curve (A), after having been copied and rotated about 70 degrees on its centre and now located at position (G). (B) represents the now locked 2nd curve, (C) represents the now locked 3rd curve, (D) represents the now locked 4th curve, (E) represents the now locked 5th curve, (F) in red represents where our newly rotated curve (G) should be positioned once the points have been appropriately edited.

## Editing the 6th Curve

Just when you were starting to get really bored guess what, this time we are going to start off in the Front Viewport for a change..!

- Maximise the **Front Viewport** if you've not done so already by **double left clicking** on its label.
- Turn ON the annotated dot labels. At the bottom of your screen you will see the *Lower Status Bar*, **right click** on the Layer info box -- the Edit Layers dialogue box will open.
- If you've not done so already, in the Name field list find the layer called *Annotated Dots\_1* and select the **ON** radio button -- click on **OK** to **Exit**.
- Unlock all the curves by typing the command: `Unlock` at the command line and pressing Enter.

- Hold down the Ctrl key and select the newly rotated 6th curve (Interp\_06) the 5th curve (Interp\_05) and the 4th curve (Interp\_04) by left clicking on them with your mouse -- they will highlight.
- Display their edit points by choosing the *Show edit points icon*  from the toolbar by **left clicking** on it or type the command: **EditPtOn** at the command line.
- Now once again hold down the Ctrl key and select the 1st Curve: ( **Interp\_01** ) the 2nd Curve: (Interp\_02) and the 3rd Curve: (Interp\_03) -- they will highlight.
- *Lock* the selected curves by typing the command: **Lock** at the command line and then press **Enter**.
- Return to the bottom of your screen where you will find the Lower Status Bar, right click on the layer info box -- the Edit Layers dialogue box will open.
- Find the layers entitled: (Interp\_03) and (Interp\_04) and LOCK them, then press OK to exit.
- Zoom in very tightly on the first set of edit points ( b - i ).
- Begin by moving edit points ( **b - i** ) to do this, **left click** on a point -- it will highlight, then first drag the point inward toward and into alignment with its sister point on the previous curve (in this case Interp\_05). Once you've done so, hold down the Shift key and drag the point back and into alignment with the red guide curve (Guide\_06) along the X axis.
- Once you've completed moving the first set of edit points ( b - i ) pan the view to expose more of the lower face.
- Now begin moving the second set of edit points ( j - p ) into alignment. **\*Note:** Edit points ( n - p ) again will be very hard to place due to the shadow in the background image. Don't worry, just try and guess where they should go for now. It will be pretty easy to sort them out in the next step when we switch into the Right viewport.

**Warning!** Getting the points aligned correctly on the 6th curve is much more difficult than those you've edited in the previous lessons, so do not rush your work. There the real potential for going seriously wrong for no other reason than getting confused about what point you are actually moving and where it should go.


For this reason I strongly advise that you count each point on the curve and make quite certain that the point you think you're moving is really indeed the correct one. **\*Hint:** Remember that with this curve the points in the jaw region are starting to compress more and more. Be careful at or about the area surrounding edit point (m.) **\*Tip--** go and get yourself a set of markers so that you can draw right on your computer monitor. This way you can circle and or label in some way the point you've already moved or are going to. I swear by this method, it's a real lifesaver and it will save you much time and effort. I use and recommend the OHPen universal (overhead marker pens) manufactured by Stabilo, they are non-permanent so you can just wipe off the mess with a damp cloth when you're done.

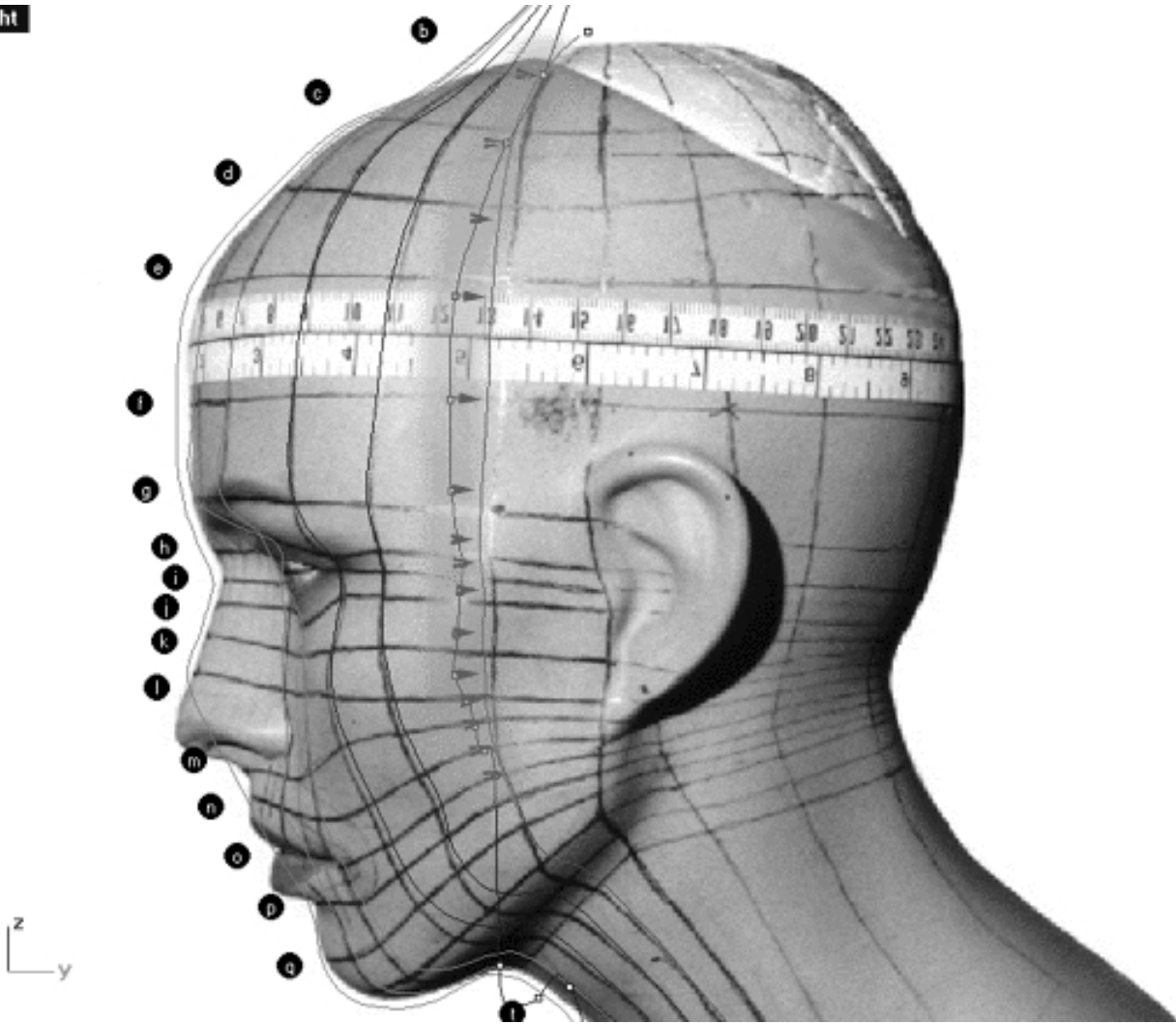


This **Front Viewport** screenshot shows points ( **b - p** ) on the 6th curve (Interp\_06) **prior** to being dragged inward toward the red guide curve ( Guide\_06 ) along the X axis. The orange highlight indicates the 1st group of curves to be moved ( b - i ) and the green highlight indicates the 2nd group of curves ( j - p ). *\*Note* - The edit points on the previous curves 4 and 5 have been displayed in order to make it easier to approximate where the edit points on the 6th curve should be moved to along the red guide curve.

## Moving from Front View to Right View -- 1st

- **Double left click** on the **Front Viewport** label -- the Viewport will minimise.
- **Double left click** on the **Right Viewport** label -- the Front Viewport will maximise.
- Zoom in nice and tightly on the 1st set of edit points ( b - i ).
- Again, start by moving edit points ( **b - i** ) to do this, **left click** on a point -- it will highlight, then it's a good idea to use the technique of dragging them over to their sister points on the previous curve just like you did earlier. Once you've aligned a given point with its sister then **left click** on the highlighted point(s) and while holding down the Shift key drag it toward and into alignment with the red guide curve ( Guide\_06 ) along the Y axis.


- When you've finished working on points ( b - i ) from the toolbar choose the Pan View icon  and pan the view so that points ( h - p ) are clearly visible.
- Now concentrate on moving this next group of points ( j - p ) inward toward the red guide. **\*Warning:** Again, you will probably not be able to get away with holding down the Shift key while dragging with this set of points. It may work with points ( j - l ) but most likely not with anything past that. Again, this is due to the curvature of the face in this area and the increasing compression of the points here in the cheek/jaw area.

**Right**

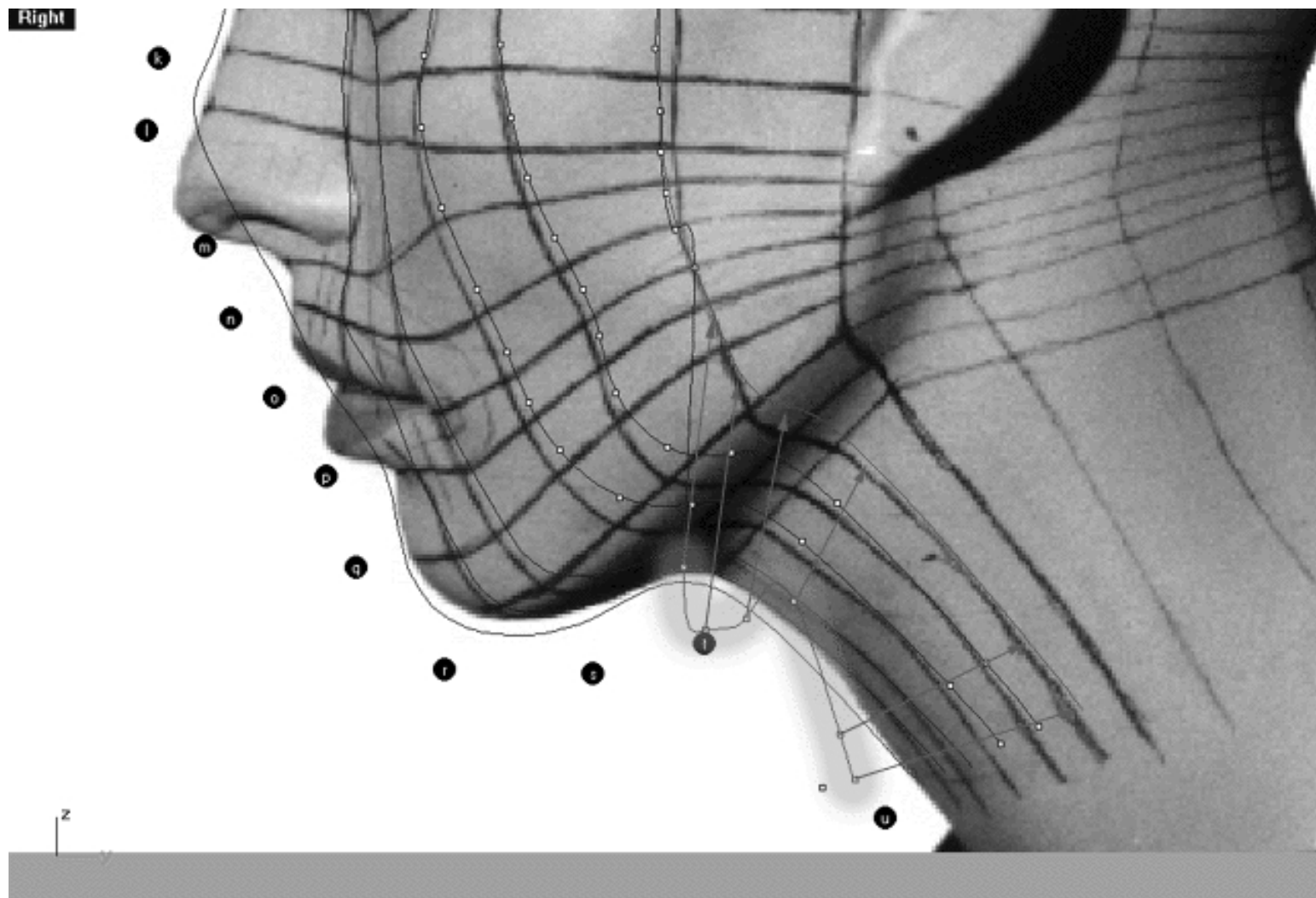
This **Right Viewport** screenshot shows points ( b - p ) on the 6th curve (Interp\_06) prior to being dragged toward the red guide curve ( Guide\_06 ) along the Y axis.

## Keep to the Right -- 2nd

- Once completed, check your work and stay in the **Right Viewport**.
- Pan the viewport if necessary to expose more of the mouth, jaw and neck area.
- Zoom in tightly on the remaining points ( q - u ).

- Starting with point ( **q** ) **left click** on it -- it will highlight. Then drag it across and upward at a rather steep angle.
- Now move on to point ( **r** ) again **left click** on the point -- it will highlight. Then drag it across and up slightly as you did in the last step.
- With the next few points ( **s - u** ) things become even more complex so be careful and take your time when moving the points into position. Remember to make judgements about where you should drag the points to along the red guide curve based mainly on the location of those displayed on the previous curves. Once again, keep in mind that the background image is only a very rough guide at this stage and should not be relied upon. Don't worry if the points seem to be falling between those drawn on the face in black pen, that's perfectly normal. The main idea is that the points should be kept in good logical alignment with each other while using the background image only to give an idea as to the direction you are trying to head in overall.
- When you are done and reasonably happy with the results, turn off all the displayed edit points.
- Select the curve you are currently working on (Interp\_06) and display only its edit points. Remember, had you not done this you would have had to contend with a confusing mass of edit points when we switch into the front view in a few moments.
- Once completed, zoom out by choosing the *Zoom Extents icon*  from the toolbar and **clicking** on it.






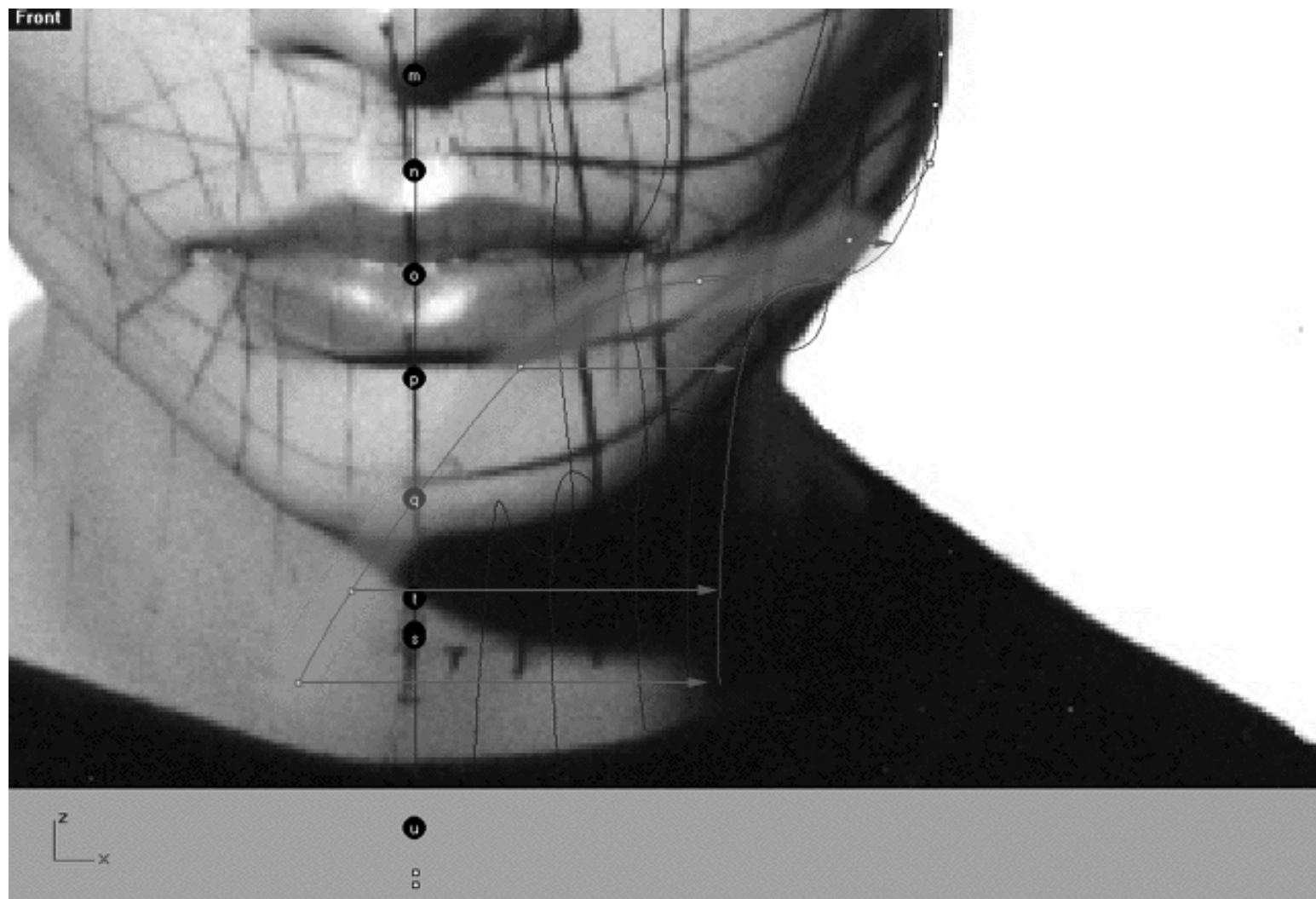
This **Right Viewport** screenshot shows points ( **q - u** ) on the 6th curve (Interp\_06) just prior to being dragged toward the red guide curve (Guide\_06 ) along the Y axis. *\*Note* - The edit points on curves 4 and 5 have been displayed also.

## Back to Front -- 3rd

- Once you've completed the prior step, check over your work and then minimise the **Right Viewport** by **double left clicking** its label.
- Maximise the **Front Viewport** by **double left clicking** on its label.
- Zoom in quite tightly on edit points ( **q - u** ).
- We will now move points ( **q - u** ) into position. To do this, start with point ( **u.** ) **left click** on the point -- it will highlight. Then, **hold down the Shift Key**, **left click** on the highlighted point and drag the point until it meets with the red guide curve ( Guide\_06 ) along the X axis while **continuing to hold down the Shift key**.
- Next move the phantom point and repeat the previous procedure.
- Next move point ( **t.** ) and repeat the procedure for the remaining points ( **s - r** )



- Once completed, zoom out by choosing the *Zoom Extents icon*  from the toolbar and **clicking** on it.
- This step is jolly easy compared with what you've been through so far, so relax and enjoy it!



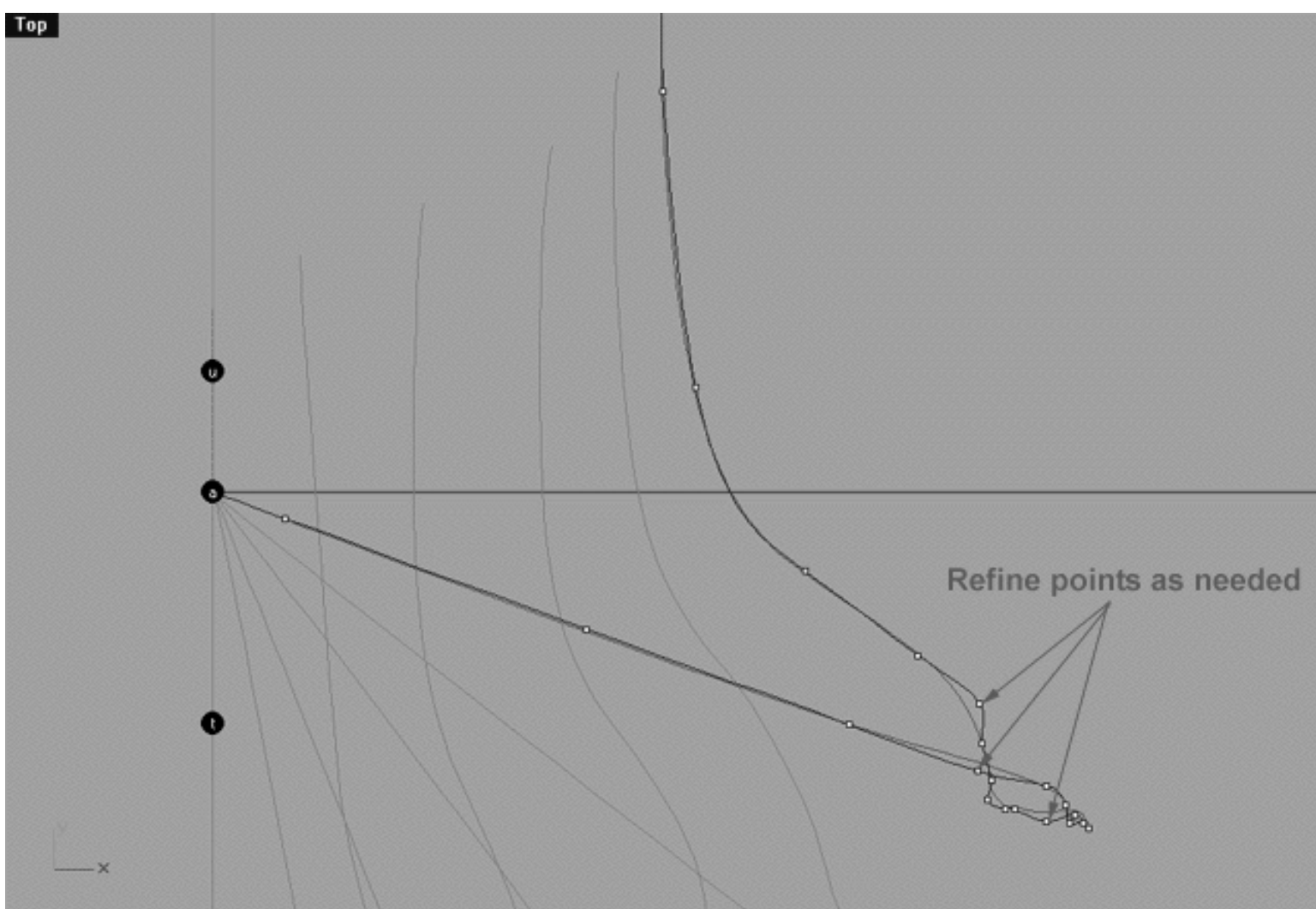
This **Front Viewport** screenshot shows points ( **q - u** ) on the 6th curve (Interp\_06) just prior to being dragged toward the red guide curve ( Guide\_06 ) along the X axis.

## Take it to the Top View -- 4th

- Once again, check over your work and then minimise the **Front Viewport** by **double left clicking** on its label.
- Maximise the **Top Viewport** by **double left clicking** on its label.
- Turn off the annotated dot labels. At the bottom of your screen you will see the *Lower Status Bar*, **right click** on the Layer info box -- the Edit Layers dialogue box will open.

- In the Name field list find the layer called *Annotated Dots\_1* and select the **Off** radio button -- click on **OK** to **Exit**.
- Zoom in tightly on the curve, carefully check to see how well the curve generally conforms to the guide.
- Correct any misalignment. It is now fairly safe to move the points along the **X** or **Y** axis -- to do so, **left click** on the misaligned point -- it will highlight.

Then, **hold down the Shift Key, left click** on the highlighted point and drag the point until it meets with the red guide curve ( Guide\_06 ) along a given axis while **continuing to hold down the Shift key**. **\*Note -- Your results may vary!** Whether or not any adjustment is needed in the top view at all will depend on how accurately your point editing went in the front and right views previously. Use extreme caution and take your time when performing any editing of points in the top view, as it's very easy to mess things up -- and remember Rhino's UNDO feature can be your best friend, don't forget to use it if you get into trouble.



This **Top Viewport** screenshot shows an example of slightly misaligned points (*\*Note -- your results may vary*) on the 6th curve (Interp\_06) just prior to being dragged toward the red guide curve ( Guide\_06 ) along the X and Y axis.

If you're confused about any of this, then be sure to watch the following movie:






## Editing the 6th Curve

View an example movie [Click Here](#)

# Snapping things up on the 6th curve

The 6th curve has now completed -- jolly good! Once again it's that time to test how well you've done overall at aligning the 6th curve to the guide. Display the points on the guide curve and see how close you came with your edited points. Once done, "snap" all of the 6th curves points to the guide just to stay in sync.

- Minimise the **Top Viewport** by **double left clicking** on its label.
- Maximise the **Right Viewport** by **double left clicking** on its label.
- Now we must unlock the Guide\_06 curve so that we may select and display its points. At the bottom of your screen you will see the *Status Bar*, **right click** on the Layer info box -- the Edit Layers dialogue box will open.
- In the *Name field list* find the layer called Guide\_06 and select the **ON** radio button -- click on **OK** to **Exit**.
- In any Viewport select the Guide\_06 curve by left clicking on it.
- Display its edit points by choosing the *Show edit points icon*  from the toolbar by **left clicking** on it or type the command: EditPtOn at the command line.
- Okay, here comes the test -- take a close look, how close did you manage to come this time?
- Let's refine the points still more. Once again lock the Guide\_06 curve so that we don't disturb anything while snapping. At the bottom of your screen you will see the *Status Bar*, **right click** on the Layer info box -- the Edit Layers dialogue box will open.
- In the *Name field list* find the layer called Guide\_06 and select the **Lock** radio button -- click on **OK** to **Exit**.
- Open the *Osnap dialogue box* by moving your cursor to the lower status bar and **left clicking** on its title. The *Osnap dialogue box* will open, enable the *Point snap* by **left clicking** on **Point** -- a check will appear indicating that it is now active. If any boxes are checked/active other than "Point" disable them now.
- **Left click** on the **X** to Exit the Onsap dialogue.
- Temporarily turn off the background reference image by typing the command: HideBackgroundBitmap at the command prompt.


- Starting with point (**b.**) zoom in on a small group of points (about 3 is good) and "snap" each curve point to its associated point on the guide curve, it's important that you re-snap each point -- be sure not to miss any!
- When you've finished working of the first group of 3 points choose and use the Pan View icon  from the toolbar and pan the view a bit further along the contour of the curve. Now start working on the next group of 3 points and continue snapping. Continue this procedure until you've snapped all the remaining points ( **b - u** ).
- Zoom out by choosing the *Zoom Extents All icon*  from the toolbar and **clicking** on it or typing the command: **ZoomExtentsAll** at the command line.
- Minimise the Right Viewport by double left clicking on its label.
- Carefully check over your work in all viewports.
- Restore the background reference image by typing the command ShowBackgroundBitmap at the command prompt.
- Disable any currently active Osnaps.
- Congratulations! -- you've now completed editing the 6th Curve. Why not go and treat yourself to a pint of something, you deserve it ;-)



View an example movie [Click Here](#)

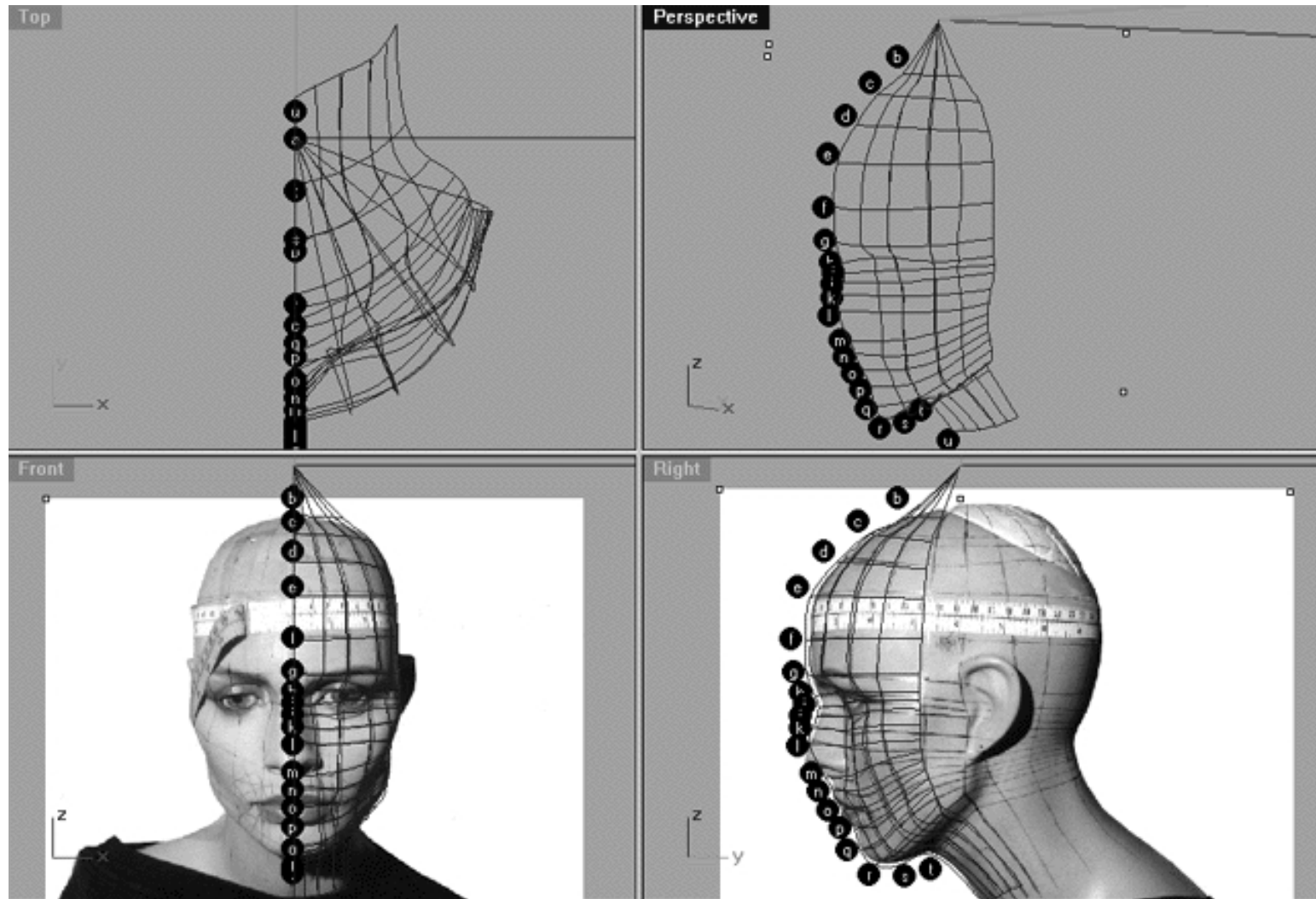
**Table Six - A list of points & coordinates  
for the completed 6th Curve - [Click Here](#)**

## Testing the Surface

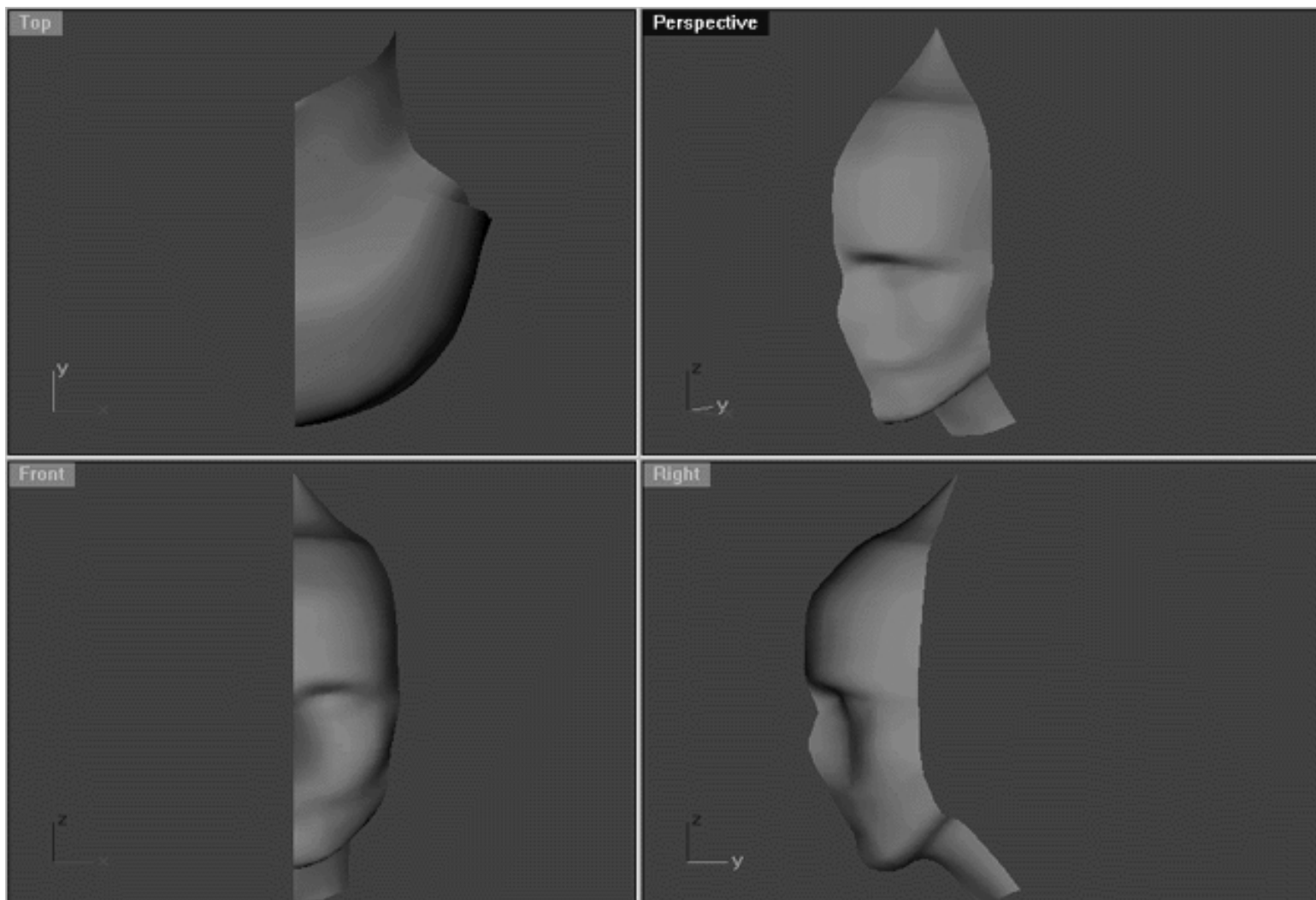
- In the **Perspective Viewport**, zoom in on points ( **a - e** ) this will make it easier to select the curves.
- Turn off any points that are currently displayed.
- Unlock any curves by typing the command: **Unlock** at the command line. Once done, the curves should revert to their normal state.
- From the toolbar choose the Loft icon  or type the command: **Loft** at the command line.
- At the command line you will receive the following prompt: **Select curves to loft (point):**



- Now, in the **Perspective Viewport** click directly on curves **1, 2, 3, 4, 5** and **6**.
- As you select each curve they should highlight, when you've finished selecting all **6** curves press **Enter**.
- The Loft Options dialogue box should appear. Set the Style drop down box to **Loose**. **click** on the **Shaded Preview** box, a tick should appear. Make sure the Do Not Simplify radio button is active and **click** on the **Preview button**.



This **All Viewport** screenshot shows an example of a loose loft applied to the curves without a quick rendered shaded preview.



This **All Viewport** screenshot shows an example of a surface created by lofting curves 1, 2, 3, 4, 5 and 6 using the "loose" type parameter with a quick rendered shaded preview.

## Shutting Down the Scene

- Confirm that no Osnaps are currently active, disable any that are.
- Open the Edit Layers Dialogue box and turn off Guide\_06
- Confirm that Layer(s): Interp\_01, Interp\_02, Interp\_03, Interp\_04, Interp\_05 and Interp\_06 are ON.
- Left click on the Layer Info box at the Lower Status Bar, highlight the layer entitled SCENE START UP and click on it -- it should now become the active layer and its name should appear in the box.
- Confirm that the newly created curve (Interp\_06) has in fact been associated with the correct layer.
- Hide any points that are currently displayed.
- Zoom Extents All.
- And SAVE YOUR WORK -- or you're daft as cheese!

## Summary of Lesson - Curve 6

Well as you've noticed things have become a bit more difficult now and you really must think about your point placement a bit more carefully than in the previous lessons. As you've seen keeping track of which point is which can be something of a chore and can easily cause a great deal of confusion. Remember that at this stage most mistakes are caused by simply moving the incorrect point so this is why it's important for you to be sure that you are actually moving the correct one.

Often you *think* you've got the right point, but you don't so be extra clever and confirm your points before you move them. How do you do that? Well select a point by clicking on it, it will highlight. Once it has done, switch around between the other viewports, now ask yourself: is the point that is currently lit up the correct one? If so, go ahead and move it -- get the idea? Yes, this is not easy, good modelling takes time but just think how hard it would be if you were trying to deform a primitive sphere into a head by dragging the points around. That's the real advantage of working with a single curve at a time, instead of dealing with hundreds of points you only need cope with a couple of dozen which is manageable.

Hopefully you'll take our advice and get yourself a set of non-permanent overhead or white board pens so that you can draw circles, arrows, lines or anything else on your screen that will help you keep track of what you're doing. You should be able to buy them at any large office supply company or art shop and they are one of the best and most inexpensive investments you can make.

[Go To Next Lesson - Drawing the 7th Curve](#)

RETURN to Top of page -- [Click Here](#)

Written by Joseph R. Saltzman.

Co-produced in association with Steven Ståhlberg

©1998-1999 Cinemagic Productions Limited. All Rights Reserved.

Duplication of this document including images and text by any means is expressly forbidden without prior written consent of Cinemagic Productions Limited.

Web Site: <http://www.cmagic.co.uk> Telephone: +44 (0)1753 733 190 Fax: +44 (0)1753 736 619 email: [cmagic@cmagic.co.uk](mailto:cmagic@cmagic.co.uk)





To **PLAY** the example movie, double click below:

To **RETURN** to the head shape tutorial -- [click here](#).

# MOVIE EDITING THE 6TH CURVE PART ONE

To **PLAY** the example movie, double click below:

To watch **PART TWO** of this movie -- [click here](#).

To **RETURN** to the head shape tutorial -- [click here](#).

# MOVIE EDITING THE 6TH CURVE PART TWO

To **PLAY** the example movie, double click below:

To **RETURN** to the head shape tutorial -- [click here](#).

# MOVIE SNAPPING UP THE 6TH CURVE

To **PLAY** the example movie, double click below:

To **RETURN** to the head shape tutorial -- [click here](#).

TABLE SIX

POINT	X AXIS	Y AXIS	Z AXIS
a - North Pole	0.000	0.000	0.000
Phantom point 1	5.422	-1.911	-6.294
b - Head top 1	28.384	-10.528	-30.318
c - Head top 2	48.148	-17.505	-45.953
d - Head top 3	58.018	-20.434	-63.517
e - Hairline	62.783	-22.154	-81.521
f - Temple	64.395	-23.283	-105.328
g - Browbone	64.818	-24.535	-126.814
h - Crease of top eyelid	66.321	-24.987	-138.308
i - Eye centre line	66.026	-24.753	-143.710
j - Under-eye area	65.223	-24.000	-149.646
k - Bridge of nose	64.208	-24.050	-159.442
l - Cheek apple	60.621	-23.713	-169.258
m - Nose base, cheek bone	59.775	-23.586	-175.006
n - Upr lip, cheek hollow	58.960	-22.682	-180.742
o - Centre of mouth, cheek hollow	58.707	-21.371	-186.660
p - Lwr lip under, cheek hollow	58.135	-18.957	-192.035
q - Tip of chin	56.935	-16.148	-198.820
r - Jawline	53.419	-12.206	-207.523
s - Nape of neck	45.198	-6.373	-212.168
t - Neck	36.443	7.762	-221.433
Phantom point 2	33.946	29.957	-246.628
u - Base of neck	34.028	38.121	-256.905

**RETURN** to tutorial -- [Click Here](#)

**RETURN** to previous lesson -- [Click Here](#)




## THE 7TH CURVE


### Contents:

- [Scene Setup](#)
- [Creating the 7th curve](#)
- [Example Movie -- Creating the 7th Curve](#)
- [Editing the 7th curve](#)
- [Moving from Front View to Right View -- 1st](#)
- [Keep to the Right View -- 2nd](#)
- [Back to Front View -- 3rd](#)
- [Take it to the Top View -- 4th](#)
- [Example Movie -- Editing the 7th Curve](#)
- [Snapping things up on the 7th curve](#)
- [Table Seven - A list of points & coordinates for the completed 7th Curve](#)
- [Testing the Surface](#)
- [Shutting Down the Scene](#)
- [Summary of Lesson -- Curve 7](#)

---

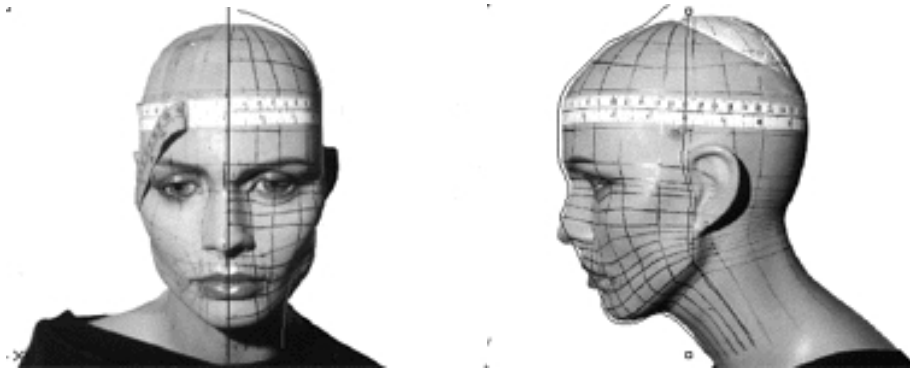
## Scene Setup

- If you've not done so already start a Rhinoceros session by **double clicking** on the desktop icon  the application will begin.
- Choose File, Open from the menu bar and double click on **START\_A.3DM** in the file list, it will load and open.
- Confirm at the Lower Status Bar the currently active layer is entitled SCENE START UP. If it is active proceed to the next step, if it's not then make it active by left clicking on the layer box, highlighting the correct layer and clicking on it.
- Again, at the Layers Box on the Lower Status Bar this time right click on the box, the Edit Layers Dialogue box will open. Confirm the following switches have been enabled or disabled:
- The Layer entitled Annotated Dots\_1 should be OFF.

- The Layer entitled Interp\_01 (the Profile Curve) should be ON.
  - The Layer entitled Interp\_02 should be ON.
  - The Layer entitled Interp\_03 should be ON.
  - The Layer entitled Interp\_04 should be ON.
  - The Layer entitled Interp\_05 should be ON.
  - The Layer entitled Interp\_06 should be ON.
  - The Layer entitled Guide\_07 should be LOCKED.
  - The Layer entitled Photopoints should be ON.
  - The Layer entitled Frozen should be LOCKED.
  - The Layer entitled SCENE START UP should be ON.
  - When you've finished making your changes ( if any ) click on OK.
  - All other layers should be set to OFF.
  - Confirm that you can see the background image in the Front and Right viewports.
  - Confirm that the grid display in the viewports has been disabled, if not turn it off now.
  - Confirm that no Osnaps are currently enabled, if any are disable them.
  - Confirm that no edit points are currently displayed, if any are hide them.
  - Zoom out all the viewports by selecting the Zoom Extents All icon  or by typing the command: ZoomExtentsAll at the command line and pressing ENTER.
-




## Creating the 7th curve







**Description:** The 7th curve begins at the top pole and runs along the side of the head, just in front of the ear and straight on over the back of the jaw ending at the base of the neck.

This curve marks a pivotal juncture in the construction of your model as when completed you will already created 1/4 of the head, something you should be feeling very proud about! You will continue to create the 7th curve in much the same way as the 6th, so don't expect too many surprises -- okay, maybe just a few ;-)

Enough chatting, let's get stuck in...

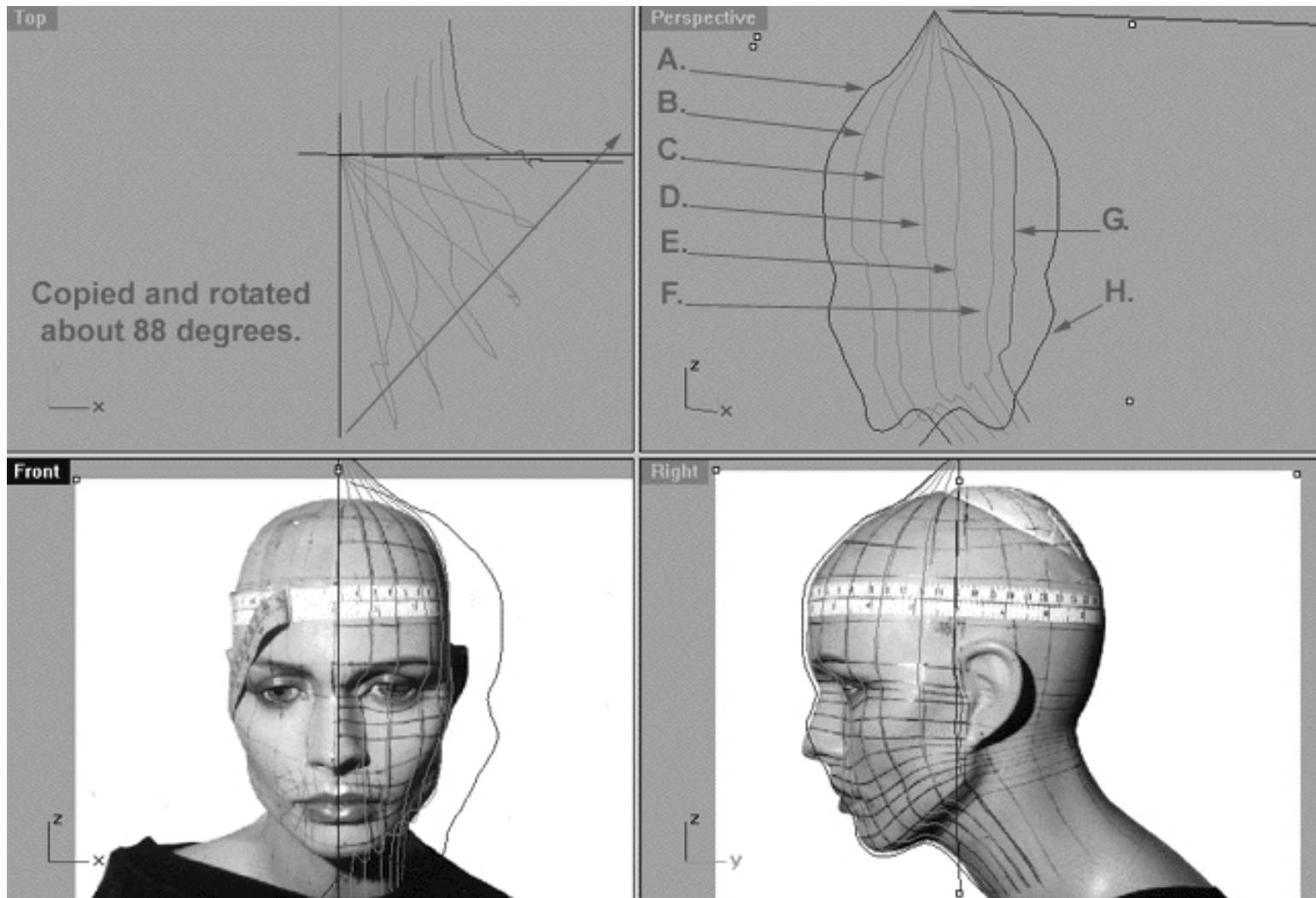
- Choose the *Zoom: Extents All Viewports* icon  from the toolbar or type the command: `ZoomExtentsAll` at the command line.
- Hold down the **Ctrl** key and select the **Interp\_02, Interp\_03, Interp\_04, Interp\_05 and Interp\_06** curves by **left clicking** on them, then *lock* the curves by typing the command: **Lock** at the command line and then press **Enter**.
- Yes, you guessed it, time to create a new layer -- At the bottom of your screen you will see the *Status Bar*, **right click** on the *Layer info box* -- the *Edit Layers dialogue box* will open.
- **Left click** on the **New** button and in the *Name field* type: **Interp\_07**.
- Move the cursor to the *colour field*, **left click** on the *colour field*, the "*Select a colour*" *dialogue* and colour wheel will appear, choose a nice bright blue (i.e. **R:0 G:0 B:255**) then click **OK**
- You will be returned to the *Edit Layers dialogue box* again, **left click** on **OK** to exit.
- Return your cursor to the *Status Bar* at the bottom of the screen and **left click** on the *Layer info box* -- the Layers list will appear.
- Locate **Interp\_07** in the list (the one you created a few moments ago) and move your cursor over its name (it will highlight) **left click** on it to make the layer currently active.
- Open the *Osnap dialogue box* by moving your cursor to the lower *status bar* and **left clicking** on its title. The *Osnap dialogue box* will open, enable the *End snap* by **left clicking** on **End** -- a check will appear indicating that it is now active. If any boxes are checked/active other than "End" disable them now.
- Close the *Osnap dialogue box* by clicking on **X**.

- In **Any Viewport** Select the 1st curve (i.e. Interp\_01) by **left clicking** on it -- it will highlight.
- From the toolbar **left click** on the Rotate 2D icon  or type the command: **Rotate** at the command line.
- At the command line you will receive the following prompt: **Choose centre of rotation (copy)**
- Type: **copy** at the command line and press **Enter**.
- In the **Right Viewport** Move your cursor to point (a. -- X:0, Y:0, Z:0) on the first profile curve (i.e. Interp\_01) -- the cursor should snap to it, when it does **left click**.
- The system will respond with the following prompt at the command line: **Angle or first reference point:**
- Now, move your cursor into the **Top Viewport** and bring the cross hairs to about the 6 o'clock position (near the bottom of the window) once you've done this **press and hold down the Shift Key** on your keyboard -- the curve should align itself perfectly along the Y axis.
- While still **holding the Shift Key down**, drag the cursor along the -Y axis about 130 units and **left click**.
- The system will then respond with the following prompt at the command line: **Second reference point:**
- Rotate the curve anti-clockwise about **88 degrees** and **left click**.
- Press **Esc** on your keyboard to complete the operation.
- In the **Any Viewport** select the newly rotated curve by **left clicking** on it -- it will highlight.
- Choose the *Layer Control Icon*  from the toolbar by **left clicking** on it and **holding down the key** -- select the *Change Layer Icon*  from the flyout.
- Select **Interp\_07** from the *Pick layer for object dialogue* -- it will highlight. This will make certain that Interp\_07 has been associated with the correct layer.
- click **OK**
- Disable any currently active Osnaps
- Choose the Zoom Extents All Viewports icon  from the toolbar or type the command: **ZoomExtentsAll** at the command line.



## Creating the 7th Curve

View an example movie [Click Here](#)




This **All Viewport** screenshot shows our original profile curve (A), after having been copied and rotated about 88 degrees on its centre and now located at position (H). (B) represents the now locked 2nd curve, (C) represents the now locked 3rd curve, (D) represents the now locked 4th curve, (E) represents the now locked 5th curve, (F) represents the now locked 6th curve, (G) in red represents where our newly rotated curve (H) should be positioned once the points have been appropriately edited.

## Editing the 7th Curve

Once again we start our work in Front Viewport.

- Maximise the **Front Viewport** if you've not done so already by **double left clicking** on its label.
- Now turn ON the annotated dot labels. At the bottom of your screen you will see the *Status Bar*, **right click** on the Layer info box -- the Edit Layers dialogue box will open.

- Now in the Name field list find the layer called *Annotated Dots\_1* and select the **ON** radio button -- click on **OK** to **Exit**
- Unlock all the curves by typing the command: **unlock** at the command line and pressing Enter.
- While holding down the Ctrl key, select curves 1 (Interp\_01), 2 (Interp\_02), 3 (Interp\_03), 4 (Interp\_04) and 5 (Interp\_05) by left clicking on them -- they will highlight.
- If you've not already done so, display the edit points for the new rotated curve (Interp\_07), select the curve by **left clicking** on it -- it will highlight.
- Lock the currently selected curves by typing the command: Lock at the command line.
- Select the 6th curve (Interp\_06) by left clicking on it and then display its edit points by choosing the *Show edit points icon*  from the toolbar by **left clicking** on it or type the command: **EditPtOn** at the command line.
- Go to the bottom of your screen where you will find the *Lower Status Bar*, right click on the layer info box -- the Edit Layers Dialogue will open.
- Find the layer entitled: (Interp\_06) and LOCK it, then press OK to Exit.
- Zoom in rather tightly on the first set of edit points we will work with, ( b - i ).
- Now begin by moving edit points ( **b - i** ) to do this, **left click** on a point -- it will highlight, then drag a given point towards and into alignment with its sister point on the previous curve (in this case Interp\_06).  
**\*Tip**--use the cross hairs of your cursor to as an alignment aid. Now that you've aligned the points with their sister points drag them back along the red guide curve (Guide\_07) along the X axis. You can probably hold down the Shift key while dragging for points ( b - g ). Keep in mind that points ( h - i - j ) are a different story as you are going to have to move them downward and at a bit of an angle.
- Once you've completed moving the first set of edit points ( b - i ) pan the view to expose more of the lower face.
- Zoom in pretty tightly on points ( j - p ).
- Now begin moving the second set of edit points ( j - p ) into alignment. Okay, I'm going to warn you know placing these next few points is going to be pretty bloody difficult because it is very easy to become confused. Again, I recommend very strongly that you use white board or overhead projector pens to draw on your screen so that you can keep track of the points. My best advice is to take your time and **THINK** carefully about each and every move you make.**\*Note:** Edit points ( n - p ) once again will be very hard to place due to the shadow in the background image and the increasing curvature of the face. Your best bet at this stage is to just try and make an educated guess as to where each point should go for now. Like last time, It will be quite easy to sort them out in the next step when we switch into the right viewport.

**Warning!** Getting the points aligned correctly on the 7th curve is much more difficult than those you've edited in the previous lessons, so do not rush your work. I advise that you actually count each and every point and make certain that the point you think you're moving is really indeed the correct one.

**Tip** - For the most part the edit points on the previous curve (Interp\_06) are very close to where we want our edit points on (Interp\_07) to be aligned with. I recommend that when moving the points on (Interp\_07) that you "aim" for aligning the points with those on the earlier curve, keeping in mind that you should still be moving the points along the red guide curve.




This **Front Viewport** screenshot shows points ( **b - p** ) on the 7th curve (Interp\_07) **prior** to being dragged inward toward the red guide curve ( Guide\_07 ) along the X axis. The orange highlight indicates the 1st group of curves to be moved ( **b - i** ) and the green highlight indicates the 2nd group of curves ( **j - p** ). *\*Note* - The edit points on the previous curve (Interp\_06) have been displayed in order to make it easier to approximate where the edit points on the 7th curve should be moved to along the red guide curve.

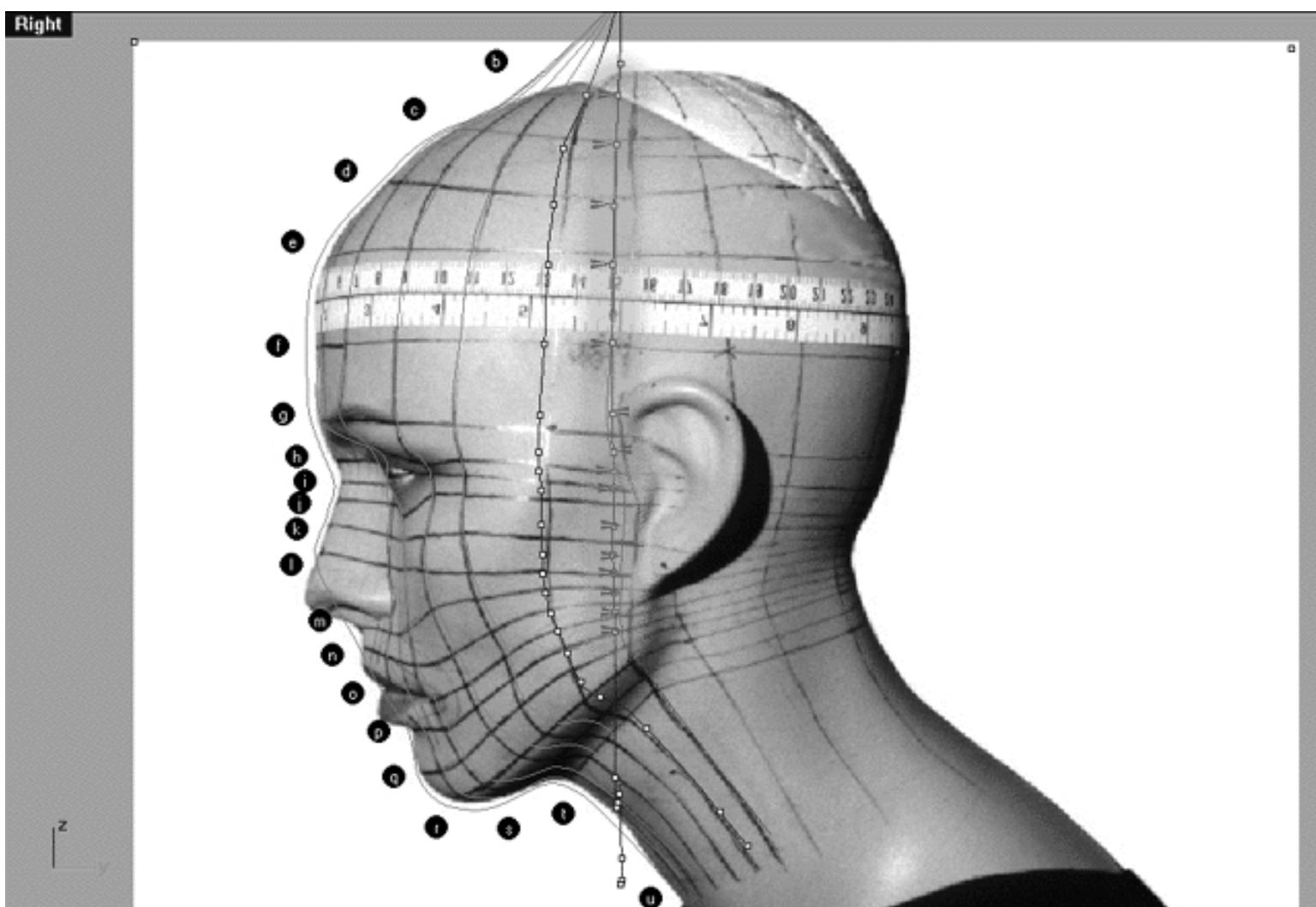
## Moving from Front View to Right View - 1st

Hopefully you should find that your points will need only very minor dragging, of course this will depend on how successful you were at aligning the points in the previous step.

- **Double left click** on the **Front Viewport** label -- the Viewport will minimise.
- **Double left click** on the **Right Viewport** label -- the Right Viewport will maximise.



- Zoom in on points ( b - i ).
- Once again, start by moving edit points ( b - i ) to do this, **left click** on a point -- it will highlight. Then **left click** on the highlighted point(s) and drag them toward the red guide curve ( Guide\_07 ) along the Y axis. Holding down the Shift key whilst dragging will probably be quite effective for this first set of points. *Tip* -- you may find that zooming the viewport in very tightly is essential under the circumstances.
- When you've finished working on points ( b - i ) from the toolbar choose the Pan View icon  and pan the view so that points ( h - p ) are clearly visible.
- Now concentrate on moving this next group of points ( j - p ) inward toward the red guide curve in the same manner as you've previously done in the step above.



This **Right Viewport** screenshot shows points ( b - p ) on the 7th curve (Interp\_07) prior to being dragged toward the red guide curve ( Guide\_07 ) along the Y axis. *\*Note* - Did you notice how close our edit points came to the red guide curve even before we started dragging them? Very little editing was required because we displayed and used the edit points on the previous curve (Interp\_06) as a guide for alignment in the prior step.


## Keep to the Right - 2nd

- Once completed, check your work and stay in the Right Viewport.
- Pan the viewport to expose more of the mouth, jaw and neck area.
- Zoom in tightly on points ( q - u ).
- Start with point ( q ) to do this, **left click** on it -- it will highlight. Then drag it across and up at a rather steep angle.
- *Alternatively...* you may wish to start by moving the last point ( u ) into place and then proceed to the phantom point and so on, as it's really simple to figure out where those points should go.

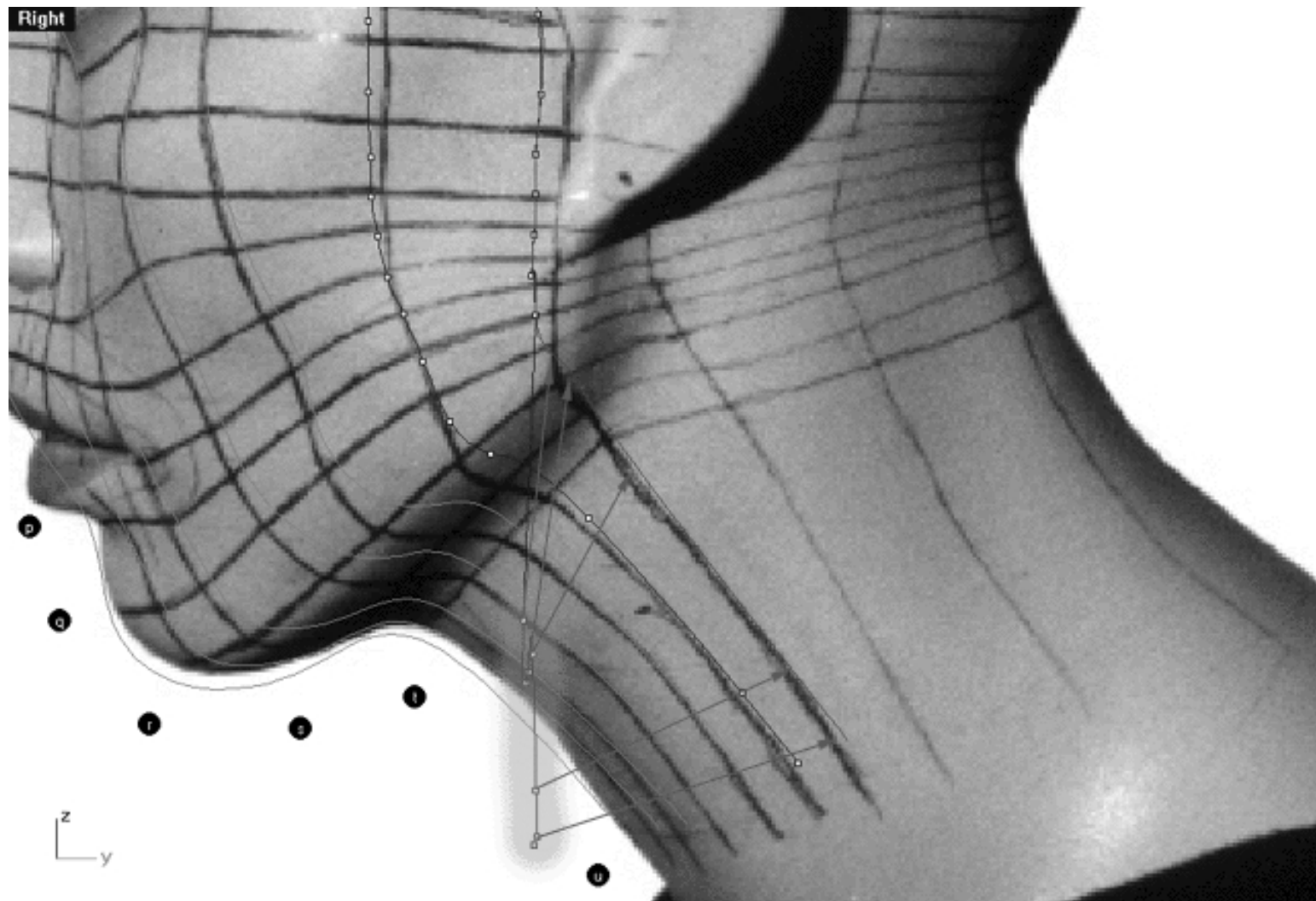
**\*Tip**--One technique that I use often is to place the points into relative alignment with their sister points on the previous curve, but rather than to place them dead on top of their sisters I'll put them in right smack in the middle between between the two curves, which in this case would be between curves 6 and 7. I'll show you exactly how I go about doing this a bit later on in the tutorials just in case you're getting confused by this lengthy explanation.

Just keep in mind that this little technique has some advantages, first by moving all the points into a line and by placing the points nearby their sisters in the first instance the points on the curve which you're working are not all unreasonably stretched out making it extra hard to identify any one given point. Secondly, obviously we know that even though we've aligned each point with its sister the alignment isn't really going to be completely applicable for the curve we are working on at the moment so we are going to have to make some adjustments.

So by putting the points between the two curves you have the advantage of having the basic alignment rather close while making it much easier to visualize what sort of adjustment you're going need to make based on the way in which the curves are running generally. What I'm trying to say is that there are many ways for you to get from here to there, it's really just a question of what method you are most comfortable with and will work best for you at the end of the day. Again, don't worry if you don't quite understand what I'm on about, as I'll show you exactly how to do this a bit later on.

- Now move on to point ( r ) again **left click** on the point -- it will highlight. Then drag it across and up slightly as you did in the last step.
- With the next few points ( s - u ) things are even more complex so be careful and take your time. Remember to make judgements about where you should drag the points to along the red guide curve based mainly on the location of those being displayed on the previous curves. Keep in mind that the background image is only a very rough guide at this stage, so don't worry if the points seem to be falling between those drawn on the face in black pen -- it's not a big deal. The main idea here is that the points should be kept in good logical alignment with each other while using the background image only to give an idea as to the direction you are trying to head in overall.
- When you are done and feel happy with the results, turn off all the displayed edit points.
- Select the curve you are currently working on (Interp\_07) and display just its edit points.
- Once completed, zoom out by choosing the *Zoom Extents icon*  from the toolbar and **clicking** on it.




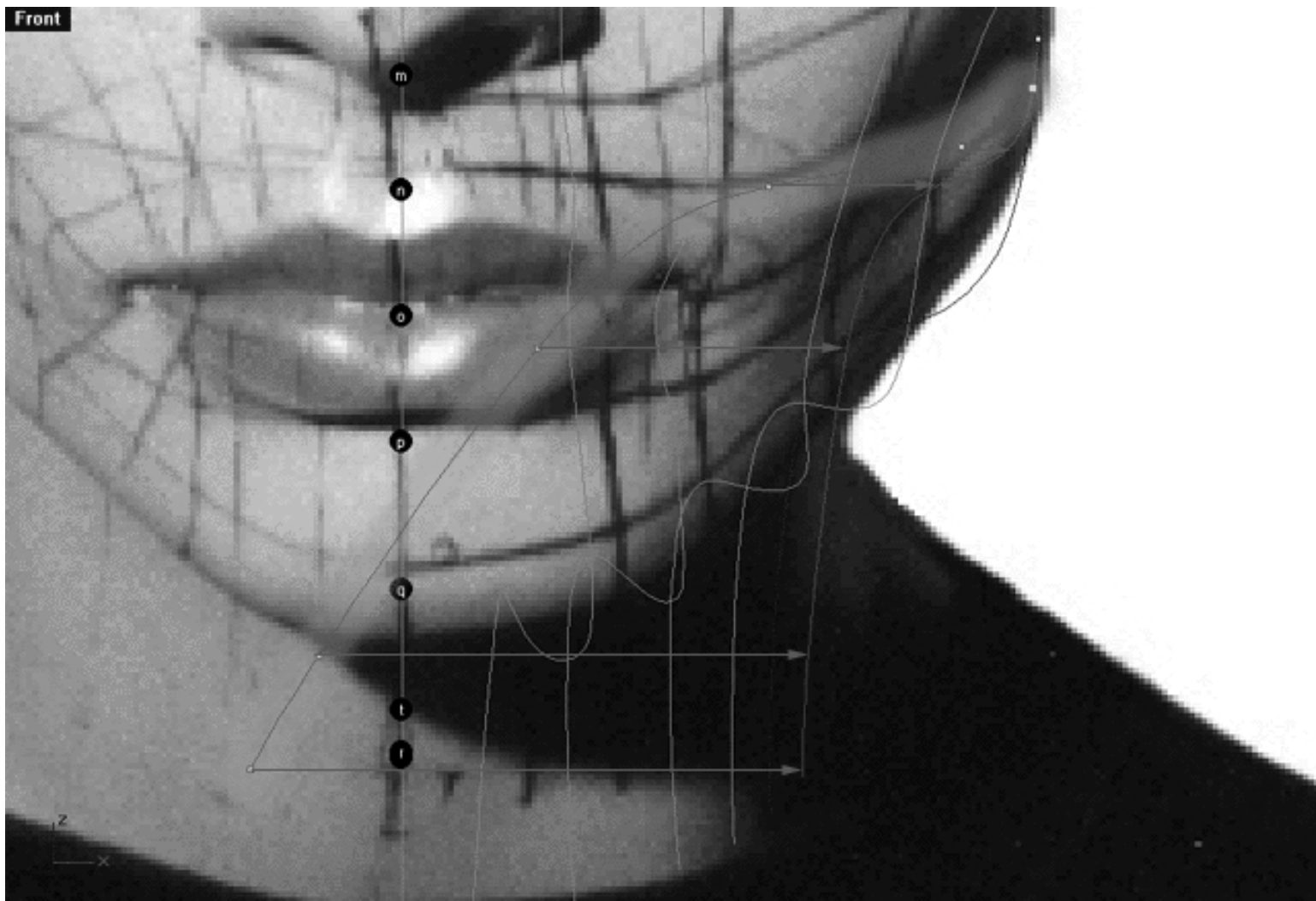


This **Right Viewport** screenshot shows points ( **q - u** ) on the 7th curve (Interp\_07) just prior to being dragged toward the red guide curve (Guide\_07 ) along the Y axis. *\*Note* - The edit points on curve 6 have been displayed also.

## Back to Front - 3rd

- Once you've completed the prior step, check your work and then minimise the **Right Viewport** by **double left clicking** its label.
- Maximise the **Front Viewport** by **double left clicking** on its label.
- Zoom in tightly on edit points ( **q - u** ).
- We will now move points ( **q - u** ) into position. To do this, start with point ( **u.** ) **left click** on the point -- it will highlight. Then, **hold down the Shift Key**, **left click** on the highlighted point and drag the point until it meets with the red guide curve ( Guide\_07 ) along the X axis while **continuing to hold down the Shift key**.
- Next move the phantom point and repeat the previous procedure.

- Next move point ( **t.** ) and repeat the procedure for the remaining points ( **s - r** )
- Once completed, zoom out by choosing the *Zoom Extents icon*  from the toolbar and **clicking** on it.

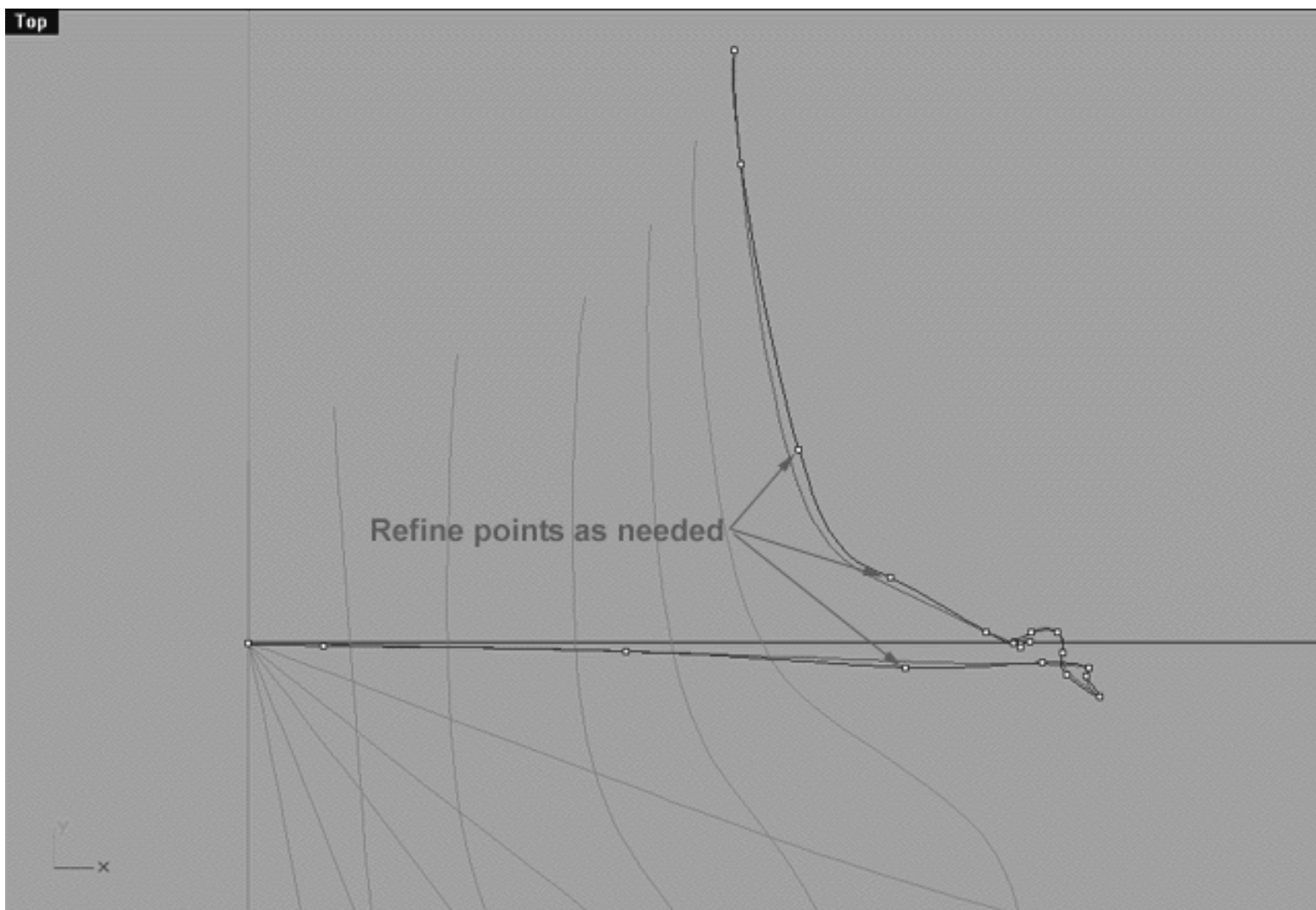


This **Front Viewport** screenshot shows points ( **q - u** ) on the 7th curve (Interp\_07) just prior to being dragged toward the red guide curve ( Guide\_07 ) along the X axis.

## Take it to the Top View - 4th

- Check your work and then minimise the **Front Viewport** by **double left clicking** on its label.
- Maximise the **Top Viewport** by **double left clicking** on its label.
- Turn off the annotated dot labels. At the bottom of your screen you will see the *Status Bar*, **right click** on the Layer info box -- the Edit Layers dialogue box will open.
- In the Name field list find the layer called *Annotated Dots\_1* and select the **Off** radio button -- click on **OK** to **Exit**.

- Zoom in tightly on the curve, carefully check to see how well the curve conforms to the guide overall.
- Correct any misalignment, it is now fairly safe to move the offending points along either the X or Y axis -- to do so, **left click** on the misaligned point -- it will highlight. Then, **hold down the Shift Key, left click** on the highlighted point and drag the point until it meets with the red guide curve ( Guide\_07 ) along the **X** or **Y** axis as required while **continuing to hold down the Shift key**. **\*Note -- Your results may vary!** Whether or not any adjustment is needed in the top view at all will depend on how accurately your point editing went in the front and right views previously.



This **Top Viewport** screenshot shows an example of slightly misaligned points (*\*Note -- your results may vary*) on the 7th curve (Interp\_07) just prior to being dragged toward the red guide curve ( Guide\_07 ) along the X or Y axis.

If you're feeling confused about any of this and would like to see how I went about creating this curve then watch the following movie:






## Editing the 7th Curve

View an example movie [Click Here](#)

# Snapping things up on the 7th curve

The 7th curve has now completed. Again, the time has come to test how well you've done overall at aligning the 7th curve to the guide. Display the points on the guide curve and see how close you came with your edited points. Once done, "snap" all of the 7th curves points to the guide just so we stay in sync.

- Minimise the **Front Viewport** by **double left clicking** on its label.
- Maximise the **Right Viewport** by **double left clicking** on its label.
- Now we must unlock the Guide\_07 curve so that we may select and display its points. At the bottom of your screen you will see the *Status Bar*, **right click** on the Layer info box -- the Edit Layers dialogue box will open.
- In the *Name field list* find the layer called Guide\_07 and select the **ON** radio button -- click on **OK** to **Exit**.
- In any Viewport select the Guide\_07 curve by left clicking on it.
- Display its edit points by choosing the *Show edit points icon*  from the toolbar by **left clicking** on it or type the command: **EditPtOn** at the command line.
- Okay, here comes your test -- take a close look, how close did you manage to come this time?
- Let's refine the points still more. Once again lock the Guide\_07 curve so that we don't mess things up while snapping. At the bottom of your screen you will see the *Status Bar*, **right click** on the Layer info box -- the Edit Layers dialogue box will open.
- In the *Name field list* find the layer called Guide\_07 and select the **Lock** radio button -- click on **OK** to **Exit**.
- Open the *Osnap dialogue box* by moving your cursor to the lower *status bar* and **left clicking** on its title. The *Osnap dialogue box* will open, enable the *Point snap* by **left clicking** on **Point** -- a check will appear indicating that it is now active. If any boxes are checked/active other than "Point" disable them now.
- **Left click** on the **X** to Exit the Onsap dialogue.
- Temporarily turn off the background reference image by typing the command **HideBackgroundBitmap** at the command prompt.

- Starting with point (**b.**) zoom in on a small group of points (as usual about 3 is good) and "snap" each curve point to its associated point on the guide curve, it's important that you re-snap each point -- be sure not to miss any!
- When you've finished working of the first group of 3 points choose and use the Pan View icon  from the toolbar and pan the view a bit further along the contour of the curve. Now start working on the next group of 3 points and continue snapping. Continue this procedure until you've snapped all the remaining points ( **b - u** ).
- Zoom out by choosing the *Zoom Extents All* icon  from the toolbar and **clicking** on it or typing the command: `ZoomExtentsAll` at the command line.
- Minimise the Right Viewport by double left clicking on its label
- Carefully check over your work in all viewports
- Restore the background reference image by typing the command: **ShowBackgroundBitmap** at the command prompt.
- Disable any currently active Osnaps.
- Congratulations! -- you've now completed editing the 7th Curve and are now 1/4 of the way done -- Jolly good!




## Snapping it up

View an example movie [Click Here](#)

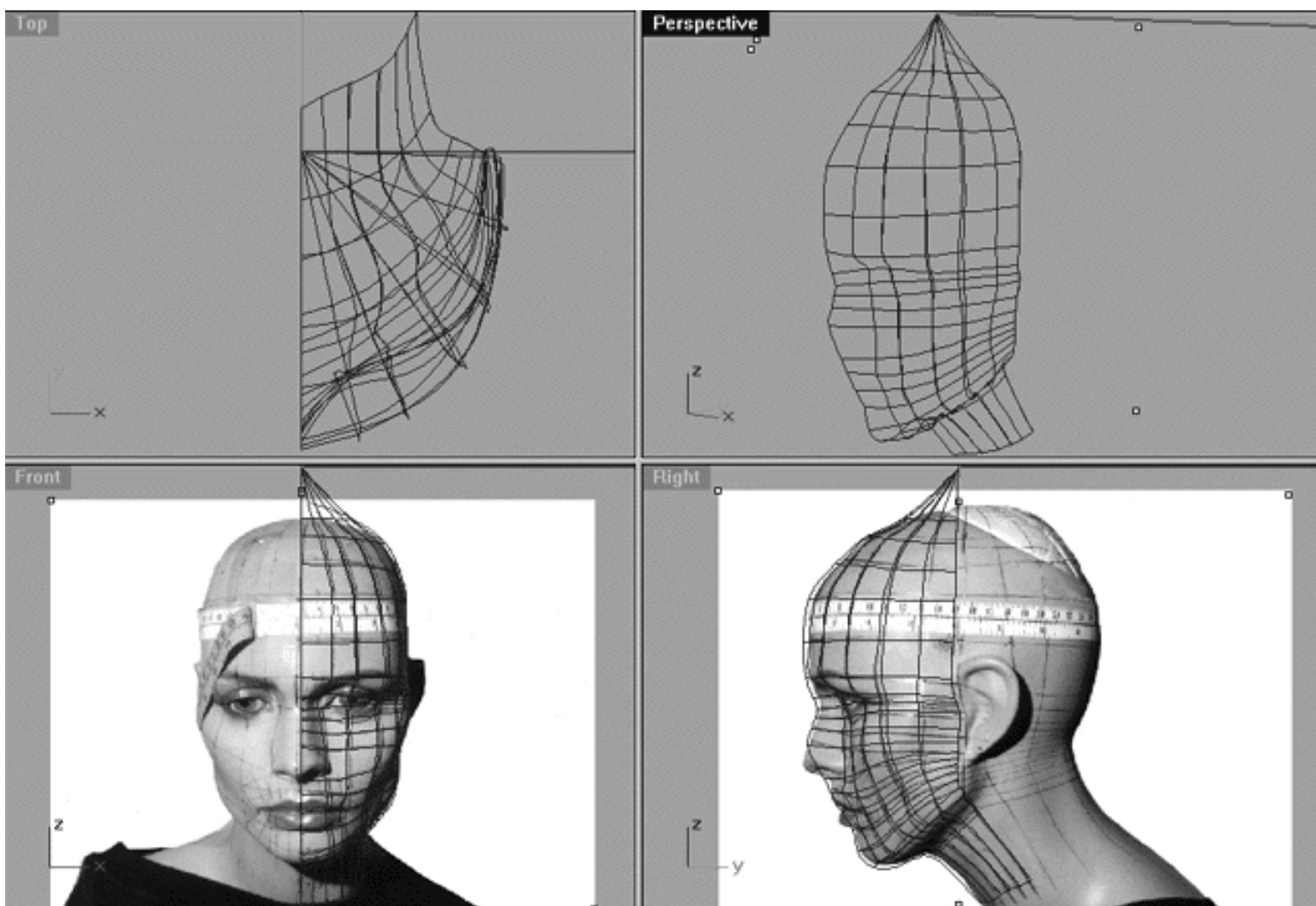
**Table Seven - A list of points & coordinates**  
for the completed 7th Curve - [Click Here](#)

## Testing the Surface

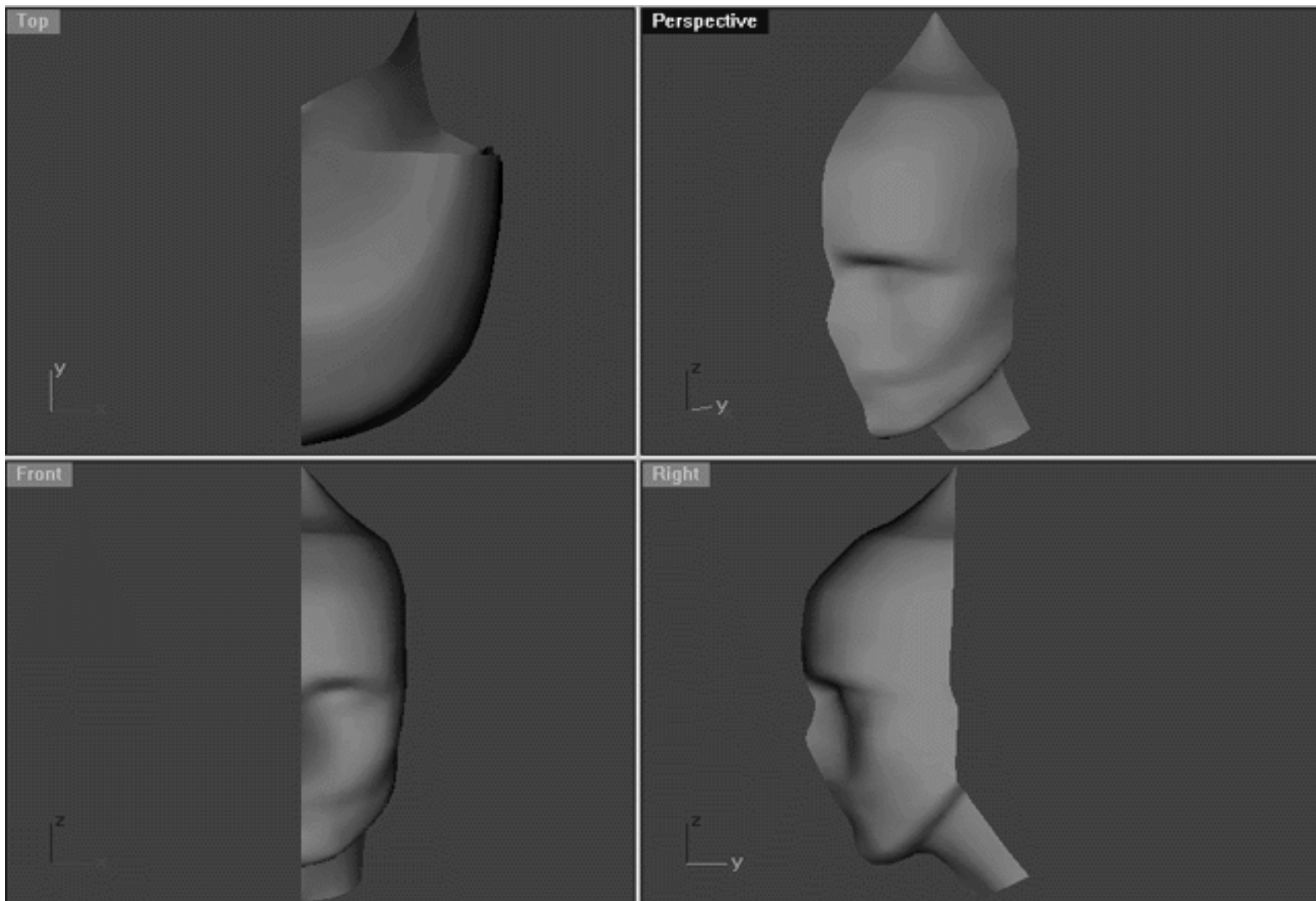
- In the **Perspective Viewport**, zoom in on points ( **a - e** ) this will make it easier to select the curves.
- Unlock the 1st, 2nd, 3rd, 4th, 5th and 6th curves by typing the command: **Unlock** at the command line. Once done, the curves should revert to their normal state.
- From the toolbar choose the Loft icon  or type the command: **Loft** at the command line.



- At the command line you will receive the following prompt: **Select curves to loft (point):**
- Now, in the **Perspective Viewport** click directly on curves 1, 2, 3, 4, 5, 6 and 7.
- As you select each curve they should highlight, when you've finished selecting all 7 curves press **Enter**.
- The Loft Options dialogue box should appear. Set the Style drop down box to **Loose**. **click** on the **Shaded Preview** box, a tick should appear. Make sure the Do Not Simplify radio button is active and **click** on the **Preview button**.



This **All Viewport** screenshot shows an example of a loose loft applied to the curves without a quick rendered shaded preview.



This **All Viewport** screenshot shows an example of a surface created by lofting curves 1, 2, 3, 4, 5, 6 and 7 using the "loose" type parameter with a quick rendered shaded preview.

## Shutting Down the Scene

- Confirm that no Osnaps are currently active, disable any that are.
- Open the Edit Layers Dialogue box and turn off Guide\_07
- Confirm that Layer(s): Interp\_01, Interp\_02, Interp\_03, Interp\_04, Interp\_05, Interp\_06 and Interp\_07 are ON.
- Left click on the Layer Info box at the Lower Status Bar, highlight the layer entitled SCENE START UP and click on it -- it should now become the active layer and its name should appear in the box.
- Confirm that the newly created curve (Interp\_07) has in fact been associated with the correct layer.
- Hide any points that are currently displayed.
- Zoom Extents All.
- And SAVE YOUR WORK -- because if you don't nobody else will!



## Summary of Lesson - Curve 7

Well as I said at the beginning of this lesson with this curve you've reached a milestone in the construction of the model as you are now 1/4 of way through the most difficult part of the process. Having come this far you should be feeling very good about yourself and quite honestly if you've been able to stick with it for this long you're well on your way to being able to create just about anything you can imagine! The skills that you are learning and perfecting right at this moment are those that you will use over and over throughout the course of your work in the future. I hope that you've come to realize that there are many ways to get the job done, with no single correct way of doing things. Half of the battle is really learning to take your time, observe and think about what you're doing before jumping right in. Working in 3D is like any other visual art, it's all about learning to actually "see" and not about what you "think" you see or know about in the world. So take your time, relax and have fun with what you're doing and you'll find that when you do everything will just seem to fall into place all that much more easily.

[Go To Next Lesson - Drawing the 8th Curve](#)

RETURN to Top of page -- [Click Here](#)

Written by Joseph R. Saltzman.

Co-produced in association with Steven Ståhlberg

©1998-1999 Cinemagic Productions Limited. All Rights Reserved.

Duplication of this document including images and text by any means is expressly forbidden without prior written consent of Cinemagic Productions Limited.

Web Site: <http://www.cmagic.co.uk> Telephone: +44 (0)1753 733 190 Fax: +44 (0)1753 736 619 email: [cmagic@cmagic.co.uk](mailto:cmagic@cmagic.co.uk)

## MOVIE CREATING THE 7TH CURVE

To **PLAY** the example movie, double click below:

To **RETURN** to the head shape tutorial -- [click here](#).



To **PLAY** the example movie, double click below:

To watch **PART TWO** of this movie -- [click here](#).

To **RETURN** to the head shape tutorial -- [click here](#).



To **PLAY** the example movie, double click below:

To watch **PART THREE** of this movie -- [click here](#).

To **RETURN** to the head shape tutorial -- [click here](#).



To **PLAY** the example movie, double click below:

To **RETURN** to the head shape tutorial -- [click here](#).

# MOVIE SNAPPING UP THE 7TH CURVE

To **PLAY** the example movie, double click below:

To **RETURN** to the head shape tutorial -- [click here](#).

TABLE SEVEN

POINT	X AXIS	Y AXIS	Z AXIS
a - North Pole	0.000	0.000	0.000
Phantom point 1	5.735	-0.151	-6.284
b - Head top 1	29.989	-0.639	-30.891
c - Head top 2	50.839	-1.386	-46.179
d - Head top 3	60.087	-1.567	-63.584
e - Hairline	63.730	-1.866	-81.774
f - Temple	63.705	-2.986	-105.878
g - Browbone	64.756	-4.150	-128.548
h - Crease of top eyelid	62.160	-2.038	-140.604
i - Eye centre line	61.891	-0.390	-145.958
j - Under-eye area	61.186	1.119	-151.161
k - Bridge of nose	59.376	0.823	-160.764
l - Cheek apple	58.970	0.204	-169.230
m - Nose base, cheek bone	58.764	0.055	-174.229
n - Upr lip, cheek hollow	58.771	0.195	-178.552
o - Centre of mouth, cheek hollow	58.623	-0.233	-182.367
p - Lwr lip under, cheek hollow	58.562	-0.227	-186.239
q - Tip of chin	57.942	0.097	-190.893
r - Jawline	55.329	1.221	-196.241
s - Nape of neck	48.017	4.749	-199.849
t - Neck	40.803	15.285	-214.856
Phantom point 2	37.374	36.512	-242.408
u - Base of neck	36.903	45.211	-253.412

**RETURN** to tutorial -- [Click Here](#)



**RETURN** to previous lesson -- [Click Here](#)




## THE 8TH CURVE


### Contents:

- [Scene Setup](#)
  - [Creating the 8th curve](#)
  - [Example Movie -- Creating the 8th Curve](#)
  - [Editing the 8th curve -- Something New in the Right View](#)
  - [Front is Fab](#)
  - [Getting on Top](#)
  - [Example Movie -- Editing the 8th Curve](#)
  - [Snapping things up on the 8th curve](#)
  - [Example Movie -- Snapping it up](#)
  - [Table Eight - A list of points & coordinates for the completed 8th Curve](#)
  - [Testing the Surface](#)
  - [Shutting Down the Scene](#)
  - [Summary of Lesson -- Curve 8](#)
- 

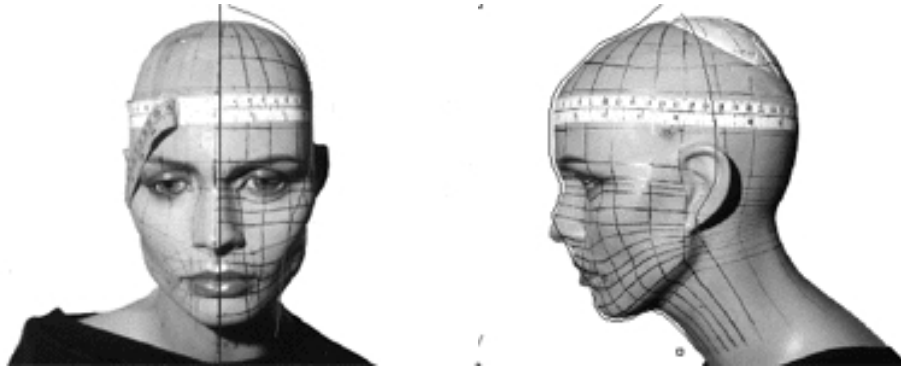
## Scene Setup



- If you've not done so already start a Rhinoceros session by **double clicking** on the desktop icon  the application will begin.
- Choose File, Open from the menu bar and double click on **START\_A.3DM** in the file list, it will load and open.
- Confirm at the Lower Status Bar the currently active layer is entitled SCENE START UP. If it is active proceed to the next step, if it's not then make it active by left clicking on the layer box, highlighting the correct layer and clicking on it.
- Again, at the Layers Box on the Lower Status Bar this time right click on the box, the Edit Layers Dialogue box will open. Confirm the following switches have been enabled or disabled:
- The Layer entitled Annotated Dots\_1 should be OFF.

- The Layer entitled Interp\_01 (the Profile Curve) should be ON.
  - The Layer entitled Interp\_02 should be ON.
  - The Layer entitled Interp\_03 should be ON.
  - The Layer entitled Interp\_04 should be ON.
  - The Layer entitled Interp\_05 should be ON.
  - The Layer entitled Interp\_06 should be ON.
  - The Layer entitled Interp\_07 should be ON.
  - The Layer entitled Guide\_08 should be LOCKED.
  - The Layer entitled Photopoints should be ON.
  - The Layer entitled Frozen should be LOCKED.
  - The Layer entitled SCENE START UP should be ON.
  - When you've finished making your changes ( if any ) click on OK.
  - All other layers should be set to OFF.
  - Confirm that you can see the background image in the Front and Right viewports.
  - Confirm that the grid display in the viewports has been disabled, if not turn it off now.
  - Confirm that no Osnaps are currently enabled, if any are disable them.
  - Confirm that no edit points are currently displayed, if any are hide them.
  - Zoom out all the viewports by selecting the Zoom Extents All icon  or by typing the command: ZoomExtentsAll at the command line and pressing ENTER.
-

## Creating the 8th curve







**Description:** The 8th curve begins at the top pole and runs along the side of the head, just in back of the ear and straight on behind the jaw ending at the base of the neck.

You will create the 8th curve by rotation of the profile in much the same way as the 7th -- here we go again..!



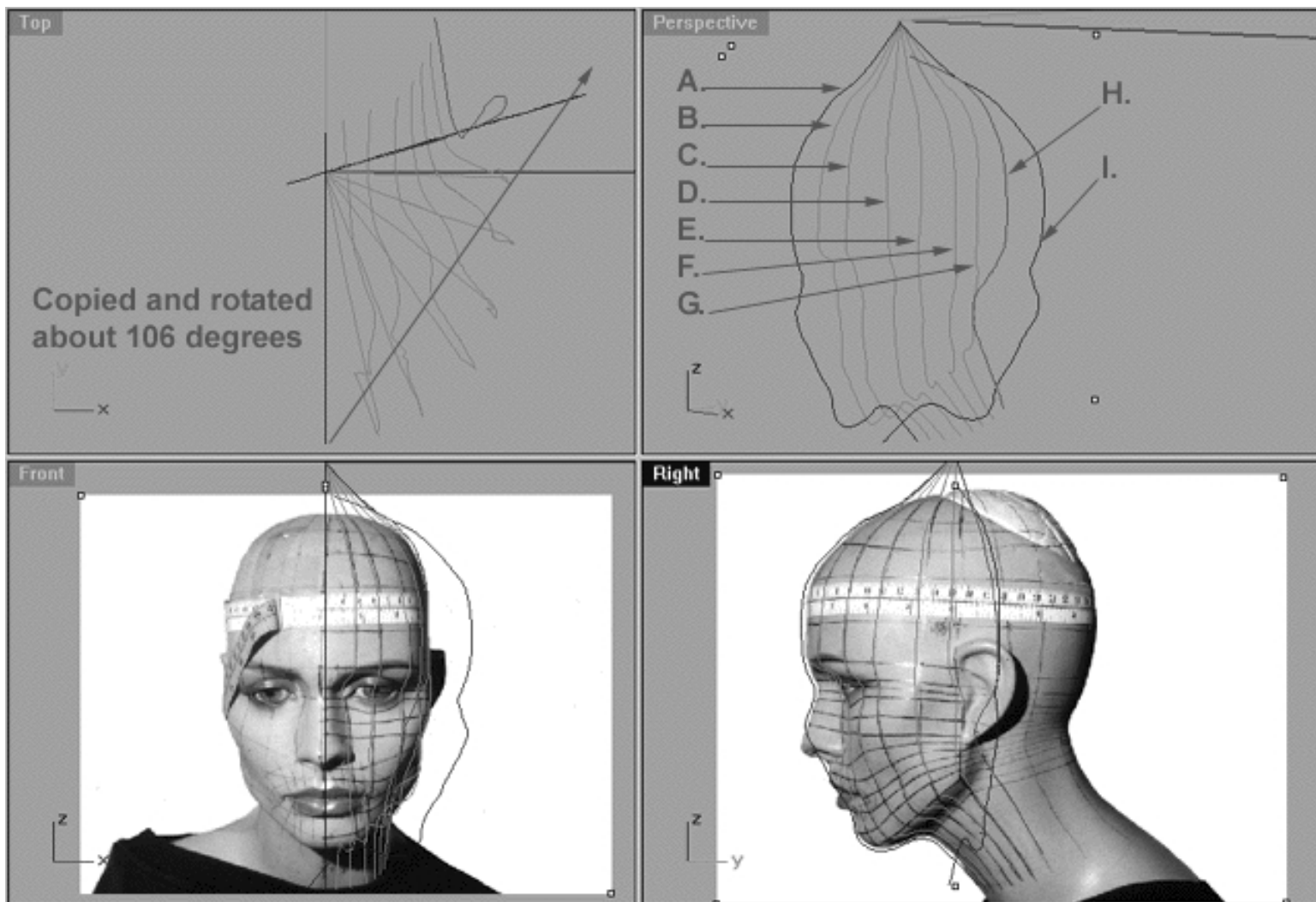
- Choose the *Zoom: Extents All Viewports icon* from the toolbar or type the command: `ZoomExtentsAll` at the command line.
- Hold down the **Ctrl** key and select the **Interp\_02, Interp\_03, Interp\_04, Interp\_05, Interp\_06 and Interp\_07** curves by **left clicking** on them, then Lock the curves by typing the comand: `Lock` at the command line and then press **Enter**.
- Create a new layer -- At the bottom of your screen you will see the *Status Bar*, **right click** on the *Layer info box* -- the *Edit Layers dialogue box* will open.
- **Left click** on the **New** button and in the *Name field* type: **Interp\_08**.
- Move the cursor to the *colour field*, **left click** on the *colour field*, the "*Select a colour*" *dialogue* and colour wheel will appear, choose a nice bright blue (i.e. **R:0 G:0 B:255**) then click **OK**
- You will be returned to the *Edit Layers dialogue box* again, **left click** on **OK** to exit.
- Return your cursor to the *Status Bar* at the bottom of the screen and **left click** on the *Layer info box* -- the Layers list will appear.
- Locate **Interp\_08** in the list (the one you created a few moments ago) and move your cursor over its name (it will highlight) **left click** on it to make the layer currently active.
- Open the *Osnap dialogue box* by moving your cursor to the lower *status bar* and **left clicking** on its title. The *Osnap dialogue box* will open, enable the *End snap* by **left clicking** on **End** -- a check will appear indicating that it is now active. If any boxes are checked/active other than "End" disable them now.
- Close the *Osnap dialogue box* by clicking on **X**.
- In **Any Viewport** Select the 1st curve (i.e. **Interp\_01**) by **left clicking** on it -- it will highlight.

- From the toolbar **left click** on the Rotate 2D icon  or type the command: **Rotate** at the command line.
- At the command line you will receive the following prompt: **Choose centre of rotation (copy)**
- Type: **copy** at the command line and press **Enter**.
- In the **Right Viewport** Move your cursor to point (a. -- X:0, Y:0, Z:0) on the first profile curve (i.e. Interp\_01) -- the cursor should snap to it, when it does **left click**.
- The system will respond with the following prompt at the command line: **Angle or first reference point:**
- Now, move your cursor into the **Top Viewport** and bring the cross hairs to about the 6 o'clock position (near the bottom of the window) once you've done this **press and hold down the Shift Key** on your keyboard -- the curve should align itself perfectly along the Y axis.
- While still **holding the Shift Key down**, drag the cursor along the -Y axis about 130 units and **left click**.
- The system will then respond with the following prompt at the command line: **Second reference point:**
- Rotate the curve anti-clockwise about **106 degrees** and **left click**.
- Press **Esc** on your keyboard to complete the operation.
- In the **Any Viewport** select the newly rotated curve by **left clicking** on it -- it will highlight.
- Choose the *Layer Control Icon*  from the toolbar by **left clicking** on it and **holding down the key** -- select the *Change Layer Icon*  from the flyout.
- Select **Interp\_08** from the *Pick layer for object dialogue* -- it will highlight. This will make certain that Interp\_08 has been associated with the correct layer.
- Click **OK**
- Disable any currently active Osnaps
- Choose the Zoom Extents All Viewports icon  from the toolbar or type **zea** at the command line.



## Creating the 8th Curve

View an example movie [Click Here](#)




This All **Viewport** screenshot shows our original profile curve (A) after having been copied and rotated about 106 degrees on its centre and now located at position ( I ). (B) represents the now locked 2nd curve, (C) represents the now locked 3rd curve, (D) represents the now locked 4th curve, (E) represents the now locked 5th curve, (F) represents the now locked 6th curve, (G) represents the now locked 7th curve, (H) in red represents where our newly rotated curve ( I ) should be positioned once the points have been appropriately edited.

## Editing the 8th Curve - Something New in the Right View

Okay, now for something completely different. Up to this point we've been more or less holding your hand throughout the exercises. However, by now you should feel comfortable with Rhino's user interface and have a pretty good grip on most of the commands, so I'll try not to nanny you quite as much ;-)

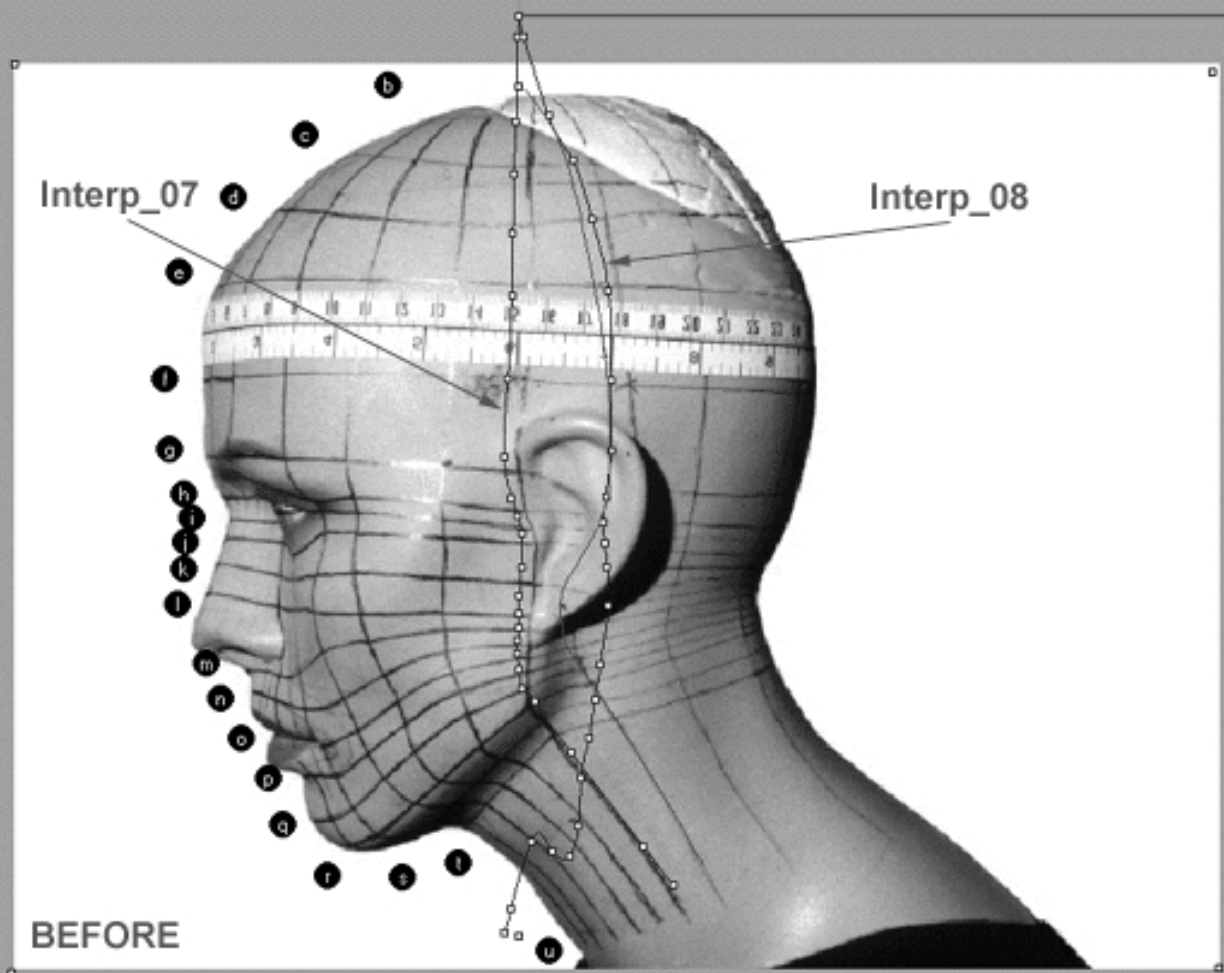
This time round we are going to start off in the **Right Viewport**.

- Maximise the **Right Viewport** if you've not done so already by **double left clicking** on its label.
- Turn ON the annotated dot labels. At the bottom of your screen you will see the *Status Bar*, **right click** on the Layer info box -- the Edit Layers dialogue box will open.
- If you've not done so already, in the Name field list find the layer called *Annotated Dots\_I* and select the **ON** radio button -- click on **OK** to **Exit**.

- Unlock all the curves
- Now switch to the **Perspective Viewport** and maximise, let's lock the curves by first holding down the Ctrl key and **left clicking** on curves 1, 2, 3, 4, 5, and 6 -- they will highlight. Now lock the curves by typing the command: **Lock** at the command line and then press **Enter**. When you've finished return to the **Right Viewport** and maximise.
- If you've not already done so, display the edit points for the previous curve (Curve 7 - Interp\_07) and the newly rotated curve (Interp\_08), select the curves by holding down the Ctrl key and **left clicking** on them -- they will highlight.
- Then choose the *Show edit points icon*  from the toolbar by **left clicking** on it or type the command: EditPtOn at the command line.
- Lock the layer containing the 7th Curve (Interp\_07)
- Okay, this time we are going to try something just a little bit different. In the last lesson I told you about how I like to first align the points with their sisters on the previous curve and then "line" them up sort of in the centre between the previous curve and the guide or sometimes as a variation just off to one side. Right I know this sounds a bit confusing so now I'm going to show you just what I mean.
- Before doing anything else check points ( b - i ) they should be pretty close to being in good alignment. However if they are not you may want to tweak them up a bit by aligning them with their sister points on the previous curve in this case (Interp\_07) and then dragging them back and into position along the red guide curve while holding down the Shift key.
- Zoom in tightly on the points ( i - u ).
- Now, begin by moving edit points ( i - u ) to do this, **left click** on a point -- it will highlight, now drag the points into the centre *between* the 7th and the red guide curve aligning each point on the 8th curve with its "sister" point on the 7th. If you don't understand what I mean, check out the screenshot's below or better yet watch the movie.
- Now that we've completed moving the edit points ( i - u ) into the centre it's time to move them along the Y axis into position along the red guide curve. I think you'll find that point placement is very easy overall on this curve especially when compared with that of the previous lesson.
- When you've finished do a Zoom Extents All.



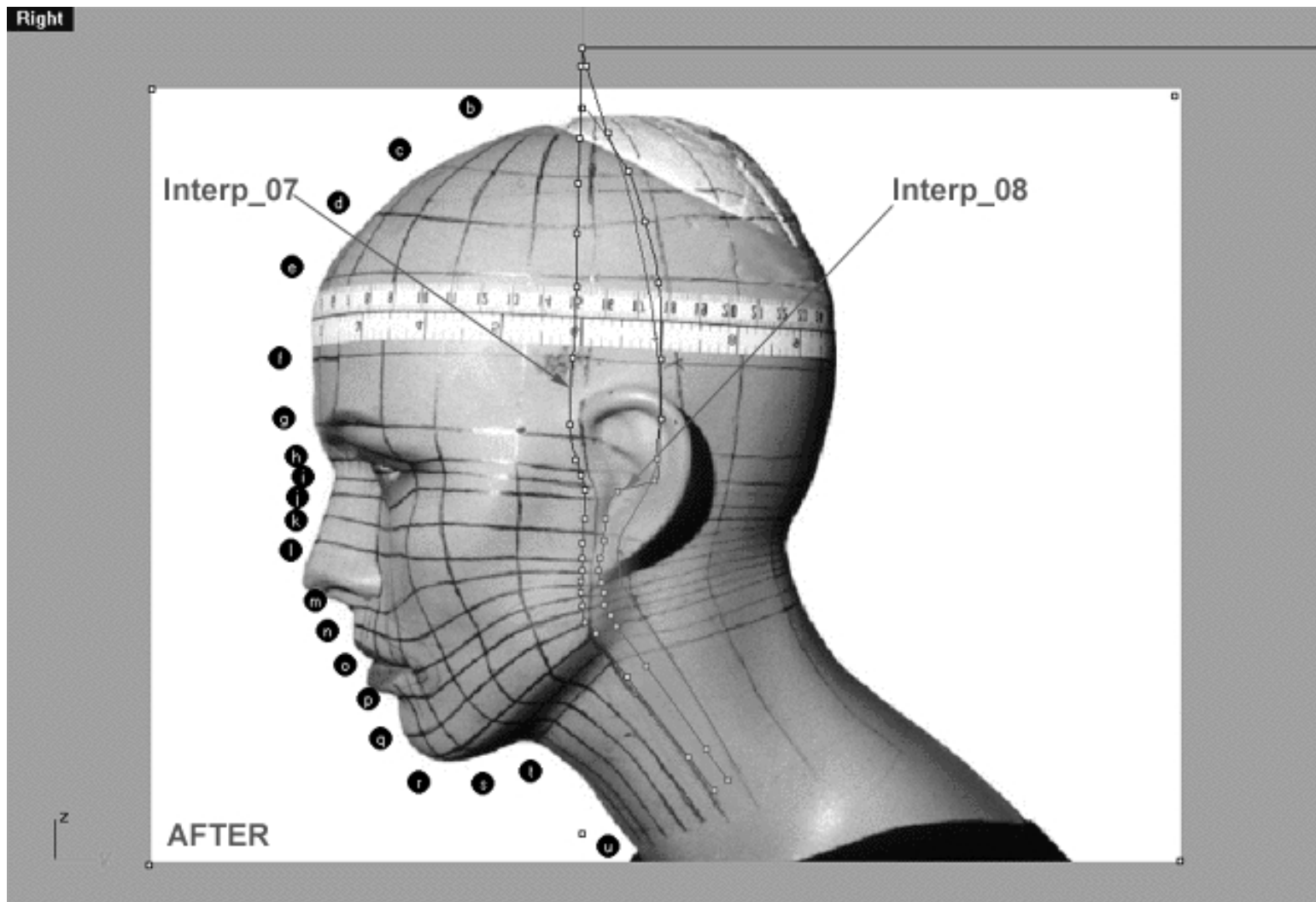
Right



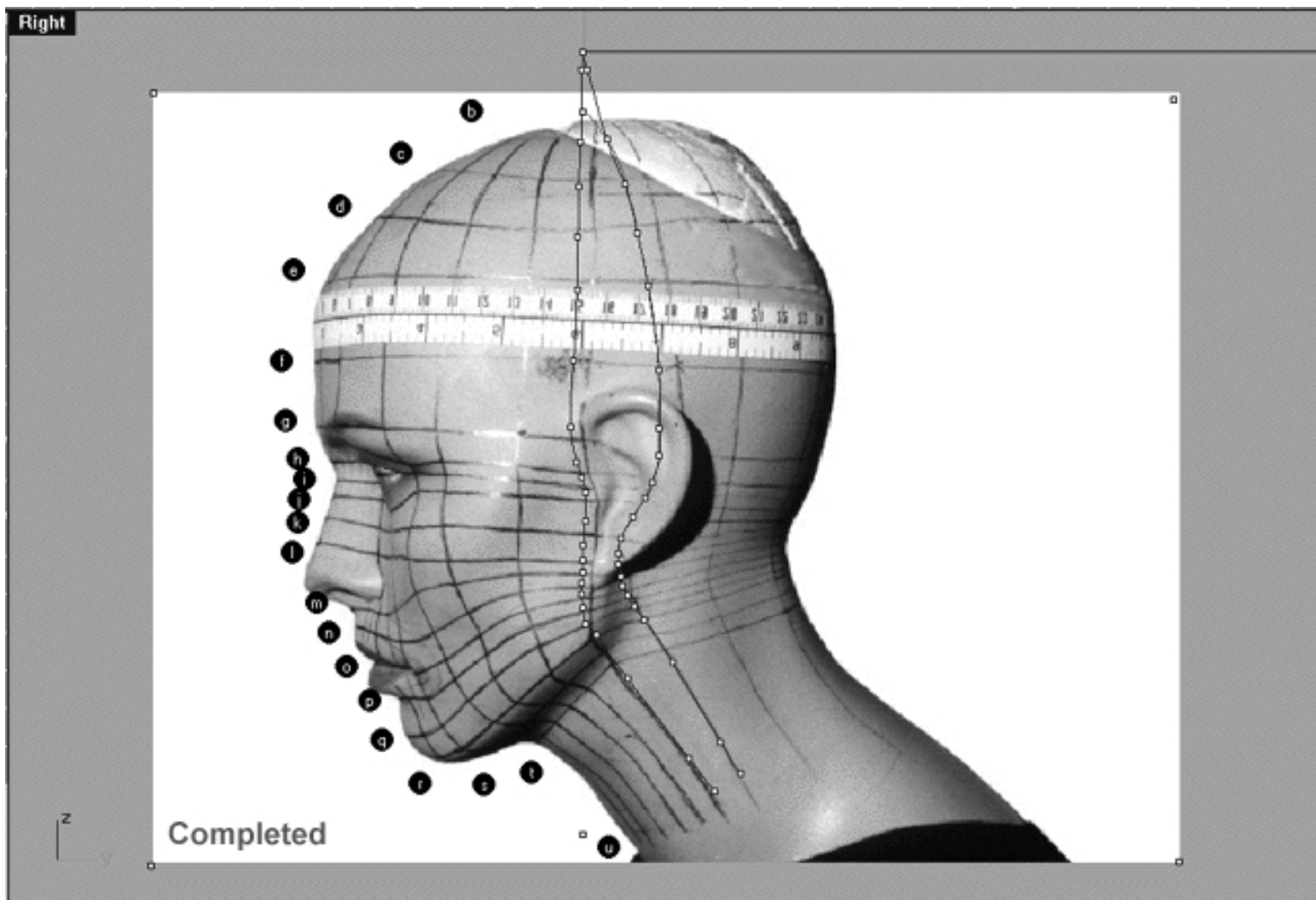
This **Right Viewport** screenshot shows the previous curve, i.e., the 7th Curve (Interp\_07) with it's edit points displayed, the 8th Curve that we are currently editing (Interp\_08) again with its edit points displayed and also the red guide curve (Guide\_08). You will notice that the 8th curve is running in pretty close alignment with the red guide curve up until about point ( i / j ) when it starts to veer off.



Right




This **Right Viewport** screenshot shows that starting at about point ( j ) I've begun to move the remaining edit points (**highlighted in orange**) on the 8th curve (Interp\_08) in-between the 7th and the red guide curve, keeping the points on the 8th curve in relative alignment with their "sister" points on the 7th. When you've finished, edit points ( j - u ) should be running straight down the centre between the 7th and the red guide curve, just as in the above example -- easy!



This **Right Viewport** screenshot shows that I've now once again moved edit points ( j - u ) that were previously located in the centre between the 7th and red guide curve across to their respective positions along the Y axis on the red guide curve. Once done, I've then further refined all the edit points ( b - u ) making sure that they line up well with the guide and carefully checked my work. *\*Note* - I've slightly compressed points ( m - s ).

## Front is Fab

- Once you've completed the prior step, double check your work and then minimise the **Right Viewport** by **double left clicking** its label.
- Maximise the **Front Viewport** by **double left clicking** on its label.
- Zoom in on points ( b - i ).
- We will now move points ( b - i ) into position. To do this, start with edit point ( b. ) **left click** on the point -- it will highlight. Then, **hold down the Shift Key**, **left click** on the highlighted point and drag the point until it meets with the red guide curve ( Guide\_08 ) along the X axis while **continuing to hold down the Shift key**.
- Repeat the procedure for all the remaining points ( j - u ) moving them along the X axis into alignment with the red guide curve.

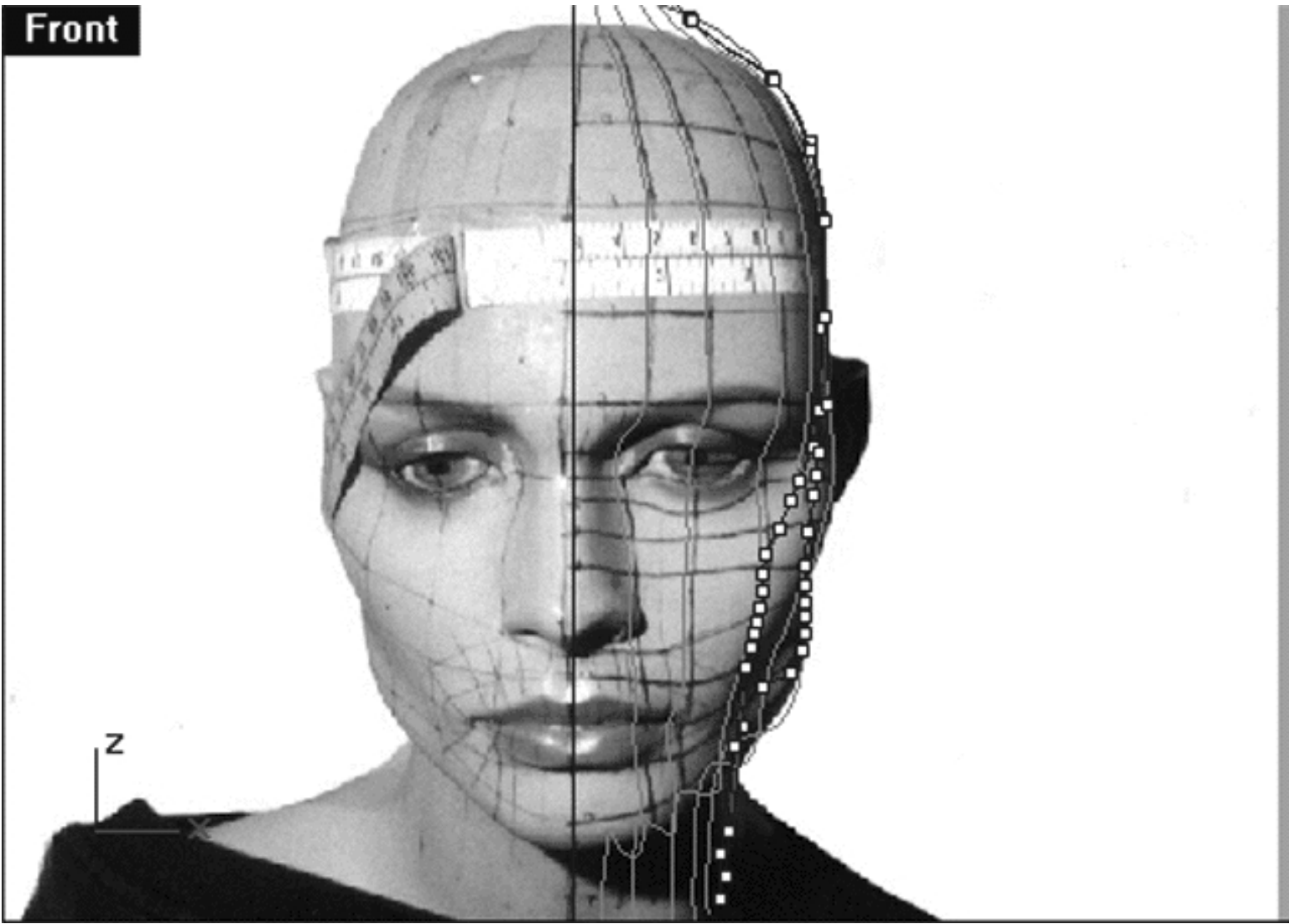
- Once completed, zoom out by choosing the *Zoom Extents icon*  from the toolbar and **clicking** on it.

Front



This **Front Viewport** screenshot shows points ( **b - u** ) on the 8th curve (Interp\_08) just prior to being dragged toward the red guide curve ( Guide\_08 ) along the X axis. The **orange highlight** indicates the 1st set of edit points you should concentrate on moving ( b - i ) and the **green highlight** indicates the 2nd set of edit points to be moved ( j - u ).

## Front



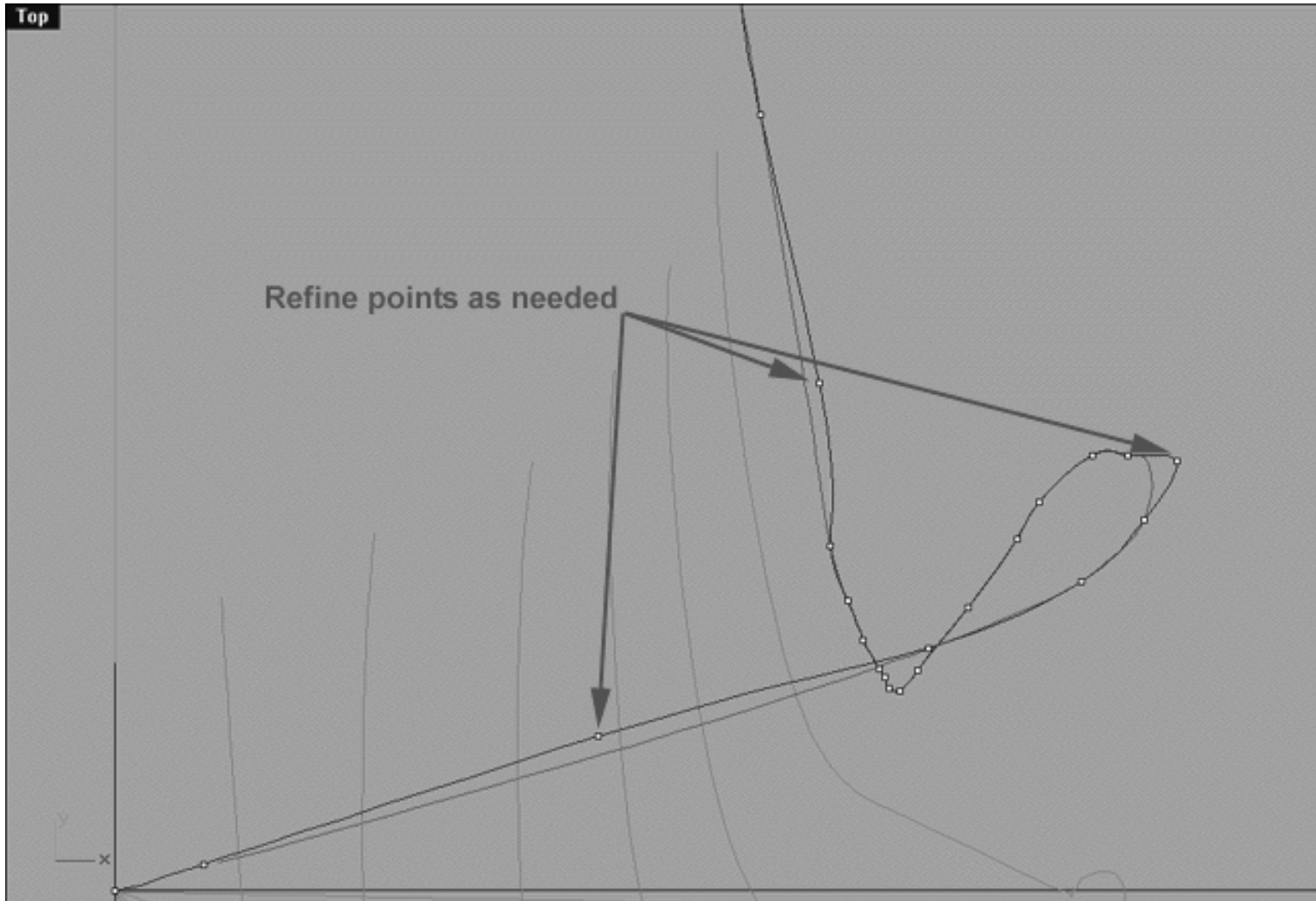
This **Front Viewport** screenshot shows points ( **b - u** ) on the 8th curve (Interp\_08) after having been dragged toward the red guide curve ( Guide\_08 ) along the X axis. \*Note -- the curve running along the side of jaw with its points displayed is the 7th curve (Interp\_07).

## Getting on Top

- Check your work and then minimise the **Front Viewport** by **double left clicking** on its label.
- If you've not done so already, at this stage it would be a good idea to turn off all the edit points and then turn them back on for the 8th curve only, this will prevent any possible confusion.
- Maximise the **Top Viewport** by **double left clicking** on its label.
- If you've not done so already, turn off the annotated dot labels. At the bottom of your screen you will see the *Status Bar*, **right click** on the Layer info box -- the Edit Layers dialogue box will open.
- In the Name field list find the layer called *Annotated Dots* and select the **Off** radio button -- click on **OK** to **Exit**.
- Zoom in on the curve, carefully check to see how well the curve conforms to the guide.



- Correct any misalignment, it is now fairly safe to move any offending points along either the X or Y axis -- to do so, **left click** on the misaligned point -- it will highlight. Then, **hold down the Shift Key, left click** on the highlighted point and drag the point until it meets with the red guide curve ( Guide\_08 ) along the X or Y axis as required while **continuing to hold down the Shift key**. **\*Note -- Your results may vary!** Whether or not any adjustment is needed in the top view at all will depend on how accurately your point editing went in the right and front views previously.



This **Top Viewport** screenshot shows an example of slightly misaligned points (*\*Note -- your results may vary*) on the 8th curve (Interp\_08) just prior to being dragged toward the red guide curve ( Guide\_08 ) along the X or Y axis.

Again, if you're confused about any of this and would like to see how I went about creating this curve then watch the following movie:






**Editing the 8th Curve**

View an example movie [Click Here](#)

# Snapping things up on the 8th curve

The 8th curve has now been completed. Once again, test how well you've done overall at aligning the 8th curve to the guide. Display the points on the guide curve and see how close you came with your edited points. Once done, "snap" all of the 8th curves points to the guide just to stay in sync.

- Minimise the **Front Viewport** by **double left clicking** on its label.
- Maximise the **Right Viewport** by **double left clicking** on its label.
- Now we must unlock the Guide\_08 curve so that we may select and display its points. At the bottom of your screen you will see the *Status Bar*, **right click** on the Layer info box -- the Edit Layers dialogue box will open.
- In the *Name field list* find the layer called Guide\_08 and select the **ON** radio button -- click on **OK** to **Exit**.
- In any Viewport select the Guide\_08 curve by left clicking on it.
- Display its edit points by choosing the *Show edit points icon*  from the toolbar by **left clicking** on it or type the command: EditPtOn at the command line.
- Okay, here comes the test -- take a close look, how close did you manage to come this time?
- Let's refine the points still more. Once again lock the Guide\_08 curve so that we don't mess things up while snapping. At the bottom of your screen you will see the *Status Bar*, **right click** on the Layer info box -- the Edit Layers dialogue box will open.
- In the *Name field list* find the layer called Guide\_08 and select the **Lock** radio button -- click on **OK** to **Exit**.
- Open the *Osnap dialogue box* by moving your cursor to the lower status bar and **left clicking** on its title. The *Osnap dialogue box* will open, enable the *Point snap* by **left clicking** on **Point** -- a check will appear indicating that it is now active. If any boxes are checked/active other than "Point" disable them now.
- **Left click** on the **X** to Exit the Onsap dialogue.
- Temporarily turn off the background reference image by typing the command: **HideBackgroundBitmap** at the command prompt and pressing Enter.
- Starting with point (**b.**) zoom in on a small group of points (about 3 is good) and "snap" each curve point to its associated point on the guide curve, it's important that you re-snap each point -- be sure not to miss any!
- When you've finished working of the first group of 3 points choose and use the Pan View icon  from the toolbar and pan the view a bit further along the contour of the curve. Now start working on the next group of 3 points and continue snapping. Continue this procedure until you've snapped all the remaining points ( **b - u** ).

- Zoom out by choosing the *Zoom Extents All icon*  from the toolbar and **clicking** on it or typing the command: **ZoomExtentsAll** at the command line.
- Minimise the Right Viewport by double left clicking on its label.
- Carefully check over your work in all viewports.
- Restore the background reference image by typing the command: **ShowBackgroundBitmap** at the command prompt.
- Disable any currently active Osnaps.
- Congratulations! -- you've now completed editing the 8th Curve.




## Snapping it up

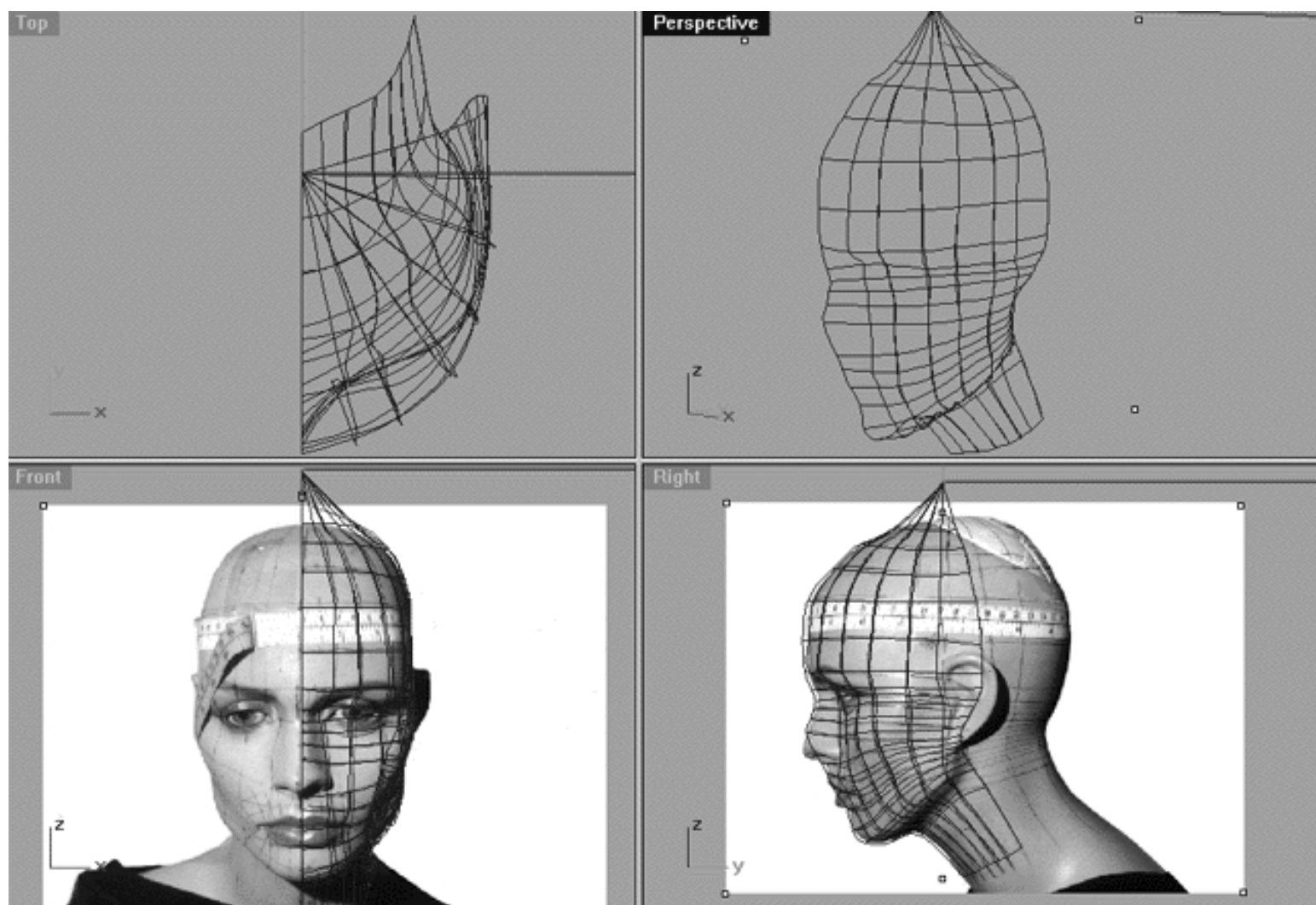
View an example movie [Click Here](#)

## Table Eight - A list of points & coordinates for the completed 8th Curve [Click Here](#)

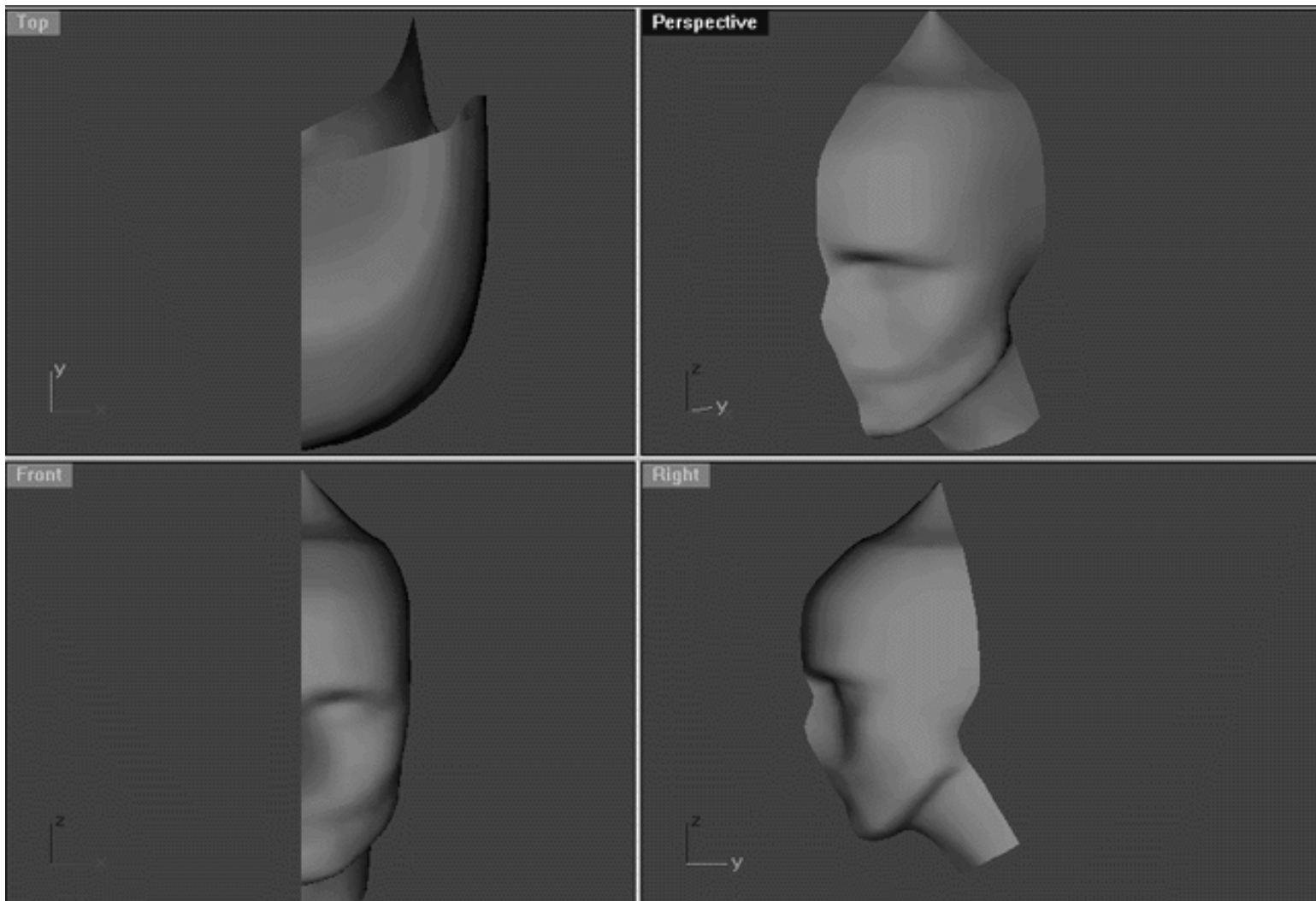
# Testing the Surface

- In the **Perspective Viewport**, zoom in on points ( a - e ) this will make it easier to select the curves.
- Unlock the 1st, 2nd, 3rd, 4th, 5th, 6th and 7th curves by typing the command: **Unlock** at the command line. Once done, the curves should revert to their normal state.
- From the toolbar choose the Loft icon  or type **Loft** at the command line.
- At the command line you will receive the following prompt: **Select curves to loft (point):**
- Now, in the **Perspective Viewport** click directly on curves 1, 2, 3, 4, 5, 6, 7 and 8.
- As you select each curve they should highlight, when you've finished selecting all 8 curves press **Enter**.
- The Loft Options dialogue box should appear. Set the Style drop down box to **Loose**. **click** on the **Shaded Preview** box, a tick should appear. Make sure the Do Not Simplify radio button is active and **click** on the **Preview button**.





This **All Viewport** screenshot shows an example of a loose loft applied to the curves without a quick rendered shaded preview.



This **All Viewport** screenshot shows an example of a surface created by lofting curves 1, 2, 3, 4, 5, 6, 7 and 8 using the "loose" type parameter with a quick rendered shaded preview.

## Shutting Down the Scene

- Confirm that no Osnaps are currently active, disable any that are.
- Open the Edit Layers Dialogue box and turn off Guide\_08.
- Confirm that Layer(s): Interp\_01, Interp\_02, Interp\_03, Interp\_04, Interp\_05, Interp\_06, Interp\_07 and Interp\_08 are ON.
- Left click on the Layer Info box at the Lower Status Bar, highlight the layer entitled SCENE START UP and click on it -- it should now become the active layer and its name should appear in the box.
- Confirm that the newly created curve (Interp\_08) has in fact been associated with the correct layer.
- Hide any points that are currently displayed.
- Zoom Extents All.

- And SAVE YOUR WORK -- aren't you getting just a bit tired of me telling you that ;-)

---

## Summary of Lesson - Curve 8

Largely, creating this curve has been quite a bit easier than those of previous lessons. Despite this, I'm sure you agree that perhaps one of the most difficult things to get right is the general area where the points are increasingly beginning to compress in the neck and jaw area. As you've seen, one of the greatest difficulties you've faced in this lesson is keeping track of the actual identity of the points on the curve that you're working on.

This problem is made all that much more difficult by the fact that when the original profile curve was initially copied and rotated into position its shape while close to where it should be at the top of the curve was way out of line at the bottom. So obviously when you began to drag the points into alignment their sisters on the previous curve the points on the curve naturally became all stretched out making it really difficult to identify the points. As you've now seen this can easily cause confusion and is one of the prime causes of error when constructing organic models such as this.

Once again, one good way to avoid this to some extent is to count your points and mark them with non-permanent pens right on your screen. I know I've been banging on about this for a while now, but it is something you really should be doing as it will make your work so much easier not to mention faster in the long run. Also, sometimes it can be very helpful to turn the background image on and off (as needed) as it can be a cause of some distraction. In addition, it's a very good idea for you to continue to perform continual test lofts while you are trying to place your points and especially so if you're having trouble trying to figure things out.

What ever you do, take your time and think about what you are doing. Don't allow yourself to become flustered or tense if things don't seem to be going smoothly. Step away from the computer for a while, relax and when you return chances are you will see the very thing that was causing you the problem. It's weird but believe it or not your mental attitude does play a huge role in your overall success or failure so stay calm and get Zen because we are just about to move on to the next lesson.

[Go To Next Lesson - Drawing the 9th Curve](#)

RETURN to Top of page -- [Click Here](#)

Written by Joseph R. Saltzman.

Co-produced in association with Steven Ståhlberg

©1998-1999 Cinemagic Productions Limited. All Rights Reserved.

Duplication of this document including images and text by any means is expressly forbidden without prior written consent of Cinemagic Productions Limited.

Web Site: <http://www.cmagic.co.uk> Telephone: +44 (0)1753 733 190 Fax: +44 (0)1753 736 619 email: [cmagic@cmagic.co.uk](mailto:cmagic@cmagic.co.uk)

## MOVIE CREATING THE 8TH CURVE

To **PLAY** the example movie, double click below:

To **RETURN** to the head shape tutorial -- [click here](#).

# MOVIE EDITING THE 8TH CURVE PART ONE

To **PLAY** the example movie, double click below:

To watch **PART TWO** of this movie -- [click here](#).

To **RETURN** to the head shape tutorial -- [click here](#).

# MOVIE EDITING THE 8TH CURVE PART TWO

To **PLAY** the example movie, double click below:

To watch **PART THREE** of this movie -- [click here](#).

To **RETURN** to the head shape tutorial -- [click here](#).

# MOVIE EDITING THE 8TH CURVE PART THREE

To **PLAY** the example movie, double click below:

To **RETURN** to the head shape tutorial -- [click here](#).



# MOVIE SNAPPING UP THE 8TH CURVE

To **PLAY** the example movie, double click below:

To **RETURN** to the head shape tutorial -- [click here](#).

TABLE 8

POINT	X AXIS	Y AXIS	Z AXIS
a - North Pole	0.000	0.000	0.000
Phantom point 1	5.496	1.646	-6.284
b - Head top 1	29.667	8.297	-30.156
c - Head top 2	49.879	14.831	-45.082
d - Head top 3	59.268	18.936	-62.045
e - Hairline	63.078	22.692	-80.865
f - Temple	63.895	26.265	-108.865
g - Browbone	62.082	26.628	-129.202
h - Crease of top eyelid	59.887	26.650	-138.760
i - Eye centre line	56.622	23.768	-147.631
j - Under-eye area	55.279	21.489	-152.627
k - Bridge of nose	52.276	17.331	-159.347
l - Cheek apple	49.177	13.454	-166.507
m - Nose base, cheek bone	48.086	12.200	-171.953
n - Upr lip, cheek hollow	47.445	12.426	-175.377
o - Centre of mouth, cheek hollow	47.213	13.065	-179.497
p - Lwr lip under, cheek hollow	46.850	13.573	-182.795
q - Tip of chin	45.894	15.316	-186.163
r - Jawline	44.909	17.791	-189.971
s - Nape of neck	43.833	21.101	-194.686
t - Neck	42.294	31.065	-209.382
Phantom point 2	39.562	47.472	-236.419
u - Base of neck	38.425	54.112	-247.778

**RETURN** to tutorial -- [Click Here](#)

**RETURN** to previous lesson -- [Click Here](#)




## THE 9TH CURVE


### Contents:

- [Scene Setup](#)
- [Creating the 9th curve](#)
- [Example Movie -- Creating the 9th Curve](#)
- [Editing the 9th curve -- Something New in the Right View](#)
- [Front is Fab](#)
- [Getting on Top](#)
- [Example Movie -- Editing the 9th Curve](#)
- [Snapping things up on the 9th curve](#)
- [Table Nine - A list of points & coordinates for the completed 9th Curve](#)
- [Testing the Surface](#)
- [Shutting Down the Scene](#)
- [Summary of Lesson -- Curve 9](#)

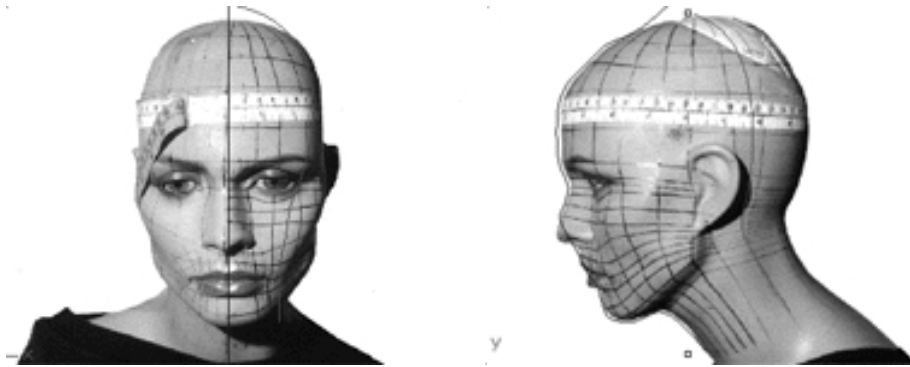
---

## Scene Setup

- If you've not done so already start a Rhinoceros session by **double clicking** on the desktop icon  the application will begin.
- Choose File, Open from the menu bar and double click on **START\_A.3DM** in the file list, it will load and open.
- Confirm at the Lower Status Bar the currently active layer is entitled SCENE START UP. If it is active proceed to the next step, if its not then make it active by left clicking on the layer box, highlighting the correct layer and clicking on it.
- Again, at the Layers Box on the Lower Status Bar this time right click on the box, the Edit Layers Dialogue box will open. Confirm the following switches have been enabled or disabled:
- The Layer entitled Annotated Dots\_1 should be OFF.
- The Layer entitled Interp\_01 (the Profile Curve) should be ON.


- The Layer entitled Interp\_02 should be ON.
  - The Layer entitled Interp\_03 should be ON.
  - The Layer entitled Interp\_04 should be ON.
  - The Layer entitled Interp\_05 should be ON.
  - The Layer entitled Interp\_06 should be ON.
  - The Layer entitled Interp\_07 should be ON.
  - The Layer entitled Interp\_08 should be ON.
  - The Layer entitled Guide\_09 should be LOCKED.
  - The Layer entitled Photopoints should be ON.
  - The Layer entitled Frozen should be LOCKED.
  - The Layer entitled SCENE START UP should be ON.
  - When you've finished making your changes ( if any ) click on OK.
  - All other layers should be set to OFF.
  - Confirm that you can see the background image in the Front and Right viewports.
  - Confirm that the grid display in the viewports has been disabled, if not turn it off now.
  - Confirm that no Osnaps are currently enabled, if any are disable them.
  - Confirm that no edit points are currently displayed, if any are hide them.
  - Zoom out all the viewports by selecting the Zoom Extents All icon  or by typing zea at the command line and pressing ENTER.
-

## Creating the 9th curve





**Description:** The 9th curve begins at the top pole and runs along the back side of the head, behind the ear and straight on ending at the base of the neck.

You will create the 9th curve by rotation of the profile in much the same way as the 8th as if you couldn't have guessed.

- Hold down the **Ctrl** key and select the **Interp\_02, Interp\_03, Interp\_04, Interp\_05, Interp\_06, Interp\_07 and Interp\_08** curves by **left clicking** on them, then *lock* the curves by typing the command: Lock at the command line and then press **Enter**.
- Create a new layer -- At the bottom of your screen you will see the *Lower Status Bar*, **right click** on the *Layer info box* -- the *Edit Layers dialogue box* will open.
- **Left click** on the **New** button and in the *Name field* type: **Interp\_09**.
- Move the cursor to the *colour field*, **left click** on the *colour field*, the "*Select a colour*" dialogue and colour wheel will appear, choose a nice bright blue (i.e. **R:0 G:0 B:255**) then click **OK**
- You will be returned to the *Edit Layers dialogue box* again, **left click** on **OK** to exit.
- Return your cursor to the *Status Bar* at the bottom of the screen and **left click** on the *Layer info box* -- the Layers list will appear.
- Locate **Interp\_09** in the list (the one you created a few moments ago) and move your cursor over its name (it will highlight) **left click** on it to make the layer currently active.
- Open the *Osnap dialogue box* by moving your cursor to the *lower status bar* and **left clicking** on its title. The *Osnap dialogue box* will open, enable the *End snap* by **left clicking** on End -- a check will appear indicating that it is now active. If any boxes are checked/active other than "End" disable them now.
- Close the *Osnap dialogue box* by clicking on **X**.
- In **Any Viewport** Select the 1st curve (i.e. Interp\_01) by **left clicking** on it -- it will highlight.
- From the toolbar **left click** on the Rotate 2D icon  or type: **Rotate** at the command line.
- At the command line you will receive the following prompt: **Choose centre of rotation (copy)**

- Type: **copy** at the command line and press **Enter**.
- In the **Right Viewport** Move your cursor to point (a. -- X:0, Y:0, Z:0) on the first profile curve (i.e. Interp\_01) -- the cursor should snap to it, when it does **left click**.
- The system will respond with the following prompt at the command line: **Angle or first reference point:**
- Now, move your cursor into the **Top Viewport** and bring the cross hairs to about the 6 o'clock position (near the bottom of the window) once you've done this **press and hold down the Shift Key** on your keyboard -- the curve should align itself perfectly along the Y axis.
- While still **holding the Shift Key down**, drag the cursor along the -Y axis about **130** units and **left click**.
- The system will then respond with the following prompt at the command line: **Second reference point:**
- Rotate the curve anti-clockwise about **126 degrees** and **left click**.
- Press **Esc** on your keyboard to complete the operation.


- In the **Any Viewport** select the newly rotated curve by **left clicking** on it -- it will highlight.

- Choose the *Layer Control Icon*  from the toolbar by **left clicking** on it and **holding down the key** -- select the *Change Layer Icon*  from the flyout.

- Select **Interp\_09** from the *Pick layer for object dialogue* -- it will highlight. This will make certain that Interp\_09 has been associated with the correct layer.

- Click **OK**

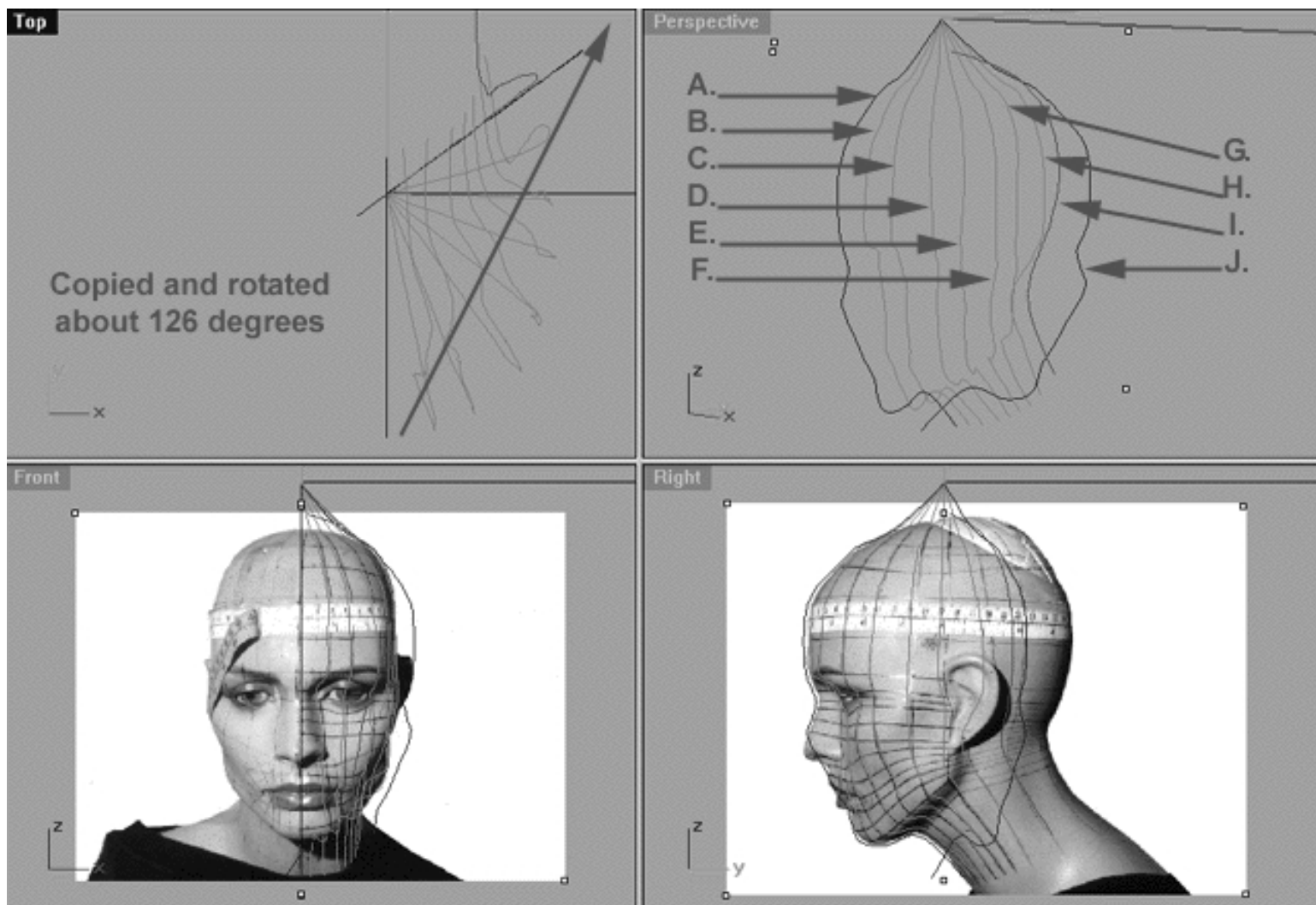
- Disable any currently active Osnaps

- Choose the Zoom Extents All Viewports icon  from the toolbar or type the command: ZoomExtentsAll at the command line.



## Creating the 9th Curve

View an example movie [Click Here](#)



This **All Viewport** screenshot shows our original profile curve (A) after having been copied and rotated about **126** degrees on its centre and now located at position ( J ). (B) represents the now locked 2nd curve, (C) represents the now locked 3rd curve, (D) represents the now locked 4th curve, (E) represents the now locked 5th curve, (F) represents the now locked 6th curve, (G) represents the now locked 7th curve, (H) represents the now locked 8th curve and ( I ) in red represents where our newly rotated curve ( J ) should be positioned once the points have been appropriately edited.

## Editing the 9th Curve - Something New in the Right View

Once again, this time round we are going to start off in the right viewport.

- Maximise the **Right Viewport** if you've not done so already by **double left clicking** on its label.
- Turn ON the annotated dot labels. At the bottom of your screen you will see the *Status Bar*, **right click** on the Layer info box -- the Edit Layers dialogue box will open.
- In the Name field list find the layer called *Annotated Dots\_1* and select the **ON** radio button -- click on **OK** to **Exit**.
- Unlock all the curves.



- Now switch to the **Perspective Viewport** and maximise, let's lock the curves by first holding down the Ctrl key and **left clicking** on curves 1, 2, 3, 4, 5, 6 and 7 -- they will highlight. Now *lock* the curves by typing the command: **Lock** at the command line and then press **Enter**. When you've finished return to the **Right Viewport** and maximise.
- If you've not already done so, display the edit points for the previous curve (Curve 8 - Interp\_08) and the newly rotated curve (Interp\_09), select the curves by holding down the Ctrl key and **left clicking** on them -- they will highlight.

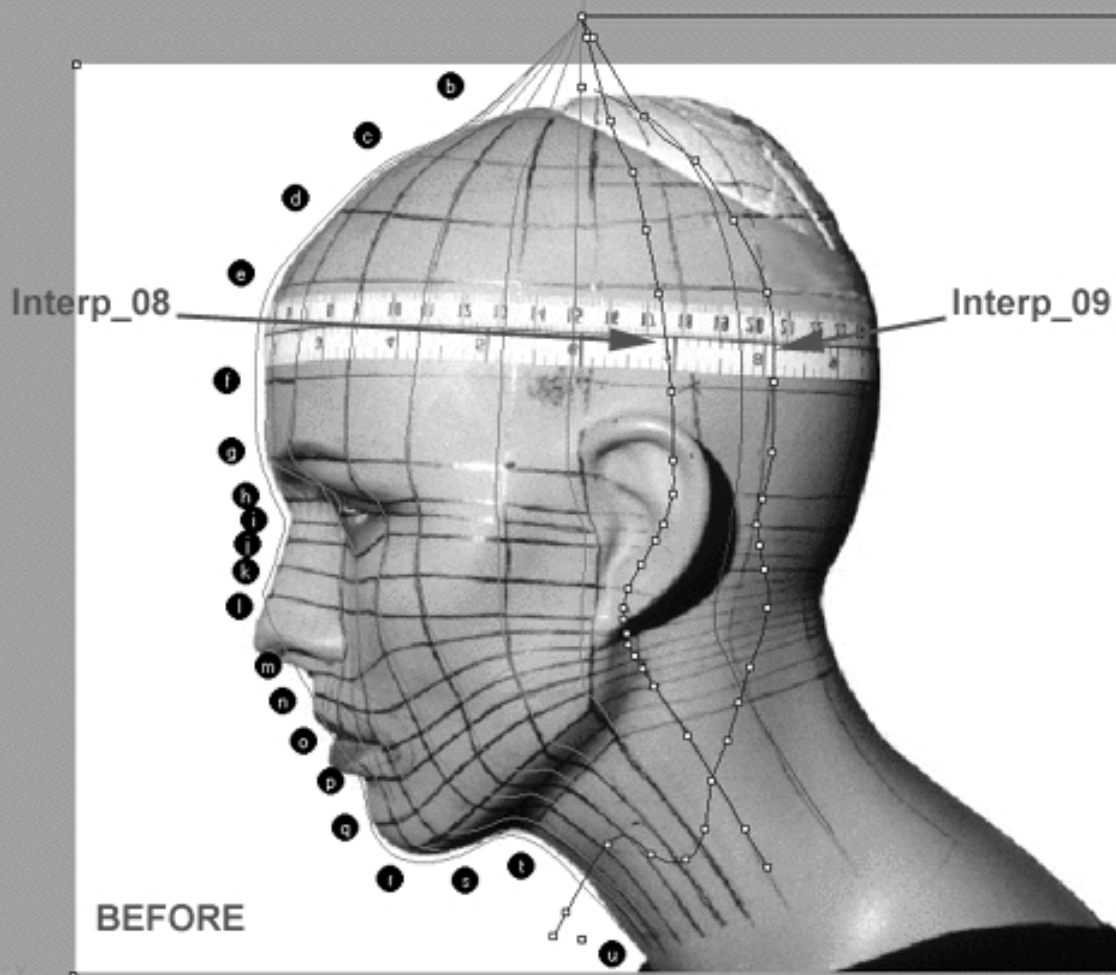


- Then choose the *Show edit points icon* from the toolbar by **left clicking** on it or type the command: **EditPtOn** at the command line.
- Lock the layer containing the 8th Curve (Interp\_08).
- Begin by moving edit points ( i - u ) to do this, **left click** on a point -- it will highlight, now start by aligning each point on the 9th curve with its "sister" point on the 8th. Once you've done this drag each of the points back toward the red guide placing them just to the right hand side of it as in the screenshot below entitled after. If you're getting confused, check out the screenshots below or you may wish to watch the movie.

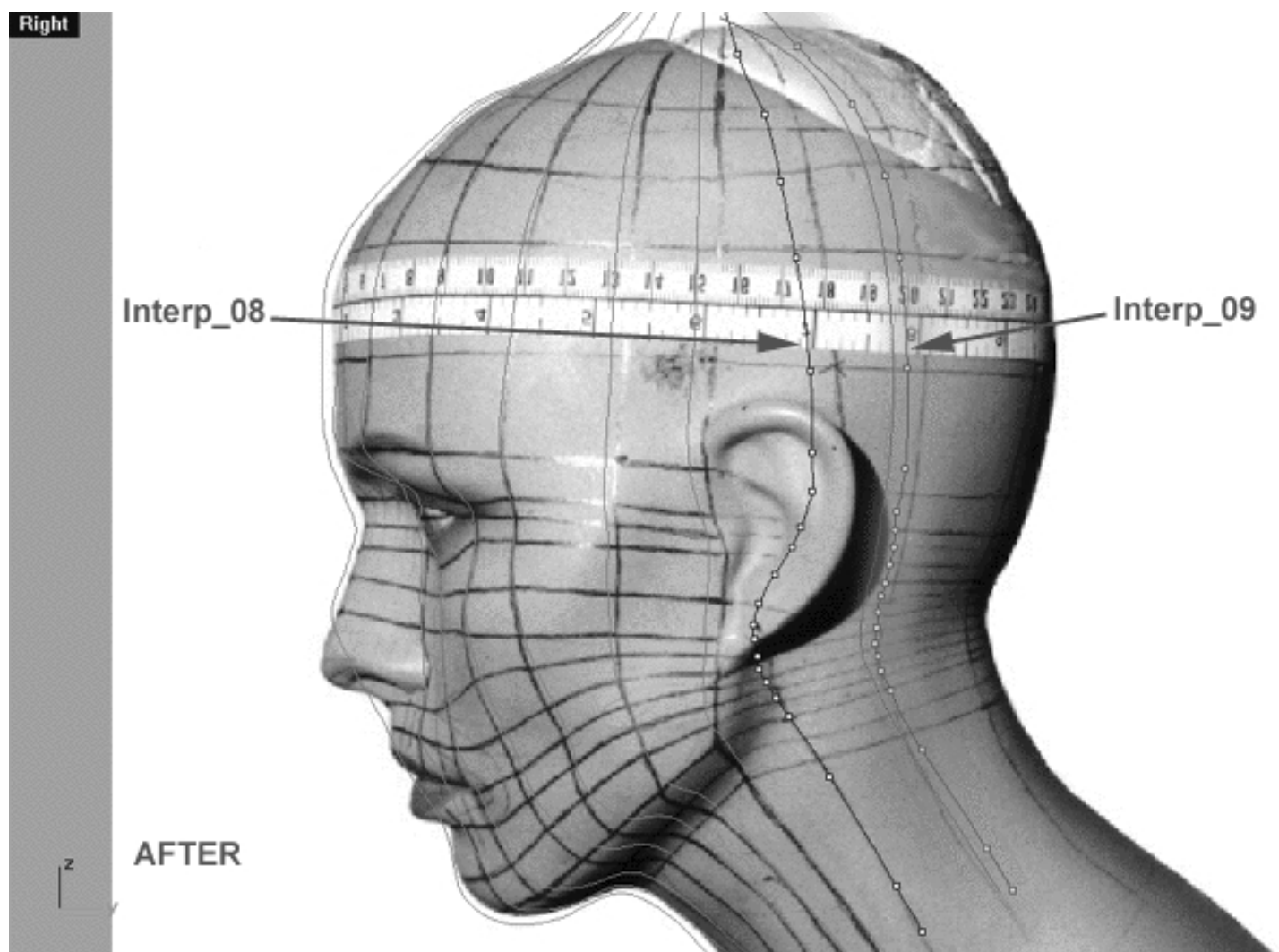
**\*Hint** -- you possibly may be able to get away with holding the Shift key down while dragging for about points ( b - l ). However, you're not going to be able to do it for points ( m - u ) because of the general curvature and compression of the points taking place in the jaw and neck area.

**\*Tip**-- Here is a little trick that you may find helpful in establishing the point alignment in this problematic area. When you click on a point and begin to drag it you will notice that a black line about one pixel in width is formed from the point of dragging to wherever you're moving the cross hairs of your cursor, do you see it, good. Well, you can use this black line to help you keep your "aim" in reasonable alignment and headed with the contour of the face by lining up the black line with outline drawn on the background image.

Right



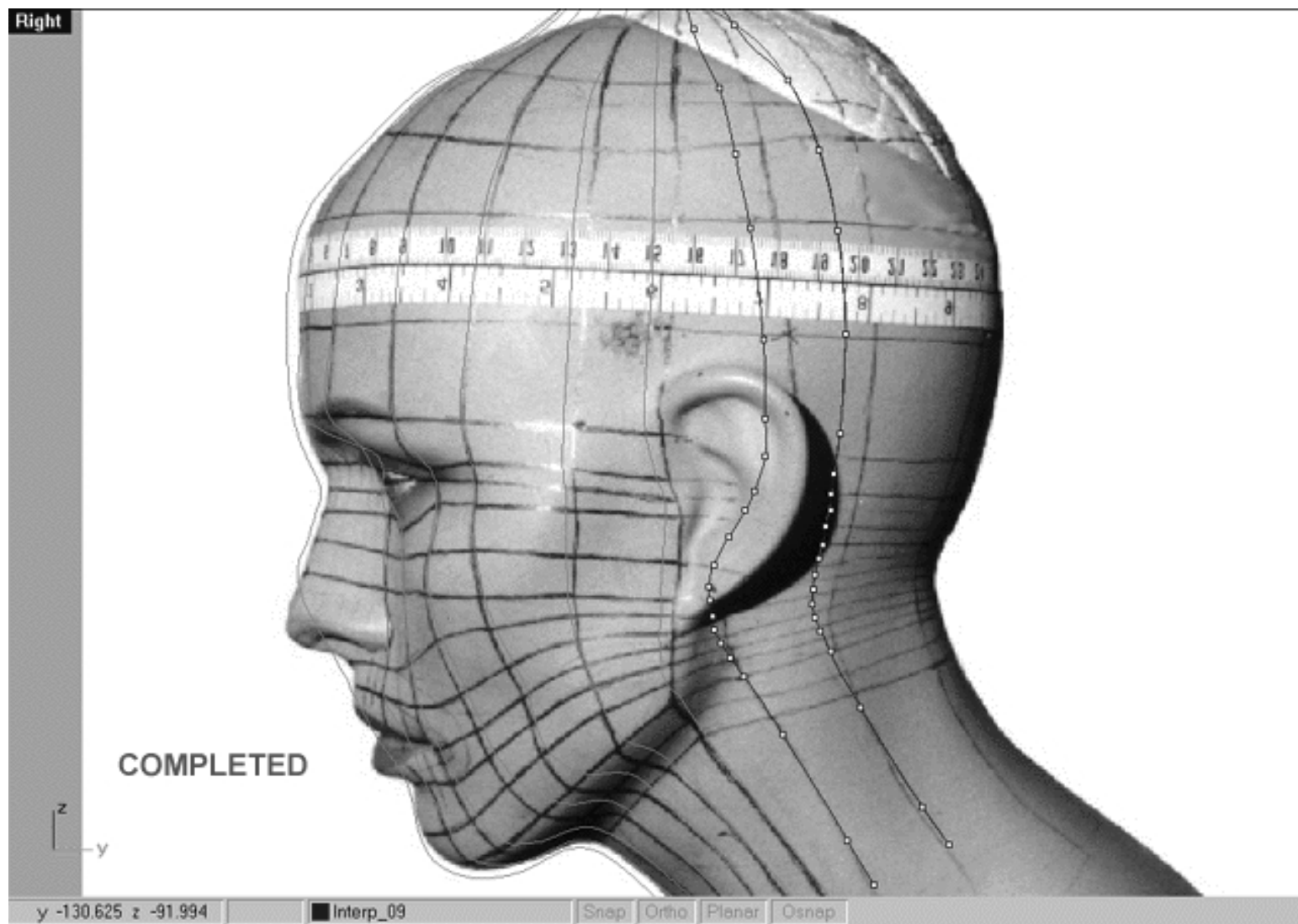
This **Right Viewport** screenshot shows the 8th Curve (Interp\_08) with its edit points displayed, the 9th Curve that we are currently editing (Interp\_09) again with its edit points displayed and also the red guide curve (Guide\_09).



This **Right Viewport** screenshot shows that starting at about point ( b ) I've begun to move all the edit points (**highlighted in orange**) on the 9th curve (Interp\_09) just to the right side of the red guide curve, keeping the points on the 9th curve in relative alignment with their "sister" points on the 8th whilst compensating for the curvature of the head/neck by compressing the points.

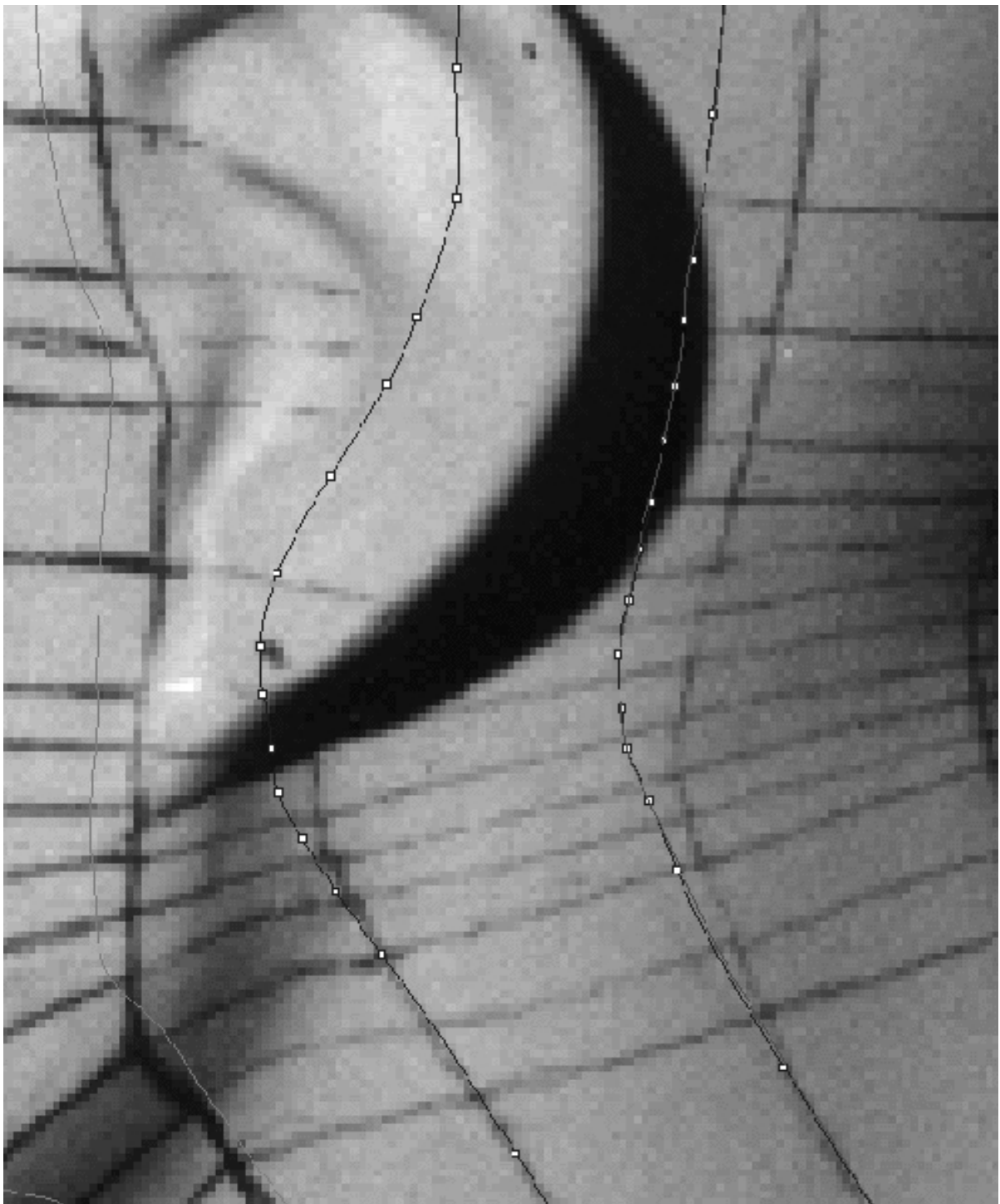
**\*Note** - There is no particular reason why I moved the 9th curve to the right side of red guide curve other than because had I moved it to the left side editing would have been more difficult due to the nasty shadow that is obscuring the guide lines that are drawn on the model. The fact is that you can move the points on the 9th curve to either side or even directly on top of the guide curve if you wish, it makes no difference whatsoever. The objective is only to "straighten" out the 9th curve in order to make the overall editing of its points easier to accomplish.

**\*Tip** - Once again, you have to make an "educated" guess as to where to move the edit points of the 9th curve. As you can see from the previous screenshot the points in the neck area (where the neck connects with the base of the skull) are becoming increasingly more "compressed" with each additional curve we've created. Therefore, when you set about trying to calculate or perhaps more accurately "guess" where you should be moving the edit points on the 9th curve to, you need to first look at where their "sister" points are on the 8th curve and then make a judgment as to where they should go next based on the design plan of your head which is depicted by the grid lines drawn in pen on the background image. Remember, you can't completely rely on the background image and its grid for your information because it is not entirely accurate, rather, you need to balance what all your visual sources are telling you and then make your best "educated" guess.



This **Right Viewport** screenshot shows that I've now moved edit points ( b - u ) on the 9th curve (Interp\_09) to their final positions along the Y axis on the red guide curve, having made educated judgements as to where they should go. Once done, I've then further refined all the edit points ( b - u ) making sure that they line up well with the guide and then carefully double checked my work. **\*Note** -Pay attention to how the points are becoming more compressed in the area where the neck meets the base of the skull.






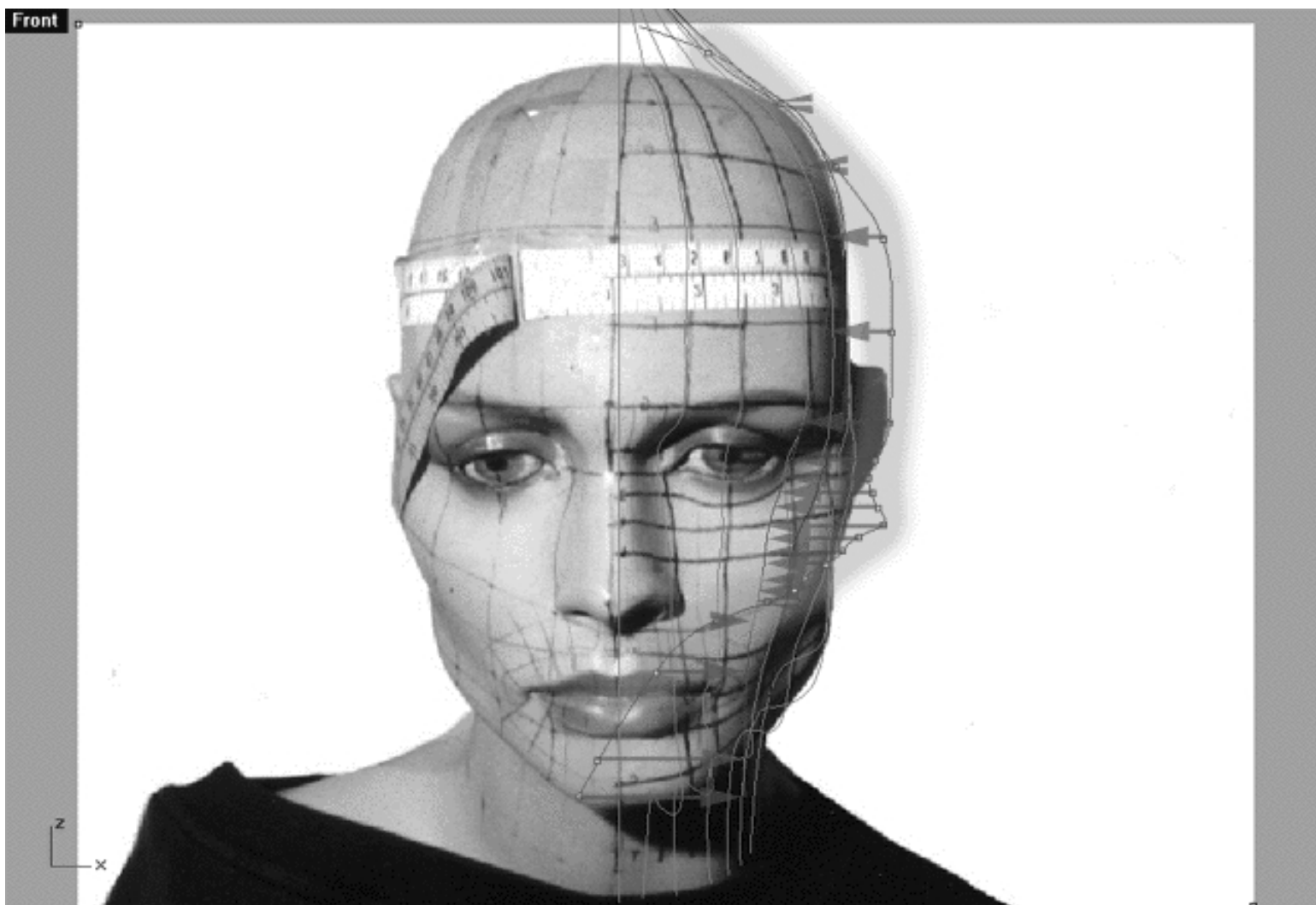
This **Right Viewport** screenshot detail shows edit points ( g - t ) the main area of compression in the jaw and neck area. Study this image carefully and pay particular attention the differences in point alignment between the previous curve (Interp\_08) and the curve we are now editing (Interp\_09).

---

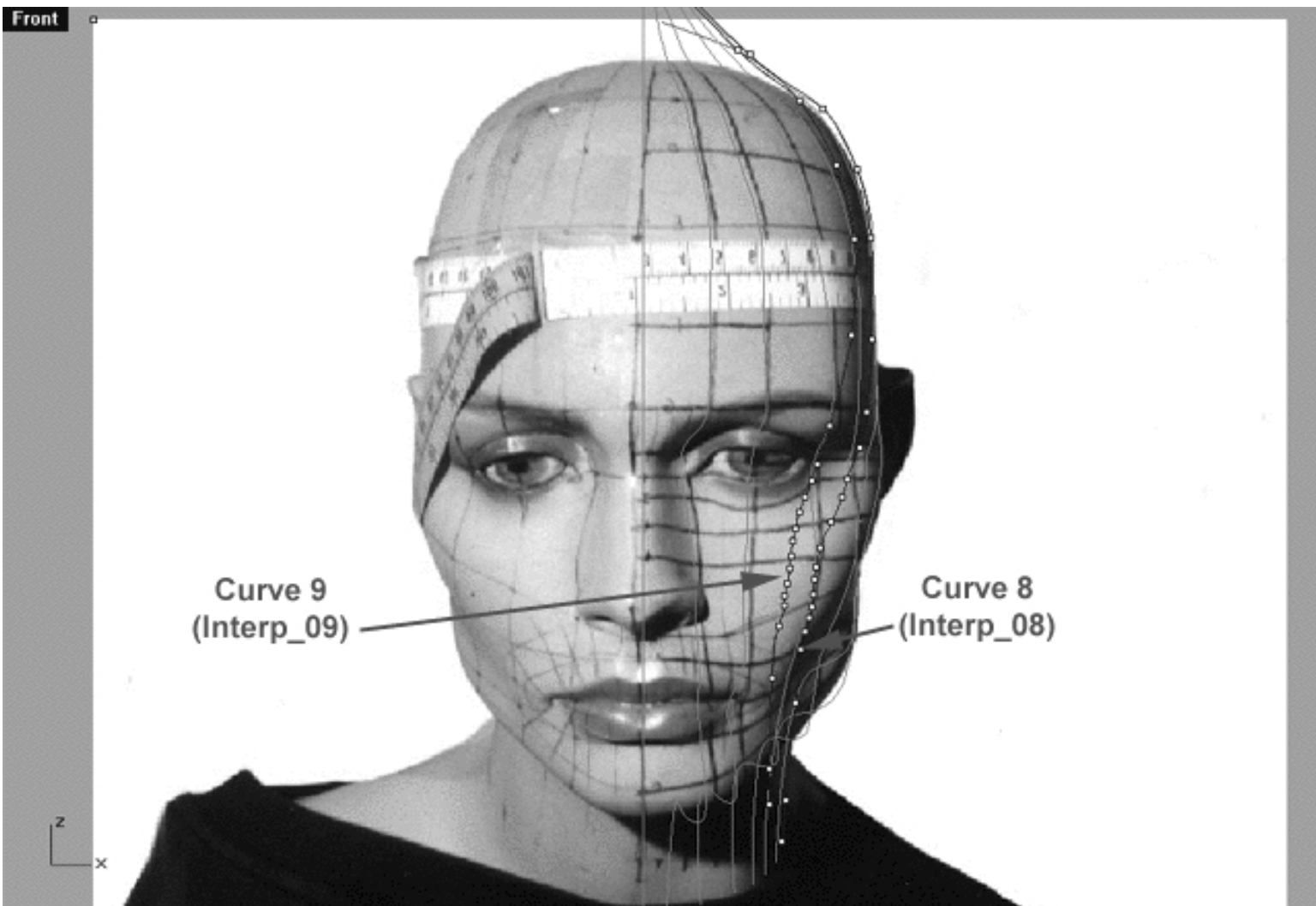
## Front is Fab

- Once you've completed the prior step, double check your work and then minimise the **Right Viewport** by **double left clicking** its label.
- Maximise the **Front Viewport** by **double left clicking** on its label.

- Hide all the edit points.
- Display the edit points for the **9th curve only (Interp\_09)**.
- Zoom in tightly on points ( **b - i** ).
- We will now move points ( **b - i** ) into position. Starting with edit point ( **b.** ) **left click** on the point -- it will highlight. Then, **hold down the Shift Key, left click** on the highlighted point and drag the point until it meets with the red guide curve ( **Guide\_09** ) along the **X** axis while **continuing to hold down the Shift key**.
- Repeat the procedure for all the remaining points ( **j - u** ) moving them along the **X** axis into alignment with the red guide curve.
- Once completed, zoom out by choosing the *Zoom Extents icon*  from the toolbar and **clicking** on it.

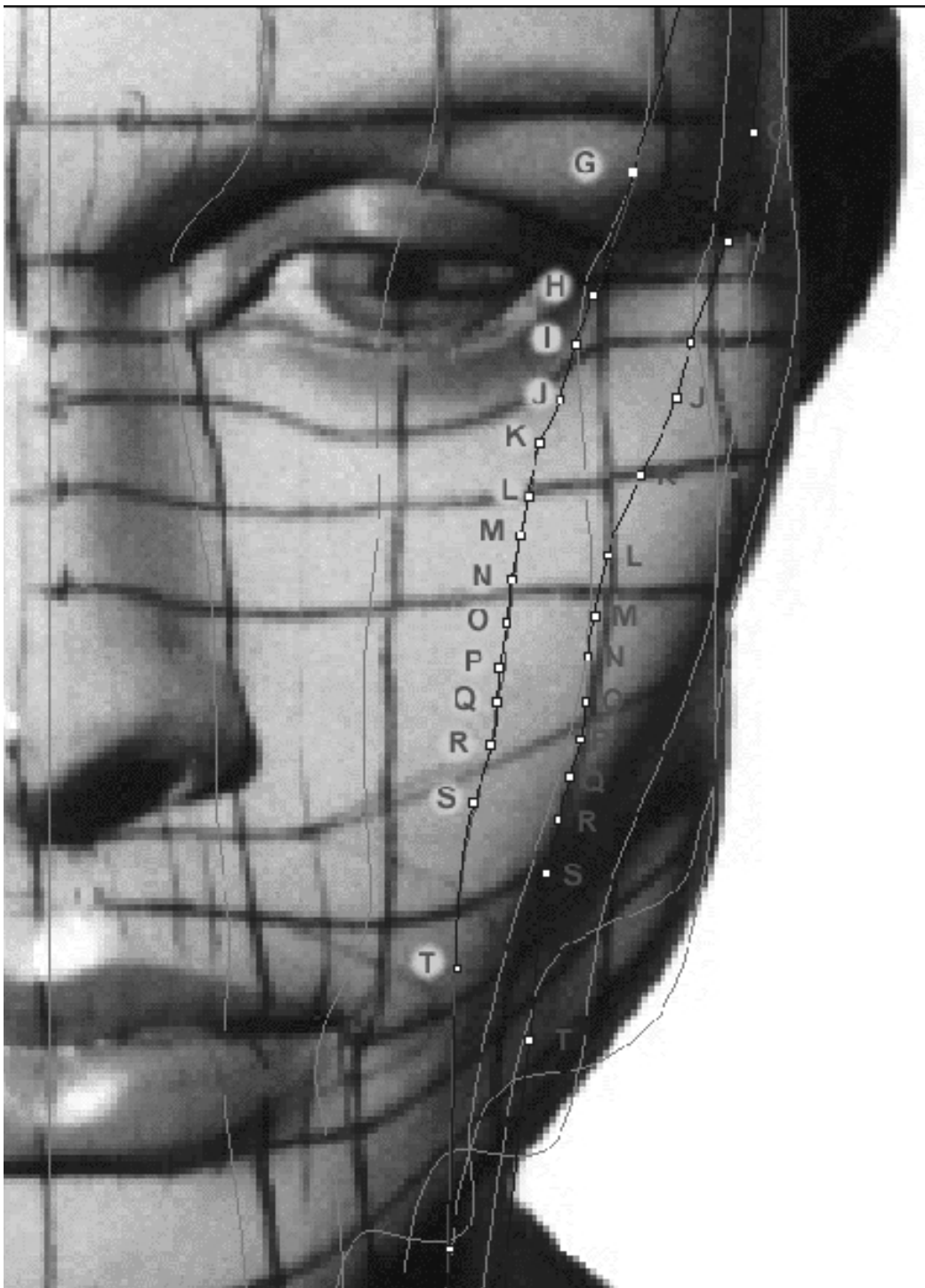


This **Front Viewport** screenshot shows points ( **b - u** ) on the 9th curve (Interp\_09) just prior to being dragged toward the red guide curve ( **Guide\_09** ) along the **X** axis.



This **Front Viewport** screenshot shows points ( **b - u** ) on the 9th curve (Interp\_09) after having been dragged toward the red guide curve ( Guide\_09 ) along the X axis. Take some time and pay particular attention to studying the relationships between the points on curves 8 and 9. ***\*Tip*** -- One common mistake that is often made is that of confusing the curves, so don't do that! Be sure that the point or curve that you wish to edit is really the correct one..!



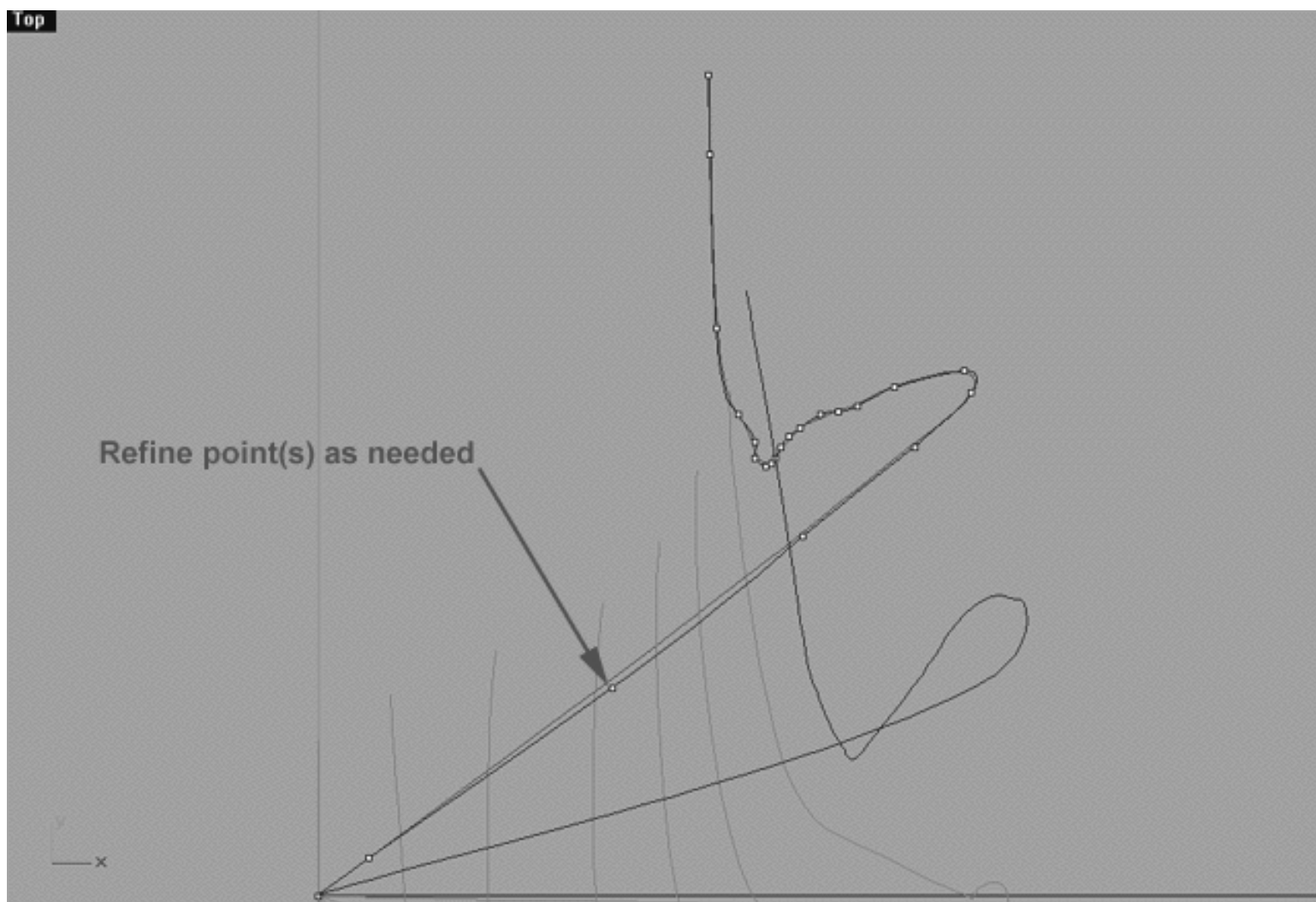


Here is another view. This **Front Viewport** screenshot detail shows points in the main area of compression ( g - t ) on the 9th and 8th curve. *\*Note--* The 9th curve is the one with the yellow dots, so don't get mixed up. Study this screenshot and pay close attention to the relationships between the points on the 9th and 8th curves.

## Getting on Top

- Check your work over carefully and then minimise the **Front Viewport** by **double left clicking** on its label.
- If you've not done so already, at this stage it would be a good idea to turn off all the edit points and then turn them back on for the 9th curve only, this will prevent any possible confusion.

- Maximise the **Top Viewport** by **double left clicking** on its label.
- Turn off the annotated dot labels. At the bottom of your screen you will see the *Lower Status Bar*, **right click** on the Layer info box -- the Edit Layers dialogue box will open.
- In the Name field list find the layer called *Annotated Dots\_1* and select the **Off** radio button -- click on **OK** to **Exit**.
- Zoom in quite tightly on the curve, carefully check to see how well the curve conforms to the guide.
- Correct any misalignment, it is now fairly safe to move any offending points along either the **X** or **Y** axis -- to do so, **left click** on the misaligned point -- it will highlight. Then, **hold down the Shift Key, left click** on the highlighted point and drag the point until it meets with the red guide curve ( Guide\_09 ) along the X or Y axis as required while **continuing to hold down the Shift key**. **\*Note -- Your results may vary!** Whether or not any adjustment is needed in the top view at all will depend on how accurately your point editing went in the right and front views previously.



This **Top Viewport** screenshot shows an example of slightly misaligned points (**\*Note -- your results may vary**) on the 9th curve (Interp\_09) just prior to being dragged toward the red guide curve ( Guide\_09 ) along the X or Y axis.

As ever, if you're confused about any of this and would like to see how I went about creating this curve then watch the following movie:






## Editing the 9th Curve

View an example movie [Click Here](#)

# Snapping things up on the 9th curve

The 9th curve has now been completed. Once again, test how well you've done overall at aligning the 9th curve to the guide. Display the points on the guide curve and see how close you came with your edited points. Once done, "snap" all of the 9th curves points to the guide just to stay in sync.

- Minimise the **Front Viewport** by **double left clicking** on its label.
- Maximise the **Right Viewport** by **double left clicking** on its label.
- Now we must unlock the Guide\_09 curve so that we may select and display its points. At the bottom of your screen you will see the *Status Bar*, **right click** on the Layer info box -- the Edit Layers dialogue box will open.
- In the *Name field list* find the layer called Guide\_09 and select the **ON** radio button -- click on **OK** to **Exit**.
- In any Viewport select the Guide\_09 curve by left clicking on it.
- Display its edit points by choosing the *Show edit points icon*  from the toolbar by **left clicking** on it or type the command: **EditPtOn** at the command line.
- Okay, here comes your test -- take a close look, how close did you manage to come this time?
- Let's refine the points still more. Once again lock the Guide\_09 curve so that we don't mess things up while snapping. At the bottom of your screen you will see the *Status Bar*, **right click** on the Layer info box -- the Edit Layers dialogue box will open.
- In the *Name field list* find the layer called Guide\_09 and select the **Lock** radio button -- click on **OK** to **Exit**.
- Open the *Osnap dialogue box* by moving your cursor to the lower status bar and **left clicking** on its title. The *Osnap dialogue box* will open, enable the *Point snap* by **left clicking** on **Point** -- a check will appear indicating that it is now active. If any boxes are checked/active other than "Point" disable them now.
- **Left click** on the **X** to Exit the Onsap dialogue.
- Temporarily turn off the background reference image by typing **HideBackgroundBitmap** at the command prompt.

- Starting with point (**b.**) zoom in on a small group of points (about 3 is good) and "snap" each curve point to its associated point on the guide curve, it's important that you re-snap each point -- be sure not to miss any!
- When you've finished working of the first group of 3 points choose and use the Pan View icon  from the toolbar and pan the view a bit further along the contour of the curve. Now start working on the next group of 3 points and continue snapping. Continue this procedure until you've snapped all the remaining points ( **b - u** ).
- Zoom out by choosing the *Zoom Extents All icon*  from the toolbar and **clicking** on it or typing the command: `ZoomExtentsAll` at the command line.
- Minimise the Right Viewport by double left clicking on its label.
- Carefully check over your work in all viewports.
- Restore the background reference image by typing the command: **ShowBackgroundBitmap** at the command prompt.
- Disable any currently active Osnaps.
- Congratulations! -- you've now completed editing the 9th Curve.




## Snapping it up

View an example movie [Click Here](#)

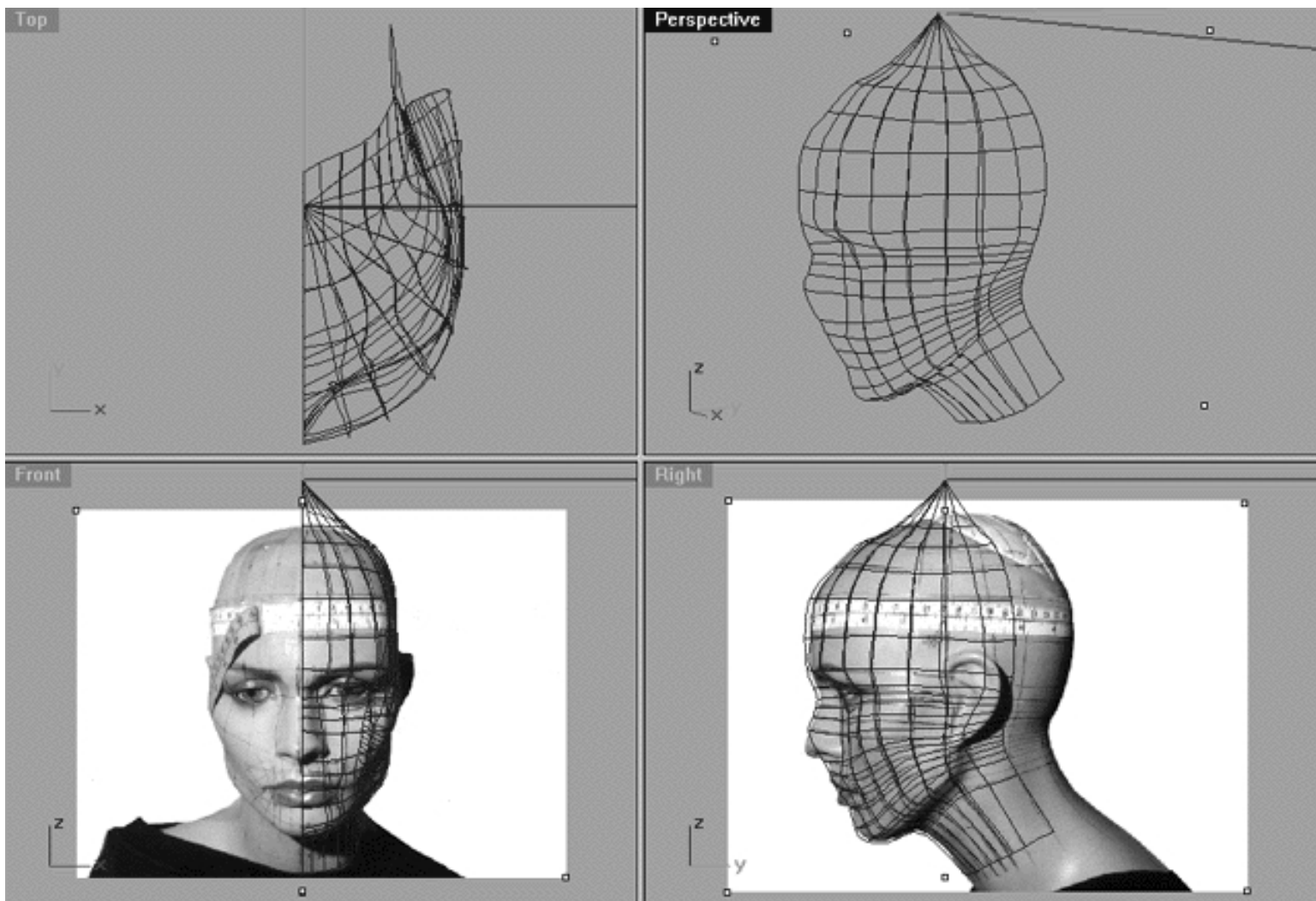
Table Nine - A list of points & coordinates  
for the completed 9th Curve [Click Here](#)

# Testing the Surface

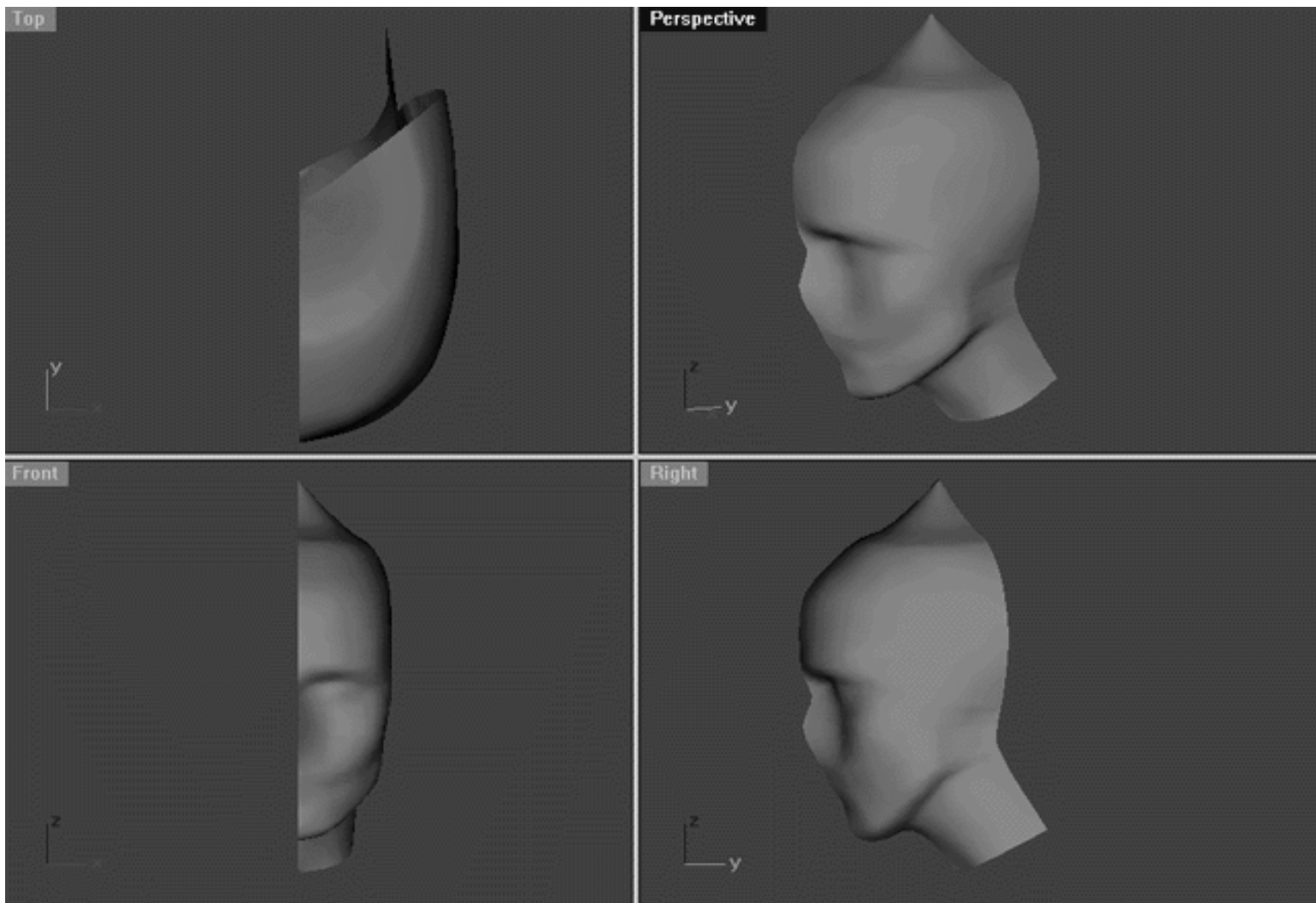
- In the **Perspective Viewport**, zoom in on points ( **a - e** ) this will make it easier to select the curves.
- Unlock all curves by typing the command: **Unlock** at the command line. Once done, the curves should revert to their normal state.
- From the toolbar choose the Loft icon  or type the command: **Loft** at the command line.
- At the command line you will receive the following prompt: **Select curves to loft (point):**
- Now, in the **Perspective Viewport** click directly on curves 1, 2, 3, 4, 5, 6, 7, 8 and 9.



- As you select each curve they should highlight, when you've finished selecting all 9 curves, then press **Enter**.
- The Loft Options dialogue box should appear. Set the Style drop down box to **Loose**. **click** on the **Shaded Preview** box, a tick should appear. Make sure the Do Not Simplify radio button is active and **click** on the **Preview button**.



This **All Viewport** screenshot shows an example of a loose loft applied to the curves without a quick rendered shaded preview.



This **All Viewport** screenshot shows an example of a surface created by lofting curves 1, 2, 3, 4, 5, 6, 7, 8 and 9 using the "loose" type parameter with a quick rendered shaded preview.

## Shutting Down the Scene

- Confirm that no Osnaps are currently active, disable any that are.
- Open the Edit Layers Dialogue box and turn off Guide\_09
- Confirm that Layer(s): Interp\_01, Interp\_02, Interp\_03, Interp\_04, Interp\_05, Interp\_06, Interp\_07, Interp\_08 and Interp\_09 are ON.
- Left click on the Layer Info box at the Lower Status Bar, highlight the layer entitled SCENE START UP and click on it -- it should now become the active layer and its name should appear in the box.
- Confirm that the newly created curve (Interp\_09) has in fact been associated with the correct layer.
- Hide any points that are currently displayed.
- Zoom Extents All.
- Oh yeah, And SAVE YOUR WORK..!

## Summary of Lesson - Curve 9

Well, editing this curve was a bit more difficult than the previous lesson. This is mainly due to its positioning within the head and the fact that the points are really starting to compress a great deal more in the jaw and lower neck area. Once again, taking your time and thinking about the moves you make is key to getting the point editing and placement spot on. You should now be using all the techniques that you've learned so far, such as: Aligning the points with their sisters on previous curves, highlighting single points and observing them from multiple views, making educated judgements as to point placement based on all the visual information available to you, verifying single points before moving them, performing test lofts and so on.

[Go To Next Lesson - Drawing the 10th Curve](#)

RETURN to Top of page -- [Click Here](#)

Written by Joseph R. Saltzman.

Co-produced in association with Steven Ståhlberg

©1998-1999 Cinemagic Productions Limited. All Rights Reserved.

Duplication of this document including images and text by any means is expressly forbidden without prior written consent of Cinemagic Productions Limited.

Web Site: <http://www.cmagic.co.uk> Telephone: +44 (0)1753 733 190 Fax: +44 (0)1753 736 619 email: [cmagic@cmagic.co.uk](mailto:cmagic@cmagic.co.uk)



# MOVIE CREATING THE 9TH CURVE

To **PLAY** the example movie, double click below:

To **RETURN** to the head shape tutorial -- [click here](#).

# MOVIE EDITING THE 9TH CURVE PART ONE

To **PLAY** the example movie, double click below:

To watch **PART TWO** of this movie -- [click here](#).

To **RETURN** to the head shape tutorial -- [click here](#).

# MOVIE EDITING THE 9TH CURVE PART TWO

---

To **PLAY** the example movie, double click below:

To watch **PART THREE** of this movie -- [click here](#).

To **RETURN** to the head shape tutorial -- [click here](#).

# MOVIE EDITING THE 9TH CURVE PART THREE

To **PLAY** the example movie, double click below:

To watch **PART FOUR** of this movie -- [click here](#).

To **RETURN** to the head shape tutorial -- [click here](#).

# MOVIE EDITING THE 9TH CURVE PART FOUR

To **PLAY** the example movie, double click below:

To **RETURN** to the head shape tutorial -- [click here](#).

# MOVIE SNAPPING IT UP ON THE 9TH CURVE

To **PLAY** the example movie, double click below:

To **RETURN** to the head shape tutorial -- [click here](#).

## TABLE NINE

POINT	X AXIS	Y AXIS	Z AXIS
a - North Pole	0.000	0.000	0.000
Phantom point 1	4.592	3.439	-6.284
b - Head top 1	25.510	18.820	-28.769
c - Head top 2	43.362	32.475	-43.022
d - Head top 3	53.313	40.397	-60.442
e - Hairline	58.549	44.783	-80.980
f - Temple	57.618	46.910	-107.758
g - Browbone	51.778	45.703	-132.557
h - Crease of top eyelid	48.133	43.944	-143.439
i - Eye centre line	46.464	43.458	-148.095
j - Under-eye area	45.049	42.793	-152.472
k - Bridge of nose	43.306	41.966	-156.807
l - Cheek apple	42.291	40.864	-161.221
m - Nose base, cheek bone	41.443	40.023	-164.733
n - Upr lip, cheek hollow	41.016	39.382	-168.522
o - Centre of mouth, cheek hollow	40.559	38.736	-172.457
p - Lwr lip under, cheek hollow	40.062	38.823	-176.352
q - Tip of chin	39.453	39.257	-179.558
r - Jawline	38.902	40.809	-183.285
s - Nape of neck	37.659	43.106	-188.235
t - Neck	35.815	50.956	-202.839
Phantom point 2	35.117	66.671	-227.741
u - Base of neck	35.160	73.352	-237.831

**RETURN** to tutorial -- [Click Here](#)



**RETURN** to previous lesson -- [Click Here](#)



## THE 10TH CURVE


### Contents:


- [Scene Setup](#)
- [Creating the 10th curve](#)
- [Example Movie -- Creating the 10th Curve](#)
- [Editing the 10th curve -- Something New in the Right View](#)
- [Front is Fab](#)
- [Getting on Top](#)
- [Example Movie -- Editing the 10th Curve](#)
- [Snapping things up on the 10th curve](#)
- [Table Ten - A list of points & coordinates for the completed 10th Curve](#)
- [Testing the Surface](#)
- [Shutting Down the Scene](#)
- [Summary of Lesson -- Curve 10](#)

---

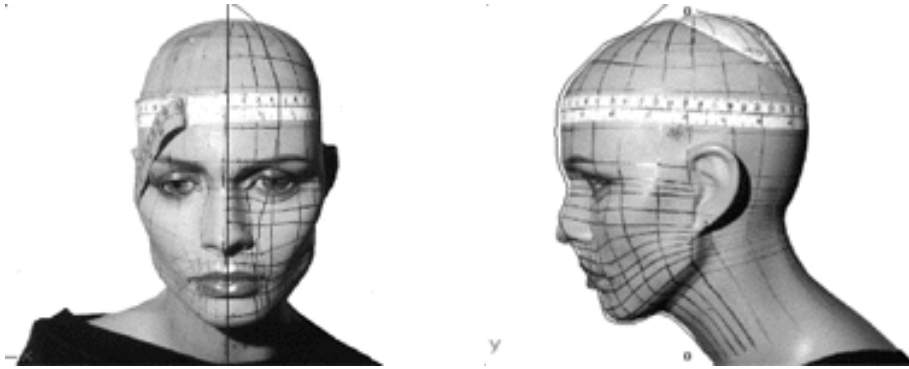
## Scene Setup



- If you've not done so already start a Rhinoceros session by **double clicking** on the desktop icon  the application will begin.
- Choose File, Open from the menu bar and double click on **START\_A.3DM** in the file list, it will load and open.
- Confirm at the Lower Status Bar the currently active layer is entitled SCENE START UP. If it is active proceed to the next step, if its not then make it active by left clicking on the layer box, highlighting the correct layer and clicking on it.
- Again, at the Layers Box on the Lower Status Bar this time right click on the box, the Edit Layers Dialogue box will open. Confirm the following switches have been enabled or disabled:
- The Layer entitled Annotated Dots\_1 should be OFF.
- The Layer entitled Interp\_01 (the Profile Curve) should be ON.

- The Layer entitled Interp\_02 should be ON.
  - The Layer entitled Interp\_03 should be ON.
  - The Layer entitled Interp\_04 should be ON.
  - The Layer entitled Interp\_05 should be ON.
  - The Layer entitled Interp\_06 should be ON.
  - The Layer entitled Interp\_07 should be ON.
  - The Layer entitled Interp\_08 should be ON.
  - The Layer entitled Interp\_09 should be ON.
  - The Layer entitled Guide\_10 should be LOCKED.
  - The Layer entitled Photopoints should be ON.
  - The Layer entitled Frozen should be LOCKED.
  - The Layer entitled SCENE START UP should be ON.
  - When you've finished making your changes ( if any ) click on OK.
  - All other layers should be set to OFF.
  - Confirm that you can see the background image in the Front and Right viewports.
  - Confirm that the grid display in the viewports has been disabled, if not turn it off now.
  - Confirm that no Osnaps are currently enabled, if any are disable them.
  - Confirm that no edit points are currently displayed, if any are hide them.
  - Zoom out all the viewports by selecting the Zoom Extents All icon  or by typing the command: ZoomExtentsAll at the command line and pressing ENTER.
-

## Creating the 10th curve






**Description:** The 10th curve begins at the top pole and runs along the back side of the head, behind the ear and straight on ending at the base of the neck.

You will create the 10th curve by rotation of the profile in much the same way as the 9th and the best part is you're almost finished..!



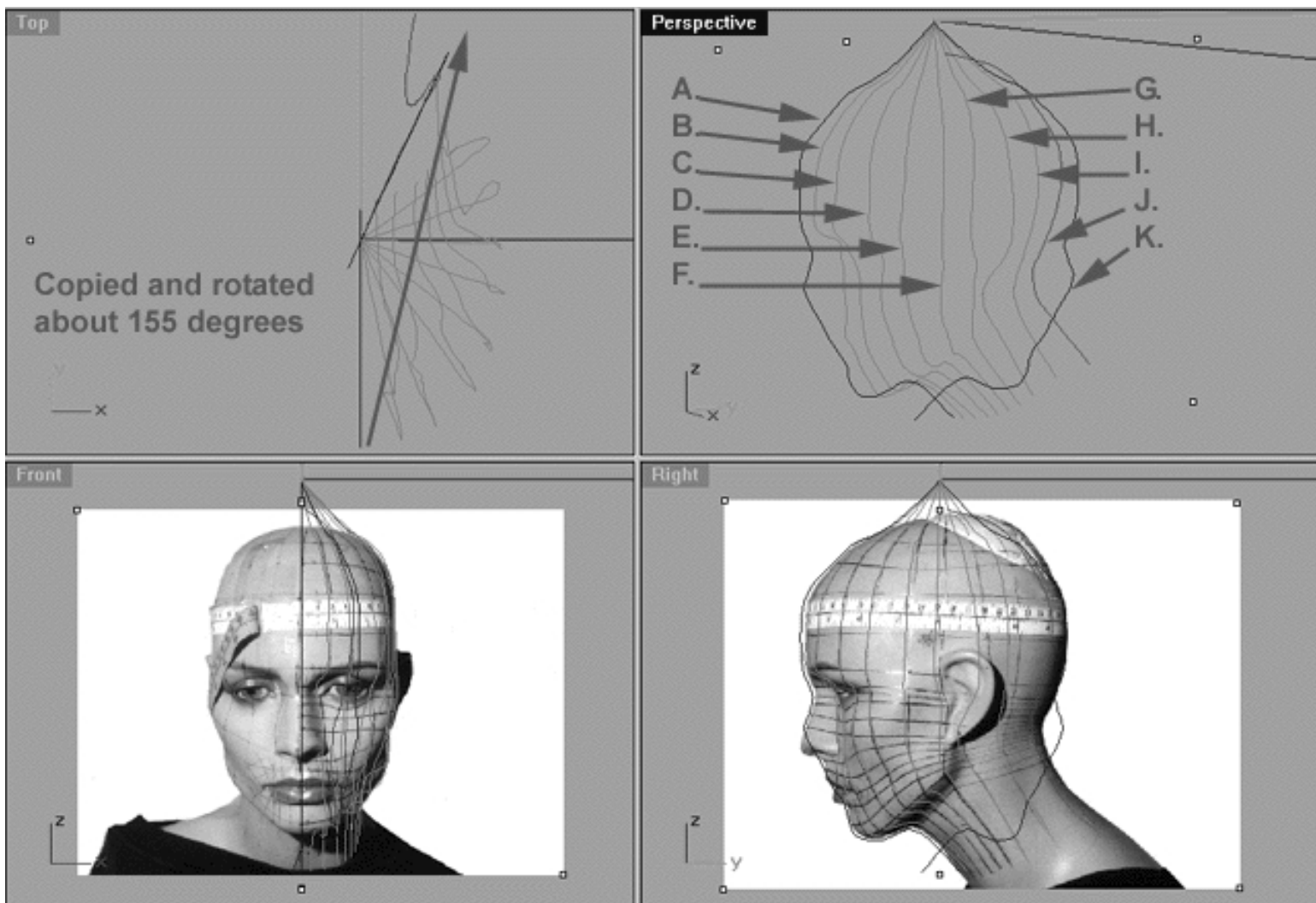
- Choose the *Zoom: Extents All Viewports icon* from the toolbar or type the command **ZoomExtentsAll** at the command line.
- Hold down the **Ctrl** key and select the **Interp\_02, Interp\_03, Interp\_04, Interp\_05, Interp\_06, Interp\_07, Interp\_08 and Interp\_09** curves by **left clicking** on them, then *lock* the curves by typing the command: Lock at the command line and then press **Enter**.
- Once again, create a new layer -- At the bottom of your screen you will see the *Lower Status Bar*, **right click** on the *Layer info box* -- the *Edit Layers dialogue box* will open.
- **Left click** on the **New** button and in the *Name field* type: **Interp\_10**.
- Move the cursor to the *colour field*, **left click** on the *Colour field*, the "*Select a colour*" dialogue and colour wheel will appear, choose a nice bright blue (i.e. **R:0 G:0 B:255**) then click **OK**.
- You will be returned to the *Edit Layers dialogue box* again, **left click** on **OK** to exit.
- Return your cursor to the *Status Bar* at the bottom of the screen and **left click** on the *Layer info box* -- the Layers list will appear.
- Locate **Interp\_10** in the list (the one you created a few moments ago) and move your cursor over its name (it will highlight) **left click** on it to make the layer currently active.
- Open the *Osnap dialogue box* by moving your cursor to the *lower status bar* and **left clicking** on its title. The *Osnap dialogue box* will open, enable the *End snap* by **left clicking** on End -- a check will appear indicating that it is now active. If any boxes are checked/active other than "End" disable them now.
- Close the *Osnap dialogue box* by clicking on **X**.
- In **Any Viewport** Select the 1st curve (i.e. Interp\_01) by **left clicking** on it -- it will highlight.

- From the toolbar **left click** on the Rotate 2D icon  or type: **Rotate** at the command line.
- At the command line you will receive the following prompt: **Choose centre of rotation (copy)**
- Type: **copy** at the command line and press **Enter**.
- In the **Right Viewport** Move your cursor to point (a. -- X:0, Y:0, Z:0) on the first profile curve (i.e. Interp\_01) -- the cursor should snap to it, when it does **left click**.
- The system will respond with the following prompt at the command line: **Angle or first reference point:**
- Now, move your cursor into the **Top Viewport** and bring the cross hairs to about the 6 o'clock position (near the bottom of the window) once you've done this **press and hold down the Shift Key** on your keyboard -- the curve should align itself perfectly along the Y axis.
- While still **holding the Shift Key down**, drag the cursor along the -Y axis about 130 units and **left click**.
- The system will then respond with the following prompt at the command line: **Second reference point:**
- Rotate the curve anti-clockwise about **155 degrees** and **left click**.
- Press **Esc** on your keyboard to complete the operation.
- In the **Any Viewport** select the newly rotated curve by **left clicking** on it -- it will highlight.
- Choose the *Layer Control Icon*  from the toolbar by **left clicking** on it and **holding down the key** -- select the *Change Layer Icon*  from the flyout.
- Select **Interp\_10** from the *Pick layer for object dialogue* -- it will highlight. This will make certain that Interp\_10 has been associated with the correct layer.
- Click **OK**
- Disable any currently active Osnaps.



## Creating the 10th Curve

View an example movie [Click Here](#)




This **All Viewport** screenshot shows our original profile curve (A) after having been copied and rotated about **155** degrees on its centre and now located at position ( K ). (B) represents the now locked 2nd curve, (C) represents the now locked 3rd curve, (D) represents the now locked 4th curve, (E) represents the now locked 5th curve, (F) represents the now locked 6th curve, (G) represents the now locked 7th curve, (H) represents the now locked 8th curve, ( I ) represents the now locked 9th curve ( J ) in red represents where our newly rotated curve ( K ) should be positioned once the points have been appropriately edited.

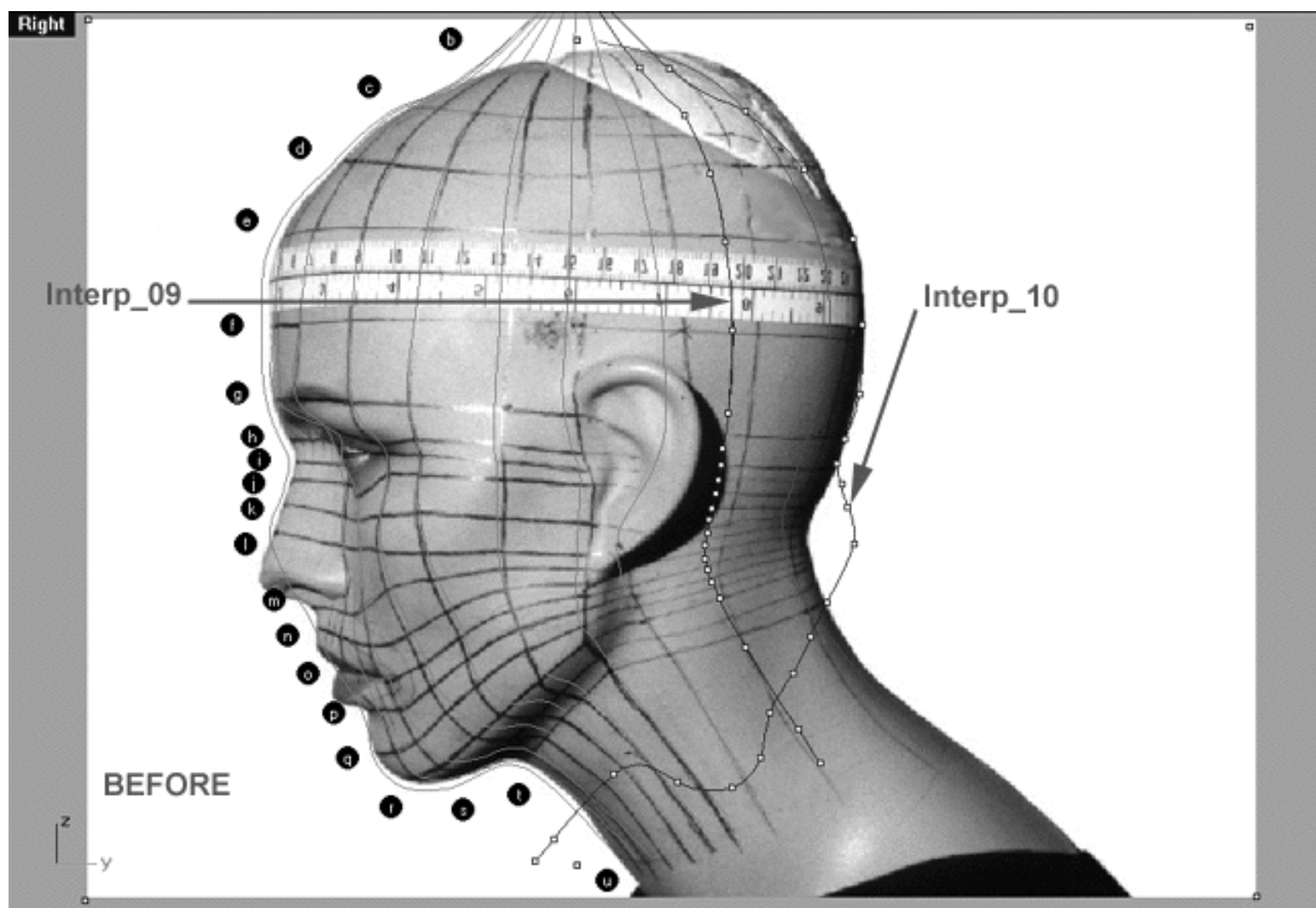
## Editing the 10th Curve Something New in the Right View

Yes you are correct, we start off in the right viewport yet again...

- Maximise the **Right Viewport** by **double left clicking** on its label.
- Turn ON the annotated dot labels. At the bottom of your screen you will see the *Lower Status Bar*, **right click** on the Layer info box -- the Edit Layers dialogue box will open.
- In the Name field list find the layer called *Annotated Dots\_1* and select the **ON** radio button -- click on **OK** to **Exit**.
- Unlock all the curves.

- Now switch to the **Perspective Viewport** and maximise, let's lock the curves by first holding down the Ctrl key and **left clicking** on curves 1, 2, 3, 4, 5, 6, 7 and 8 -- they will highlight. Now *lock* the curves by typing Lock at the command line and then press **Enter**. When you've finished return to the **Right Viewport** and maximise.
- If you've not already done so, display the edit points for the previous curve (Curve 9 - Interp\_09) and the newly rotated curve (Interp\_10), select the curves by holding down the Ctrl key and **left clicking** on them -- they will highlight.
- Then choose the *Show edit points icon*  from the toolbar by **left clicking** on it or type **EditPtOn** at the command line.
- Lock the layer containing the 9th Curve (Interp\_09).
- Zoom in on the first set of edit points ( b - i ).
- Begin by moving edit points ( b - i ) to do this, **left click** on a point -- it will highlight, now starting with point ( b ) drag them one by one into alignment with their sister points on the previous curve, in this case the 9th curve (Interp\_09). Then once you've done that, drag the points back to the red guide curve placing them just to the left side.
- Now let's move on to the next set edit points ( j - u ). Once again we will align each point with it's sister on the previous curve, but rather than to drag them back just to the left of the red guide curve, for the time being we will leave them resting just nearby their sisters.
- Okay, now we are going to drag each of the 2nd set of edit points from their current locations back towards the red guide curve. Don't place the points directly on the red guide curve, rather leave them just a tiny bit to the left side since we will refine the points even further before we've finished. Oh yes, and don't attempt to hold down the shift key while dragging, it will not work due to the curvature of the head the compression of the points that is taking place in this area. As a result, you will have to make an educated guess about how and where you are going align and place the points along side the red guide curve. Take your time and think about what you are doing and be sure carefully study each of the following screenshots.

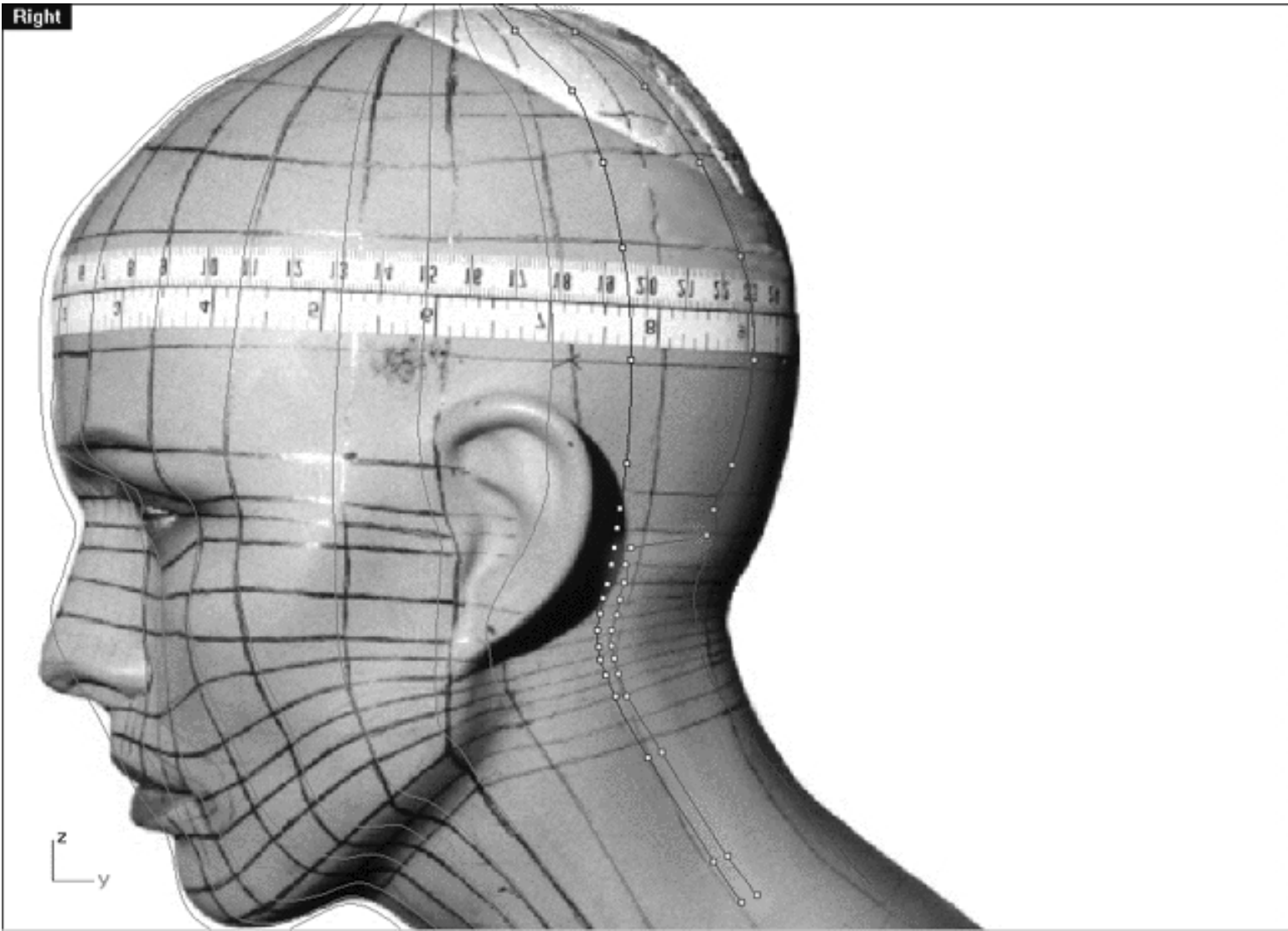




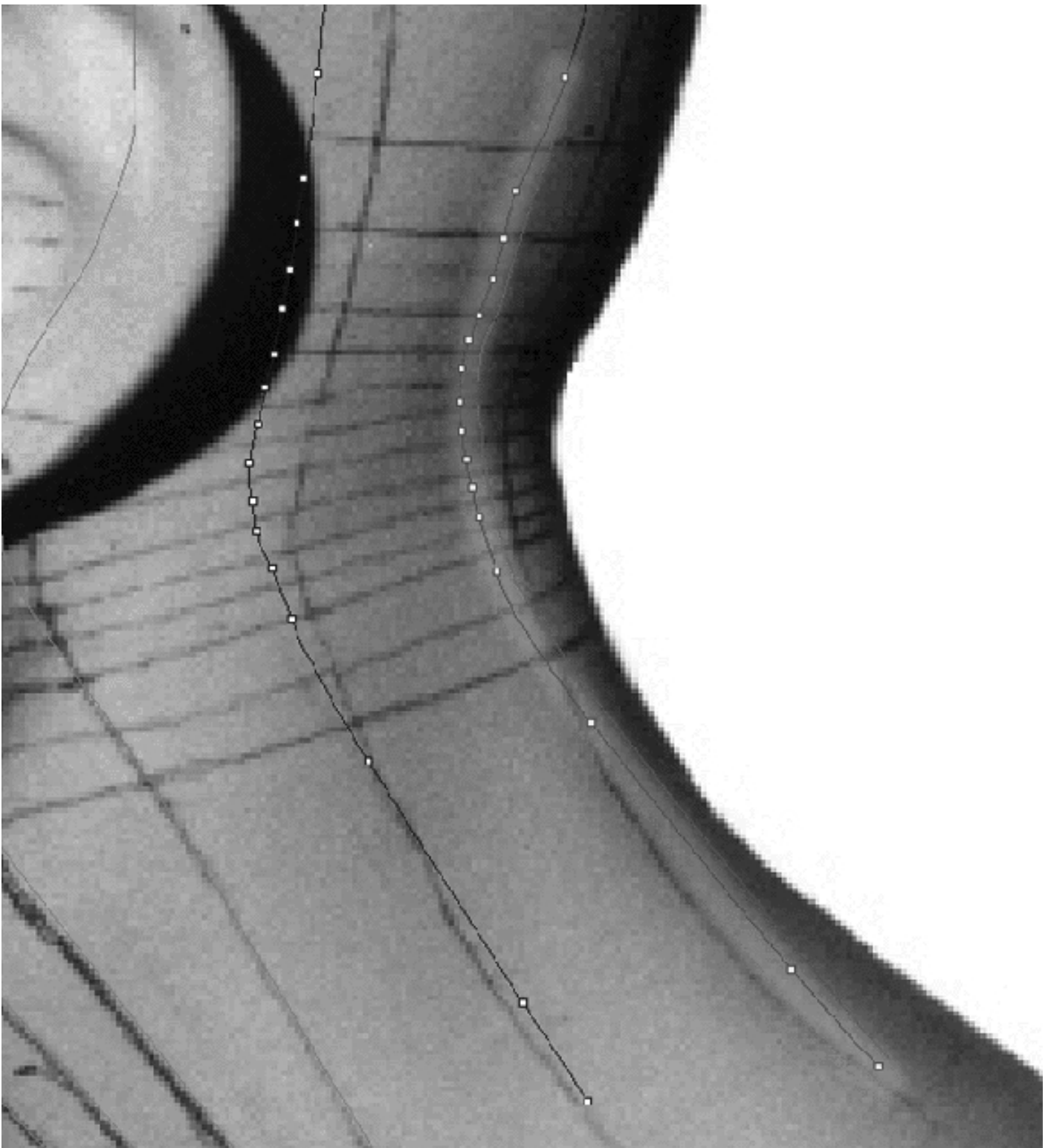
This **Right Viewport** screenshot shows the 9th Curve (Interp\_09) with it's edit points displayed, the 10th Curve that we are currently editing (Interp\_10) again with its edit points displayed and also the red guide curve (Guide\_10).



Right

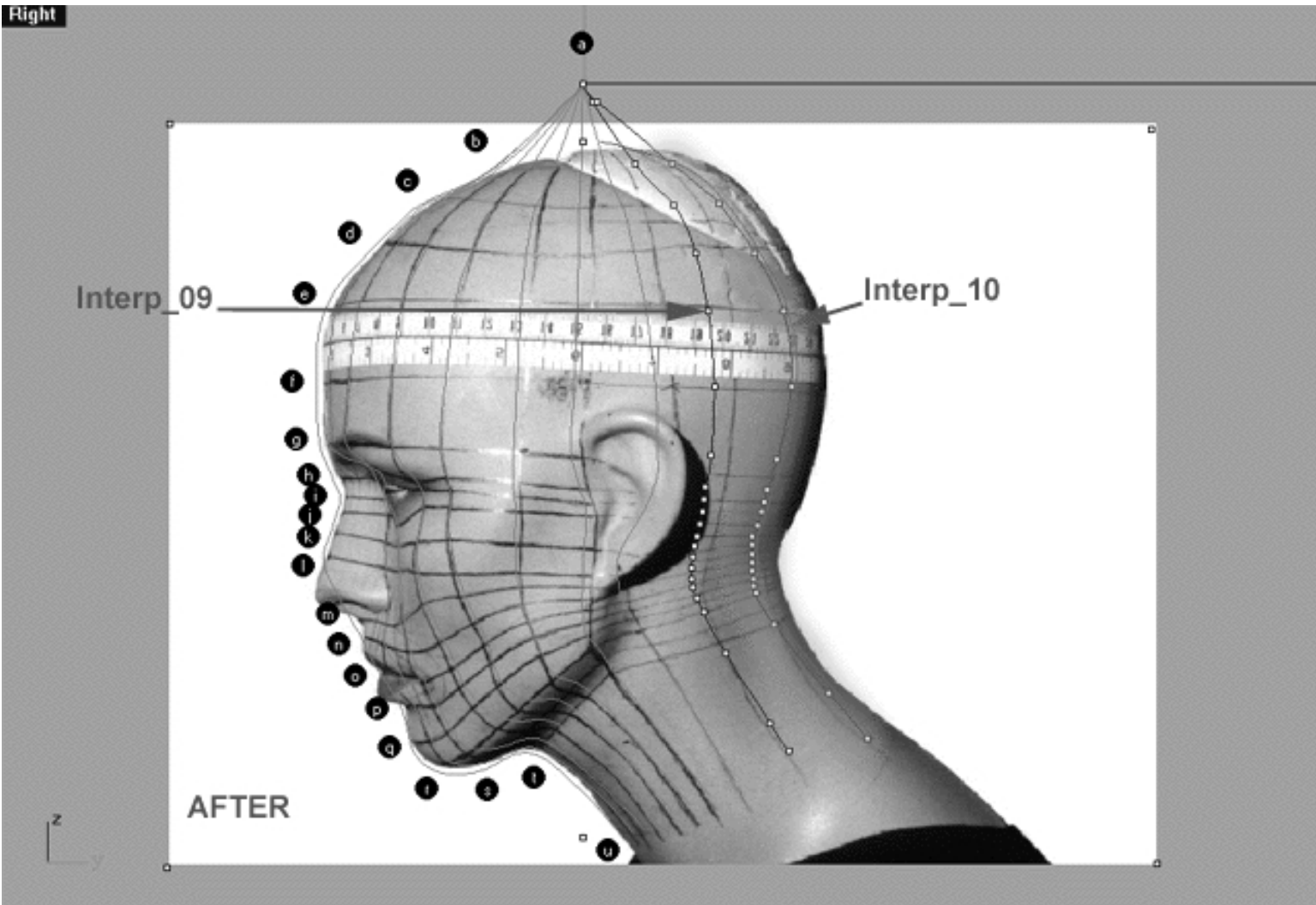


This **Right Viewport** screenshot shows that the first set of points {( b - i ) highlighted in purple} have been first aligned with their sister points on the previous curve and then while holding down the Shift key dragged back and placed just to the left of the red guide curve. Then the second set of points {( j - u ) highlighted in yellow} have been aligned with their sister points on the previous curve, but have been left resting just nearby for the time being.



This **Right Viewport** screenshot shows that the 2nd set of points set of edit points have now been dragged from where they were resting along side their sister points on the previous curve a few moments ago, back toward the red guide curve where they are now currently positioned.

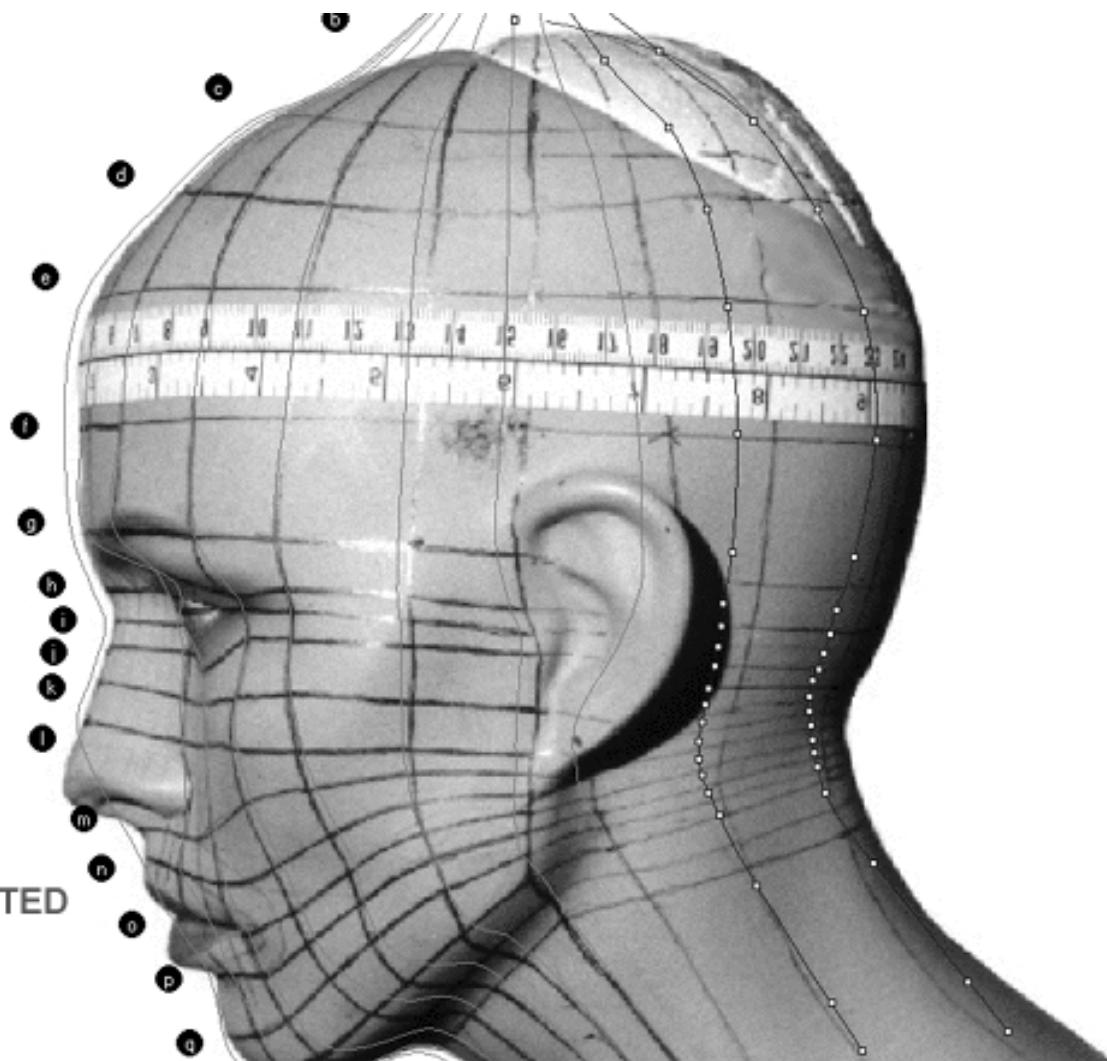
Right



This **Right Viewport** screenshot shows that starting at about point ( b ) I've now moved all the edit points (**highlighted in orange**) on the 10th curve (Interp\_10) just to the left side of the red guide curve, keeping the points on the 10th curve in **relative** alignment with their "sister" points on the 9th **whilst compensating for the curvature of the head/neck by compressing the points**. The main objective is basically to "straighten" out the 10th curve in order to make the overall editing of its points easier to accomplish.

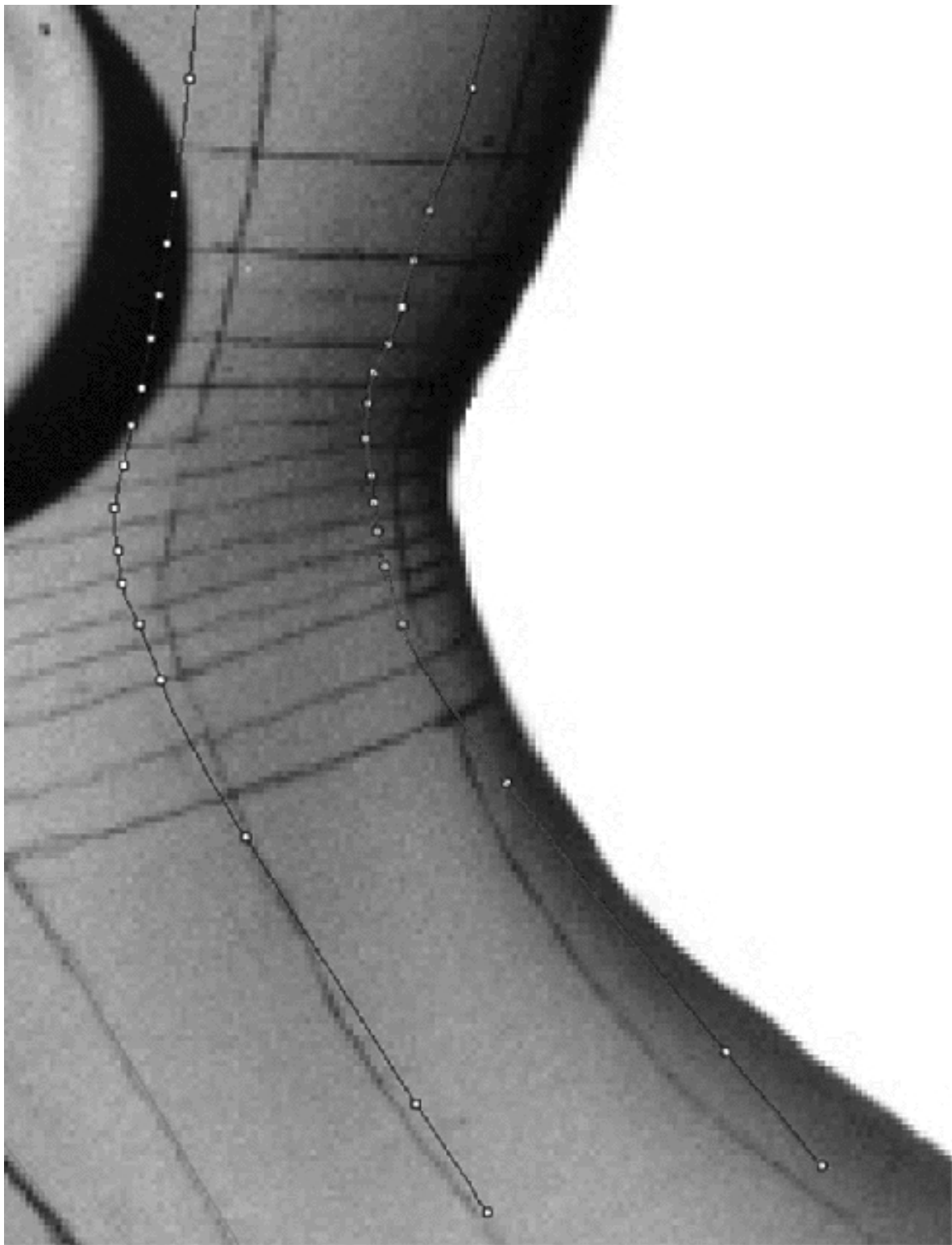
- Now that all the points are located just about where they should be it just a matter of moving them all over just slightly on to the red guide curve and into their final resting positions. You should take your time doing this, tweak and refine any points that you feel can placed even more accurately, you're bound to find a few. When you've finished your model should resemble the following screenshot.

Right



This **Right Viewport** screenshot shows that I've now moved all the edit points ( b - u ) on the 10th curve (Interp\_10) to their final positions along the Y axis on the red guide curve, having made educated judgements as to where they should go. Once done, I've then further tweaked and refined all the edit points ( b - u ) making sure that they line up well with the guide and carefully double checked my work. **\*Note** -Pay attention to how the points are becoming more compressed in the area where the neck meets the base of the skull.







This **Right Viewport** screenshot shows a detailed close up of the 2nd set of edit points once they have been moved into final alignment in the area of greatest compression within the jaw and neck area. Study the relationships between the points on each of the curves shown, especially if you're having trouble trying to establish placement.

---

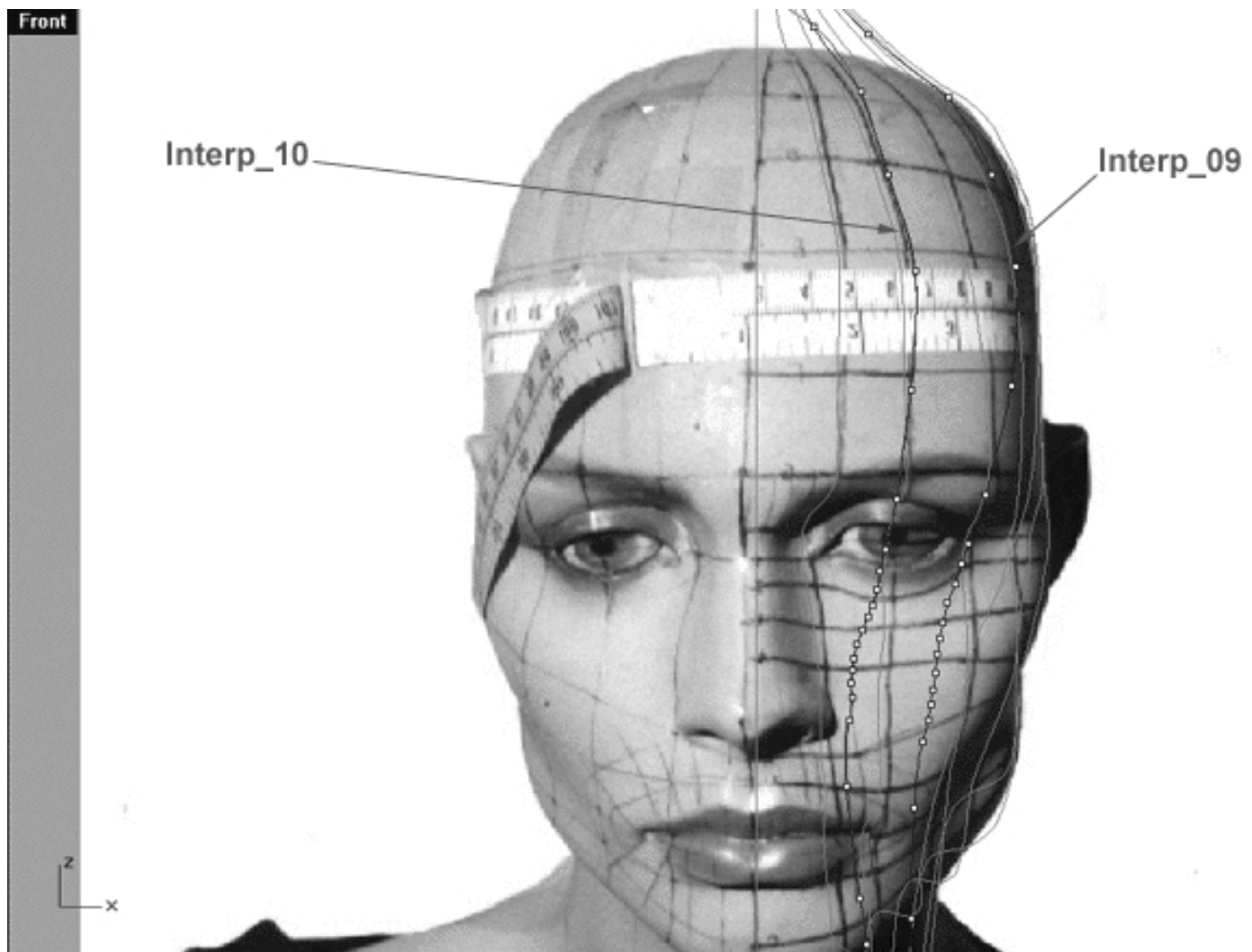
## Front is Fab

- Once you've completed the prior step, double check your work and then minimise the **Right Viewport** by **double left clicking** its label.

- Reset the viewport by choosing the *Zoom Extents icon*  from the toolbar and **clicking** on it.
- Maximise the **Front Viewport** by **double left clicking** on its label.
- Zoom in tightly on points ( b - i ).
- We will now move points ( b - i ) into position. To do this, start with edit point ( b. ) **left click** on the point -- it will highlight. Then, **hold down the Shift Key, left click** on the highlighted point and drag the point until it meets with the red guide curve ( Guide\_10 ) along the X axis while **continuing to hold down the Shift key**.
- Repeat the procedure for all the remaining points ( j - u ) moving them along the X axis into alignment with the red guide curve.
- Once completed, zoom out by choosing the *Zoom Extents icon*  from the toolbar and **clicking** on it.



This **Front Viewport** screenshot shows points ( b - u ) on the 10th curve (Interp\_10) just prior to being dragged toward the red guide curve ( Guide\_10 ) along the X axis.



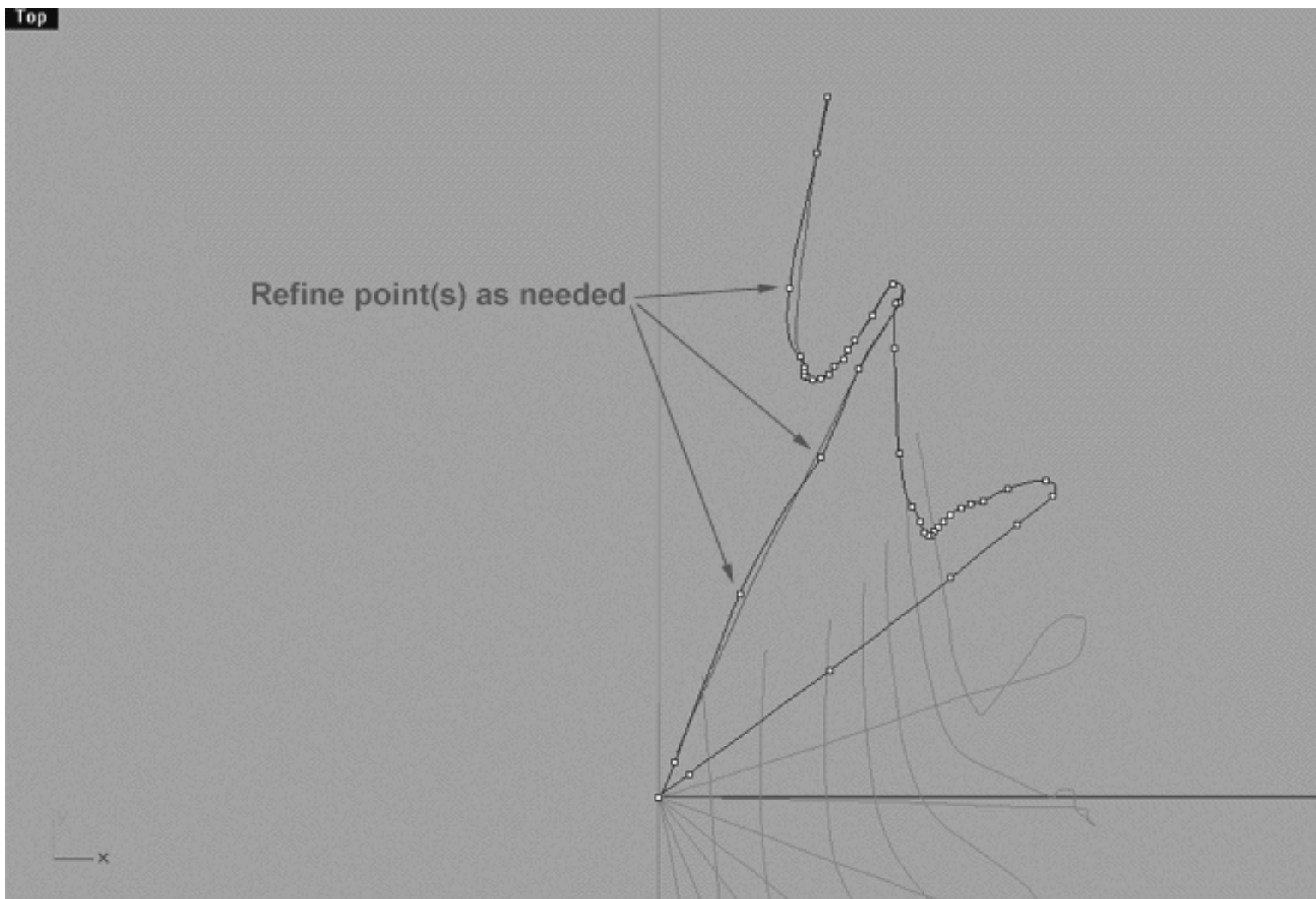
This **Front Viewport** screenshot shows points ( **b - u** ) on the 10th curve (Interp\_10) after having been dragged toward the red guide curve ( Guide\_10 ) along the X axis. Take some time to pay particular attention to and study the relationships between the points on curves 9 and 10. *\*Tip* -- One common mistake that is often made is that of confusing one curve for another. Be sure that the point or curve that you wish to edit is really the correct one..!

## Getting on Top

- Check your work and then minimise the **Front Viewport** by **double left clicking** on its label.
- If you've not done so already, at this stage it would be a good idea to turn off all the edit points and then turn them back on for the 10th curve only, this will prevent any possible confusion.
- Maximise the **Top Viewport** by **double left clicking** on its label.
- Turn off the annotated dot labels. At the bottom of your screen you will see the *Lower Status Bar*, **right click** on the Layer info box -- the Edit Layers dialogue box will open.
- In the Name field list find the layer called *Annotated Dots\_1* and select the **Off** radio button -- click on **OK** to **Exit**.
- Zoom in tightly on the curve, carefully check to see how well the curve conforms to the guide.



- Correct any misalignment, it is now fairly safe to move any offending points along either the **X** or **Y** axis -- to do so, **left click** on the misaligned point -- it will highlight. Then, **hold down the Shift Key, left click** on the highlighted point and drag the point until it meets with the red guide curve ( Guide\_10 ) along the X or Y axis as required while **continuing to hold down the Shift key**. **\*Note -- Your results may vary!** Whether or not any adjustment is needed in the top view at all will depend on how accurately your point editing went in the right and front views previously.



This **Top Viewport** screenshot shows an example of slightly misaligned points (*\*Note -- your results may vary*) on the 10th curve (Interp\_10) just prior to being dragged toward the red guide curve ( Guide\_10 ) along the X or Y axis.


If you're confused about any of this and would like to see how I went about creating this curve then watch the following movie:





**Editing the 10th Curve**  
View an example movie [Click Here](#)

# Snapping things up on the 10th curve

The 10th curve has now been completed. Once again, test how well you've done overall at aligning the 10th curve to the guide. Display the points on the guide curve and see how close you came with your edited points. Once done, "snap" all of the 10th curves points to the guide.

- Minimise the **Front Viewport** by **double left clicking** on its label.
- Maximise the **Right Viewport** by **double left clicking** on its label.
- Now we must unlock the Guide\_10 curve so that we may select and display its points. At the bottom of your screen you will see the *Lower Status Bar*, **right click** on the Layer info box -- the Edit Layers dialogue box will open.
- In the *Name field list* find the layer called Guide\_10 and select the **ON** radio button -- click on **OK** to **Exit**.
- In any Viewport select the Guide\_10 curve by left clicking on it.
- Display its edit points by choosing the *Show edit points icon*  from the toolbar by **left clicking** on it or type the command: **EditPtOn** at the command line.
- Okay, and now the test -- take a close look, how close did you manage to come this time..?
- Let's refine the points still more. Once again, lock the Guide\_10 curve so that we don't mess things up while snapping. At the bottom of your screen you will see the *Lower Status Bar*, **right click** on the Layer info box -- the Edit Layers dialogue box will open.
- In the *Name field list* find the layer called Guide\_10 and select the **Lock** radio button -- click on **OK** to **Exit**.
- Open the *Osnap dialogue box* by moving your cursor to the *lower status bar* and **left clicking** on its title. The *Osnap dialogue box* will open, enable the *Point snap* by **left clicking** on **Point** -- a check will appear indicating that it is now active. If any boxes are checked/active other than "Point" disable them now.
- **Left click** on the **X** to Exit the Onsap dialogue.
- Temporarily turn off the background reference image by typing the command: HideBackgroundBitmap at the command prompt.
- Starting with point **(b.)** zoom in on a small group of points (about 3 is still good) and "snap" each curve point to its associated point on the guide curve, it's important that you re-snap each point -- pay attention, be sure not to miss any!

- When you've finished working of the first group of 3 points choose and use the Pan View icon  from the toolbar and pan the view a bit further along the contour of the curve. Now start working on the next group of 3 points and continue snapping. Continue this procedure until you've snapped all the remaining points ( **b - u** ).
- Zoom out by choosing the *Zoom Extents All* icon  from the toolbar and **clicking** on it or typing **the command: ZoomExtentsAll** at the command line.
- Minimise the Right Viewport by double left clicking on its label.
- Carefully check over your work in all viewports.
- Restore the background reference image by typing the command: **ShowBackgroundBitmap** at the command prompt.
- Disable any currently active Osnaps.
- Congratulations! -- you've now completed editing the 10th Curve.




## Snapping it up

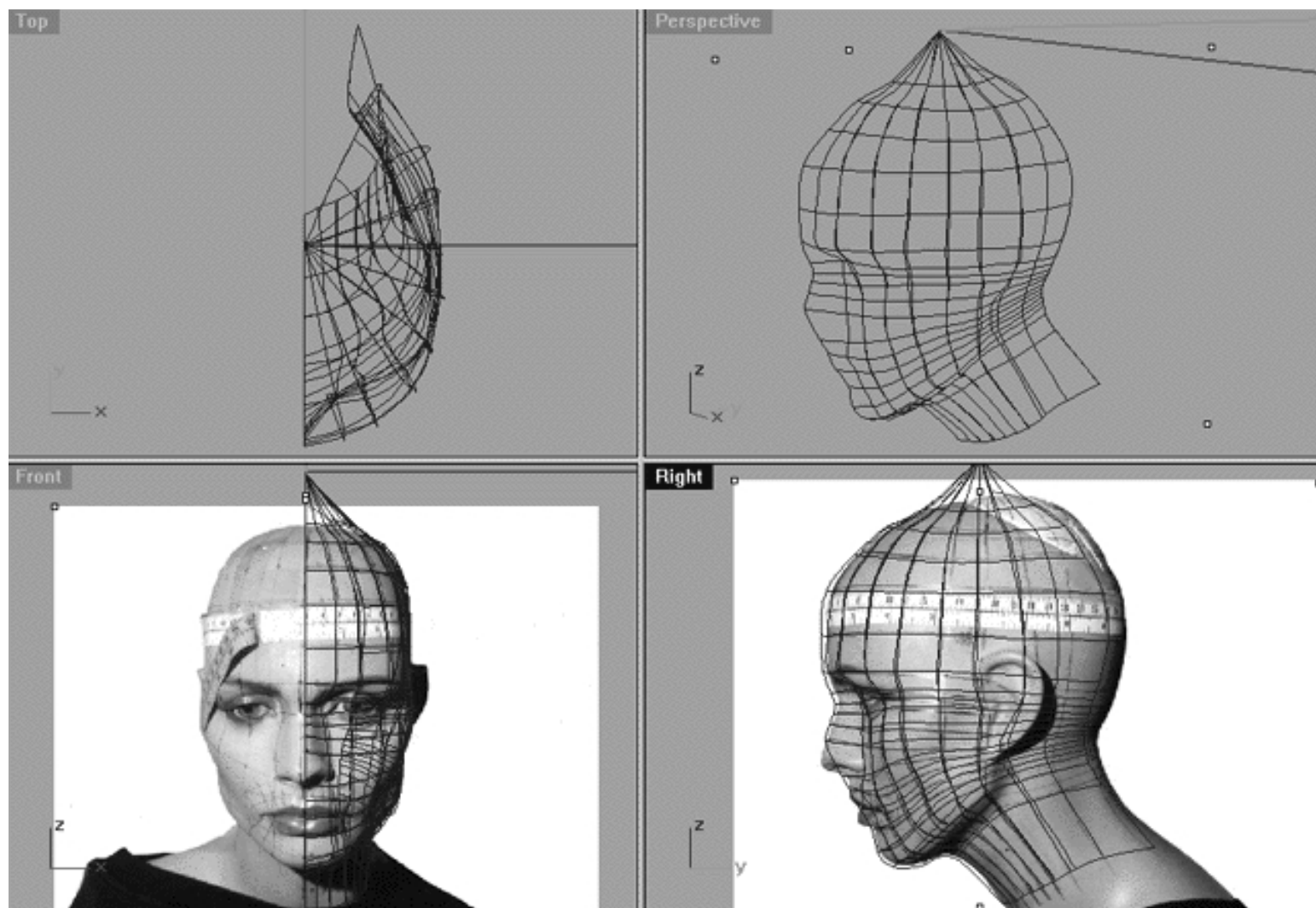
View an example movie [Click Here](#)

**Table Ten - A list of points & coordinates for the completed 10th Curve -**  
[Click Here](#)

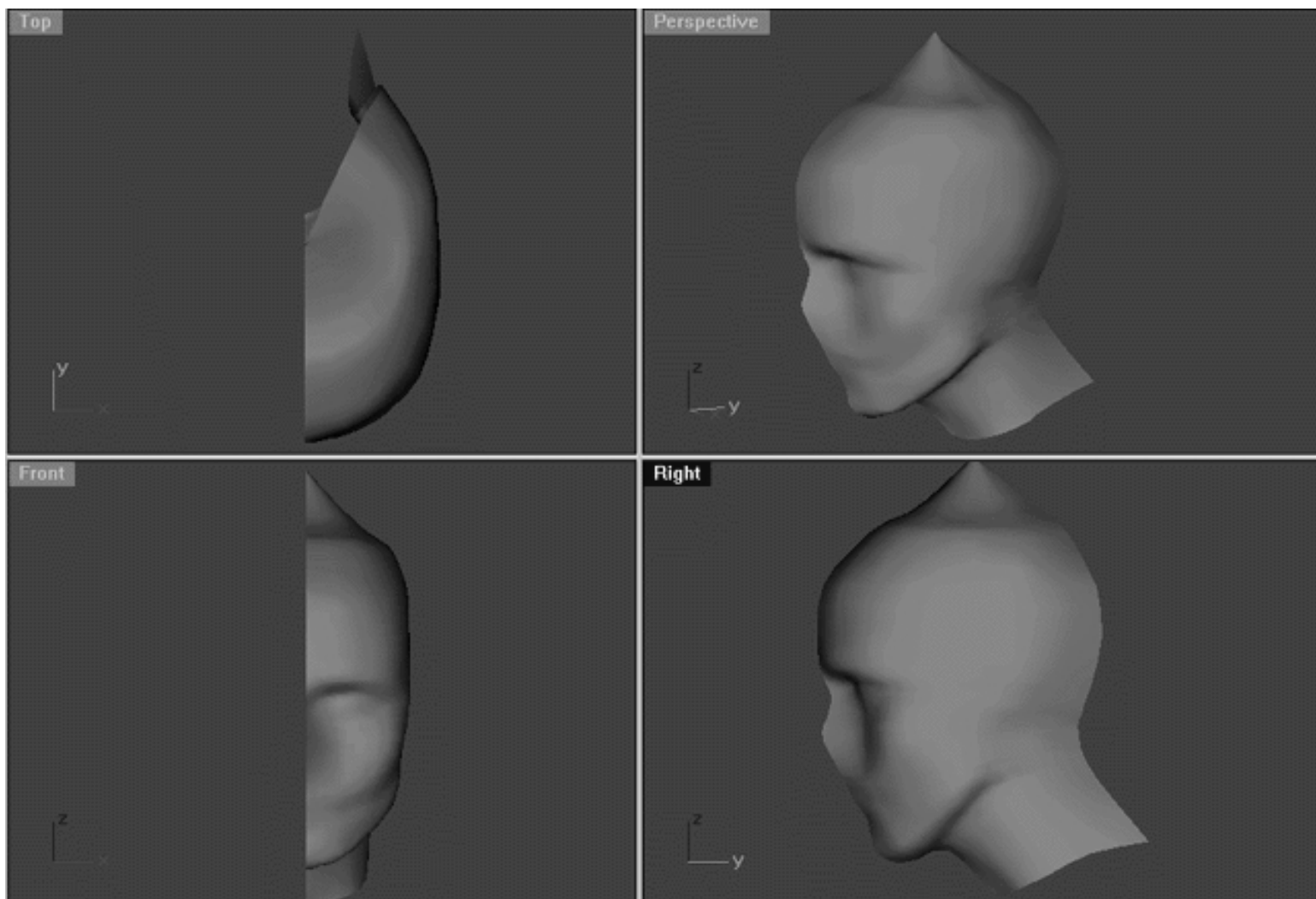
## Testing the Surface

- In the **Perspective Viewport**, zoom in on points ( **a - e** ) this will make it easier to select the curves.
- Unlock all curves by typing the command: Unlock at the command line. Once done, the curves should revert to their normal state.
- From the toolbar choose the Loft icon  or type the command: **Loft** at the command line.
- At the command line you will receive the following prompt: **Select curves to loft (point):**
- Now, in the **Perspective Viewport** click directly on curves 1, 2, 3, 4, 5, 6, 7, 8, 9 and 10.
- As you select each curve they should highlight, when you've finished selecting all 10 curves press **Enter**.

- The Loft Options dialogue box should appear. Set the Style drop down box to **Loose**. Click on the **Shaded Preview** box, a tick should appear. Make sure the Do Not Simplify radio button is active and **click** on the **Preview** button.



This **All Viewport** screenshot shows an example of a loose loft applied to the curves without a quick rendered shaded preview.



This **All Viewport** screenshot shows an example of a surface created by lofting curves 1, 2, 3, 4, 5, 6, 7, 8, 9 and 10 using the "loose" type parameter with a quick rendered shaded preview.

## Shutting Down the Scene

- Confirm that no Osnaps are currently active, disable any that are.
- Open the Edit Layers Dialogue box and turn off Guide\_10.
- Confirm that Layer(s): Interp\_01, Interp\_02, Interp\_03, Interp\_04, Interp\_05, Interp\_06, Interp\_07, Interp\_08, Interp\_09 and Interp\_10 are ON.
- Left click on the Layer Info box at the Lower Status Bar, highlight the layer entitled SCENE START UP and click on it -- it should now become the active layer and its name should appear in the box.
- Confirm that the newly created curve (Interp\_10) has in fact been associated with the correct layer.
- Hide any points that are currently displayed.
- Zoom Extents All.
- **SAVE YOUR WORK..!**



## Summary of Lesson - Curve 10

I think you'll agree the probably the most difficult aspect of editing this curve is getting the points aligned correctly in the area where they all compress in the lower jaw and neck. However, as you've seen it's quite possible to figure out where they should go if you work with a consistent and systematic approach to the problem.

In this exercise we aligned the points that we were dragging with their sister points on the previous curves, just as we have done in the earlier lessons. The main difference this time round was that instead of dragging the points right back along the red guide curve straight away, we tried two different approaches.

The first was to focus on the points in areas of the head where little or no compression along the curves was taking place and to move those almost straight across, placing them just to one side of the red guide curve. Yes, we could have placed the points directly on top the red guide curve at that that stage, but we didn't. Why not? Well, I'll explain that in a moment.

The second approach was to align the points with their sisters and then to more or less leave them right there. Why did we do this? Well, as you've witnessed in this and the previous lessons once you start dragging the points around it becomes increasingly hard to identify points, that is unless you count and mark each of them on your monitor with a non permanent water based marker or dry board pen (which is a very good idea by the way). However, if you leave the points right along side their sisters, then it's quite easy to figure out straight away what point it is that you're working on -- that makes sense, doesn't it?

The primary reason for working in this manner is to alter the shape of our rotated curve from that of its original profile into something more suitable for this particular location in the head. Quite simply, it's much easier to edit and refine the alignment of the points if the curve you're working on is already close to the shape you require. The primary advantage to building a head by duplicating and rotating the main profile curve (as we are doing) is that you get the same number of points on each curve. While the points at the top of head, the forehead and the upper face are all pretty close to being where you want them as you continue to duplicate and rotate, those at the bottom of the neck are way out.

[Go To Next Lesson - Drawing the 11th Curve](#)

RETURN to Top of page -- [Click Here](#)

Written by Joseph R. Saltzman.

Co-produced in association with Steven Ståhlberg

©1998-1999 Cinemagic Productions Limited. All Rights Reserved.

Duplication of this document including images and text by any means is expressly forbidden without prior written consent of Cinemagic Productions Limited.

Web Site: <http://www.cmagic.co.uk> Telephone: +44 (0)1753 733 190 Fax: +44 (0)1753 736 619 email: [cmagic@cmagic.co.uk](mailto:cmagic@cmagic.co.uk)

# MOVIE CREATING THE 10TH CURVE

To **PLAY** the example movie, double click below:

To **RETURN** to the head shape tutorial -- [click here](#).



# MOVIE EDITING THE 10TH CURVE PART ONE

To **PLAY** the example movie, double click below:

To watch **PART TWO** of this movie -- [click here](#).

To **RETURN** to the head shape tutorial -- [click here](#).

# MOVIE EDITING THE 10TH CURVE PART TWO

To **PLAY** the example movie, double click below:

To watch **PART THREE** of this movie -- [click here](#).

To **RETURN** to the head shape tutorial -- [click here](#).

# MOVIE EDITING THE 10TH CURVE PART THREE

To **PLAY** the example movie, double click below:

To watch **PART FOUR** of this movie -- [click here](#).

To **RETURN** to the head shape tutorial -- [click here](#).

# MOVIE EDITING THE 10TH CURVE PART FOUR

To **PLAY** the example movie, double click below:

To **RETURN** to the head shape tutorial -- [click here](#).

## MOVIE SNAPPING UP THE 10TH CURVE

To **PLAY** the example movie, double click below:

To **RETURN** to the head shape tutorial -- [click here](#).

## TABLE TEN

POINT	X AXIS	Y AXIS	Z AXIS
a - North Pole	0.000	0.000	0.000
Phantom point 1	2.421	5.201	-6.284
b - Head top 1	13.229	30.175	-27.060
c - Head top 2	23.471	50.574	-41.741
d - Head top 3	29.739	63.442	-60.394
e - Hairline	35.835	73.514	-81.716
f - Temple	34.937	76.200	-108.849
g - Browbone	31.564	71.572	-133.522
h - Crease of top eyelid	29.298	67.791	-144.748
i - Eye centre line	28.106	66.375	-149.470
j - Under-eye area	27.285	65.038	-153.839
k - Bridge of nose	25.938	63.918	-157.345
l - Cheek apple	25.171	62.675	-159.932
m - Nose base, cheek bone	23.921	62.137	-162.869
n - Upr lip, cheek hollow	22.960	61.955	-165.992
o - Centre of mouth, cheek hollow	22.232	62.383	-169.324
p - Lwr lip under, cheek hollow	21.909	62.560	-172.020
q - Tip of chin	21.587	63.070	-174.803
r - Jawline	21.472	63.770	-178.014
s - Nape of neck	21.138	65.337	-183.203
t - Neck	20.776	75.210	-198.129
Phantom point 2	23.537	95.435	-233.271
u - Base of neck	25.122	104.126	-233.470

**RETURN** to tutorial -- [Click Here](#)

**RETURN** to previous lesson -- [Click Here](#)




## THE 11TH CURVE


### Contents:

- [Scene Setup](#)
  - [Creating the 11th curve](#)
  - [Example Movie -- Creating the 11th Curve](#)
  - [Editing the 11th curve -- Something New in the Right View](#)
  - [Example Movie -- Editing the 11th Curve](#)
  - [Snapping things up on the 11th curve](#)
  - [Table Eleven - A list of points & coordinates for the completed 11th Curve](#)
  - [Testing the Surface](#)
  - [Shutting Down the Scene](#)
  - [Summary of Lesson -- Curve 11](#)
- 

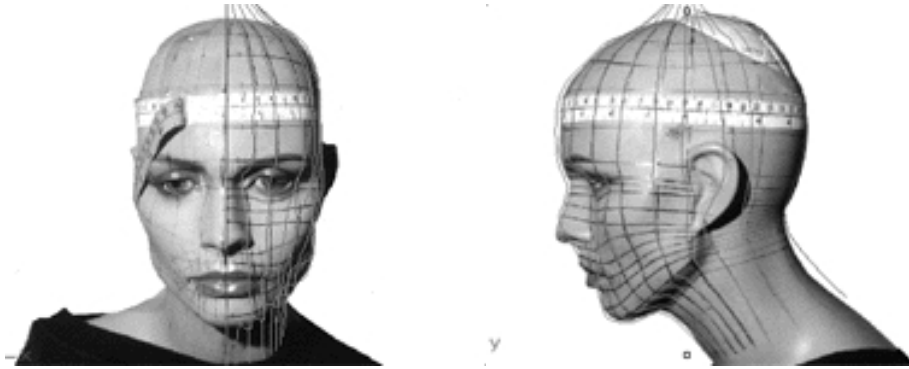
## Scene Setup

- If you've not done so already start a Rhinoceros session by **double clicking** on the desktop icon  the application will begin.
- Choose File, Open from the menu bar and double click on **START\_A.3DM** in the file list, it will load and open.
- Confirm at the Lower Status Bar the currently active layer is entitled SCENE START UP. If it is active proceed to the next step, if it's not then make it active by left clicking on the layer box, highlighting the correct layer and clicking on it.
- Again, at the Layers Box on the Lower Status Bar this time right click on the box, the Edit Layers Dialogue box will open. Confirm the following switches have been enabled or disabled:
- The Layer entitled Annotated Dots\_1 should be OFF.
- The Layer entitled Interp\_01 (the Profile Curve) should be ON.
- The Layer entitled Interp\_02 should be ON.




- The Layer entitled Interp\_03 should be ON.
  - The Layer entitled Interp\_04 should be ON.
  - The Layer entitled Interp\_05 should be ON.
  - The Layer entitled Interp\_06 should be ON.
  - The Layer entitled Interp\_07 should be ON.
  - The Layer entitled Interp\_08 should be ON.
  - The Layer entitled Interp\_09 should be ON.
  - The Layer entitled Interp\_10 should be ON.
  - The Layer entitled Guide\_11 should be LOCKED.
  - The Layer entitled Photopoints should be ON.
  - The Layer entitled Frozen should be LOCKED.
  - The Layer entitled SCENE START UP should be ON.
  - When you've finished making your changes ( if any ) click on OK.
  - All other layers should be set to OFF.
  - Confirm that you can see the background image in the Front and Right viewports.
  - Confirm that the grid display in the viewports has been disabled, if not turn it off now.
  - Confirm that no Osnaps are currently enabled, if any are disable them.
  - Confirm that no edit points are currently displayed, if any are hide them.
  - Zoom out all the viewports by selecting the Zoom Extents All icon  or by typing ZoomExtentsAll at the command line and pressing ENTER.
-




# Creating the 11th curve



**Description:** Offset 180 degrees from the original profile curve, the 11th curve begins at the top pole and defines the very back of the head.

You will create the 11th curve by rotation of the profile in much the same way as the 10th, however of all the curves you've constructed so far this will be the easiest to create and edit.

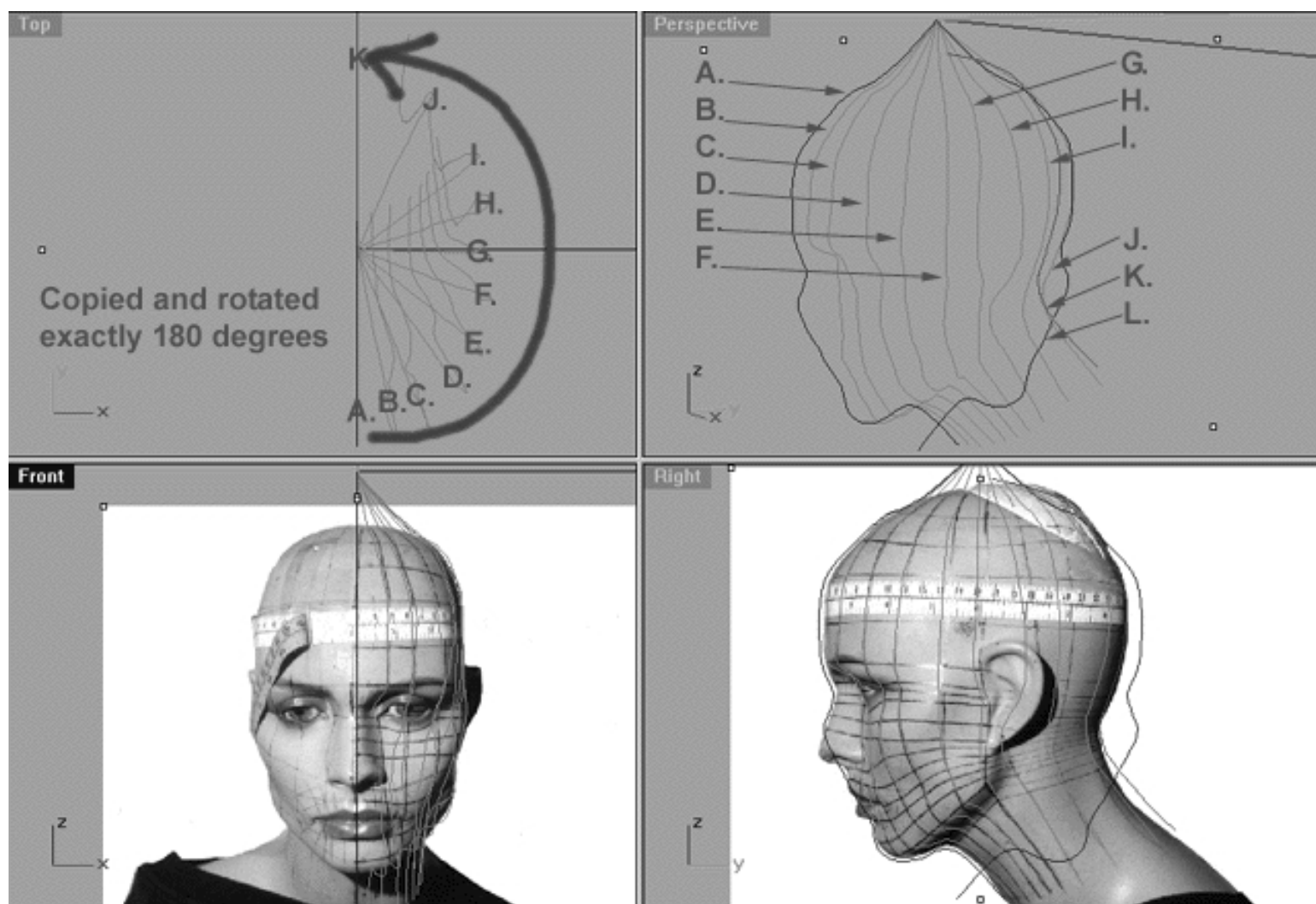
- Hold down the **Ctrl** key and in **Any Viewport** select the **Interp\_02, Interp\_03, Interp\_04, Interp\_05, Interp\_06, Interp\_07, Interp\_08, Interp\_09 and Interp\_10** curves by **left clicking** on them, then *lock* the curves by typing **Lock** at the command line and then press **Enter**.
- Create a new layer-- At the bottom of your screen you will see the *Lower Status Bar*, **right click** on the *Layer info box* -- the *Edit Layers dialogue box* will open.
- **Left click** on the **New** button and in the *Name field* type: **Interp\_11**.
- Move the cursor to the *colour field*, **left click** on the *Colour field*, the "*Select a colour*" dialogue and colour wheel will appear, choose a nice bright blue (i.e. **R:0 G:0 B:255**) then click **OK**.
- You will be returned to the *Edit Layers dialogue box* again, **left click** on **OK** to exit.
- Return your cursor to the *Status Bar* at the bottom of the screen and **left click** on the *Layer info box* -- the Layers list will appear.
- Locate **Interp\_11** in the list (the one you created a few moments ago) and move your cursor over its name (it will highlight) **left click** on it to make the layer currently active.
- Open the *Osnap dialogue box* by moving your cursor to the *lower status bar* and **left clicking** on its title. The *Osnap dialogue box* will open, enable the *End snap* by **left clicking** on End -- a check will appear indicating that it is now active. If any boxes are checked/active other than "End" disable them now.
- Close the *Osnap dialogue box* by clicking on **X**.
- In **Any Viewport** Select the 1st curve (i.e. Interp\_01) by **left clicking** on it -- it will highlight.
- From the toolbar **left click** on the Rotate 2D icon  or type the command: **Rotate** at the command line.
- At the command line you will receive the following prompt: **Choose centre of rotation (copy)**

- Type: **copy** at the command line and press **Enter**.
- In the **Right Viewport** Move your cursor to point (a. -- X:0, Y:0, Z:0) on the first profile curve (i.e. Interp\_01) -- the cursor should snap to it, when it does **left click**.
- The system will respond with the following prompt at the command line: **Angle or first reference point:**
- Now, move your cursor into the **Top Viewport** and bring the cross hairs to about the 6 o'clock position (near the bottom of the window) once you've done this **press and hold down the Shift Key** on your keyboard -- the curve should align itself perfectly along the Y axis.
- While still **holding the Shift Key down**, drag the cursor along the -Y axis about 130 units and **left click**.
- The system will then respond with the following prompt at the command line: **Second reference point:**
- Rotate the curve anti-clockwise about **180 degrees** and **left click**.
- Press **Esc** on your keyboard to complete the operation.
- In the **Any Viewport** select the newly rotated curve by **left clicking** on it -- it will highlight.
- Choose the *Layer Control Icon*  from the toolbar by **left clicking** on it and **holding down the key** -- select the *Change Layer Icon*  from the flyout.
- Select **Interp\_11** from the *Pick layer for object dialogue* -- it will highlight. This will make certain that Interp\_11 has been associated with the correct layer.
- Click **OK**.
- Disable any currently active Osnaps.
- Choose the Zoom Extents All Viewports icon  from the toolbar or type **the command: ZoomExtentsAll** at the command line.



## Creating the 11th Curve

View an example movie [Click Here](#)




This **All Viewport** screenshot shows our original profile curve (A) after having been copied and rotated about **180** degrees on its centre and now located at position (L). (B) represents the now locked 2nd curve, (C) represents the now locked 3rd curve, (D) represents the now locked 4th curve, (E) represents the now locked 5th curve, (F) represents the now locked 6th curve, (G) represents the now locked 7th curve, (H) represents the now locked 8th curve, (I) represents the now locked 9th curve (J) represents the now locked 10th curve (K) in red represents where our newly rotated curve (L) should be positioned once the points have been appropriately edited.

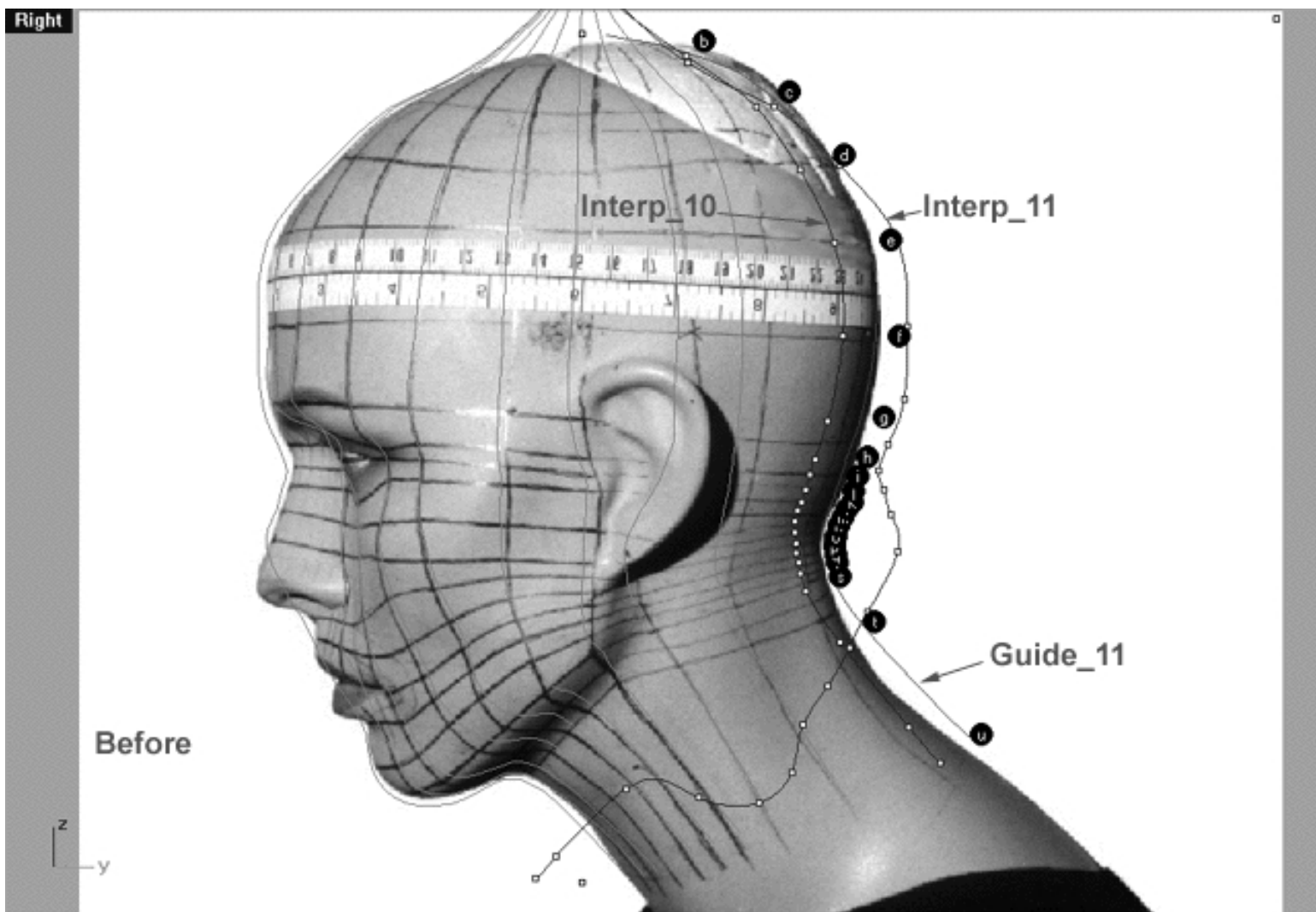
## Editing the 11th Curve Something New in the Right View

Once again we are going to start off in the right viewport.

- Maximise the **Right Viewport** if you've not done so already by **double left clicking** on its label.
- Turn ON the annotated dot labels. At the bottom of your screen you will see the *Lower Status Bar*, **right click** on the Layer info box -- the Edit Layers dialogue box will open.
- If you've not done so already, in the Name field list find the layer called *Annotated Dots\_2* and select the **Lock** radio button -- click on **OK** to **Exit**.
- Unlock all the curves.

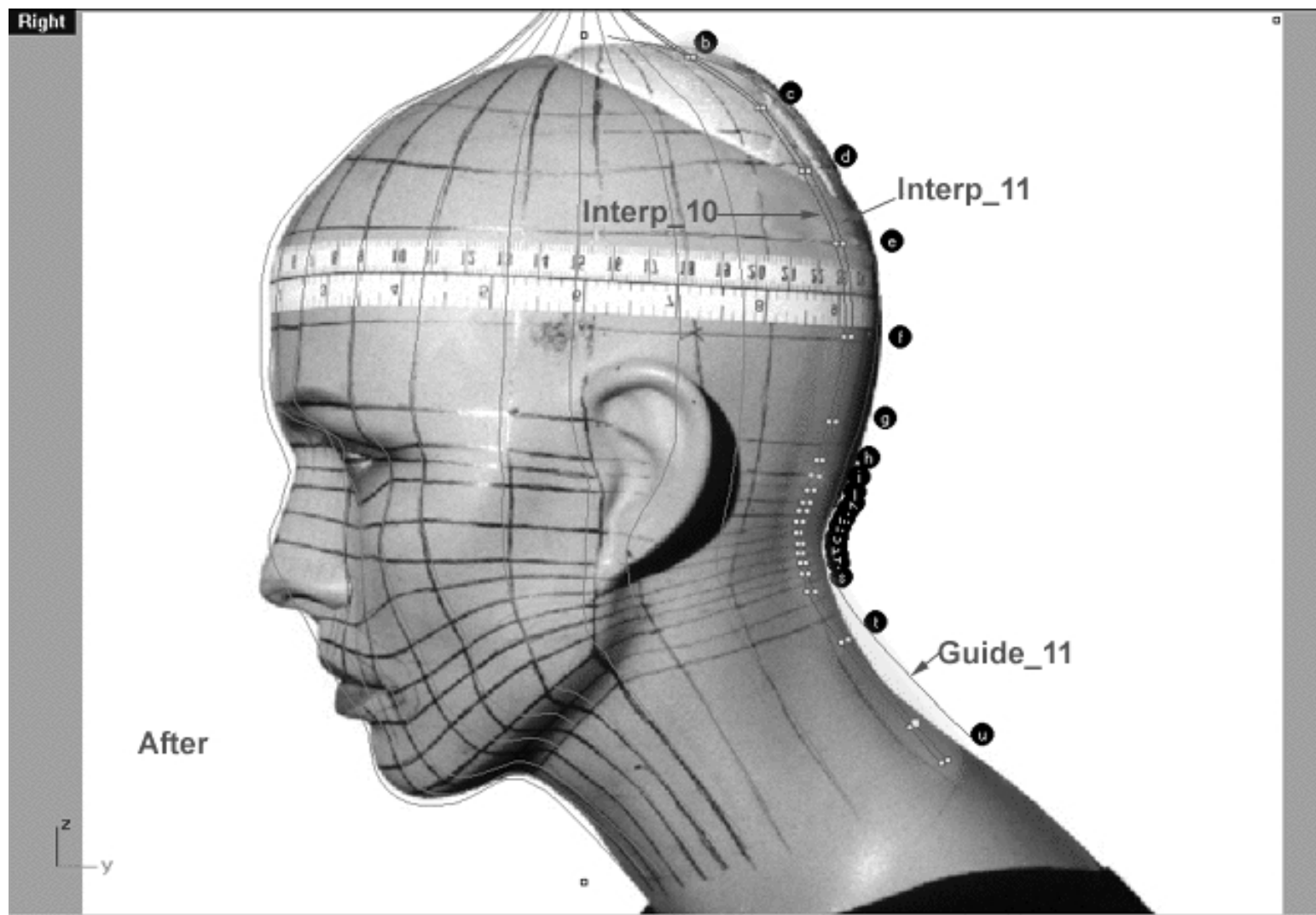
- Now switch to the **Perspective Viewport** and maximise, let's lock curves 1, 2, 3, 4, 5, 6, 7, 8, and 9 by first holding down the **Ctrl** key and **left clicking** on them, then lock the curves by typing **Lock** at the command line and then press **Enter**. When you've finished return to the **Right Viewport** and maximise.
- Display the edit points for the previous curve (Curve 10 - Interp\_10) and the newly rotated curve (Interp\_11), select the curves by holding down the **Ctrl** key and **left clicking** on them -- they will highlight.
- Then choose the *Show edit points icon*  from the toolbar by **left clicking** on it or type the command: **EditPtOn** at the command line.
- Lock the layer containing the 10th Curve (Interp\_10).
- Minimise the Perspective Viewport by double left clicking on its label, then return to the Right Viewport.
- Maximise the Right Viewport by double left clicking on its label.
- Zoom in on the first set of edit points ( b - i ).
- Now lets begin by moving the first set of edit points ( b - i ) to do this, **left click** on a point -- it will highlight, now drag each point nearby and into alignment with their sister points on the 10th curve. *\*Note* -- Don't place the points directly on top of their sister points, rather place each point just to one side. *\*Tip* - Use the cross hairs of your cursor to aid in alignment.
- Pan the view to expose more the points in the lower face and neck area, then zoom in quite tightly on the area where the points bunch up ( j - u ). Now concentrating on the second set of points ( j - u ) once again move each point into alignment with its sister on the 10th curve. Again, don't place the points directly on top of their sister points, rather place each point just to one side. Remember that your main objective is to get the curve straightened out with all the points aligned in a logical and usable manner (see the following screenshot entitled: "After" ).
- Now that we've completed moving each of the first set of edit points ( b - i ) on the 11th curve over to their sister points on the 10th, it's time to move them back along the Y axis to their final resting position along the red guide curve. Once again as in the previous lessons you are going to have to make an educated judgement as where exactly you should be placing each point along the red guide curve. Remember, because you took the time to align each point with their sisters in the previous steps you're going to be very close to where you need to be anyway, it's really only a matter of making compensations for the continued compression of the points and the curvature of the head. (see the following screenshot entitled: "Completed One" and study the relationships between the points). The main thing is don't worry, just take your time and think about what you're doing. Be sure to use all the visual cues that are available to you and remember that you can always do a test loft.
- It's now time to move the second set of edit points ( j - u ) using the same procedure as above. Take extra care in the areas of greatest compression and it's a good idea to zoom in very tightly when working on that section (see the following screenshot entitled: "Completed Two" and study the relationships between the points).

And now for the really good news. Once you've completed the last step that's pretty much it for this phase of the project. You don't have to do any further editing to this curve in the Front or the Right Viewports as the curve was already perfectly oriented along the construction plane from the very beginning -- easy!



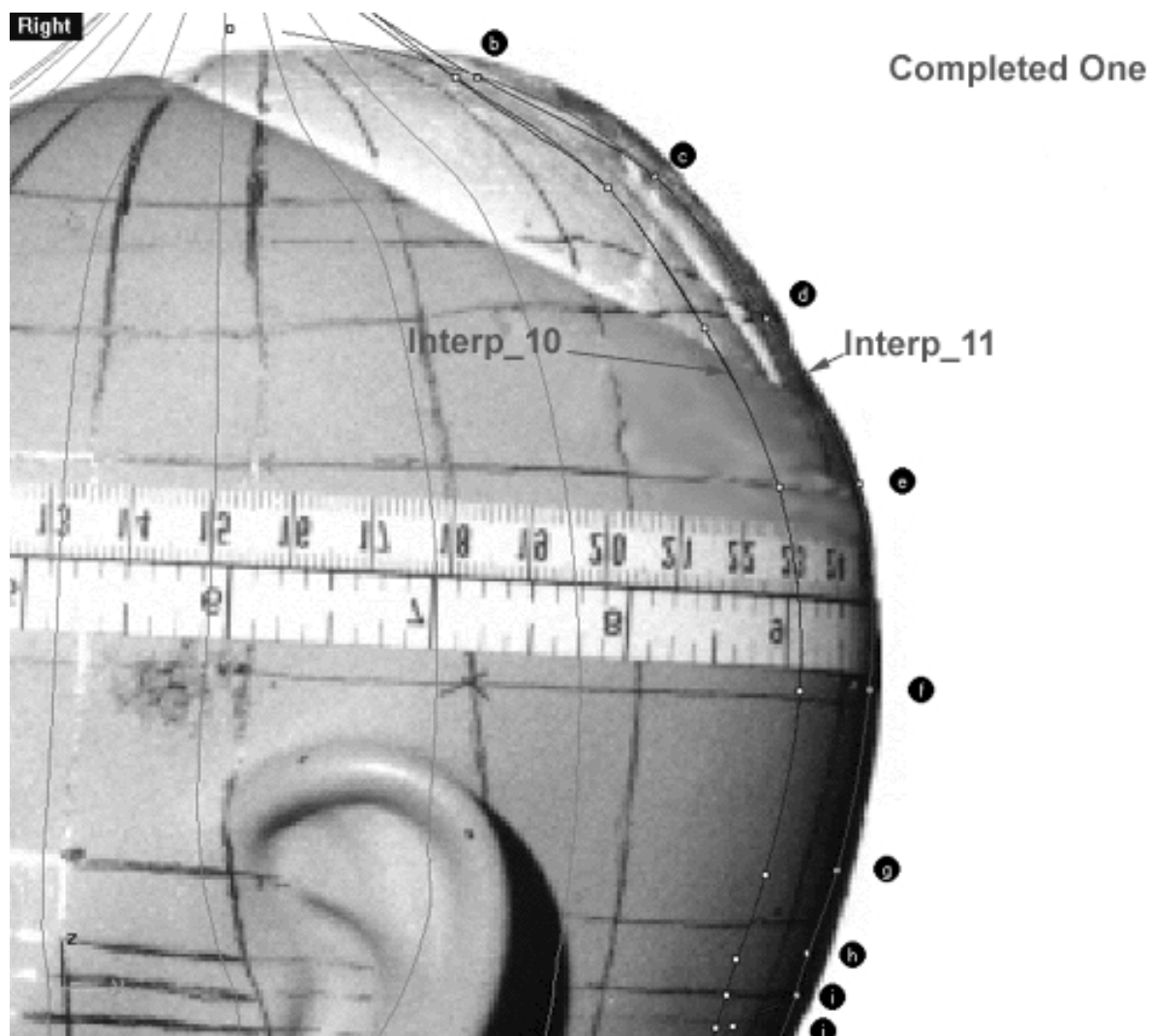
This **Right Viewport** screenshot shows the 10th Curve (Interp\_10) with its edit points displayed, the 11th Curve that we are currently editing (Interp\_11) again with its edit points displayed and also the red guide curve (Guide\_11).



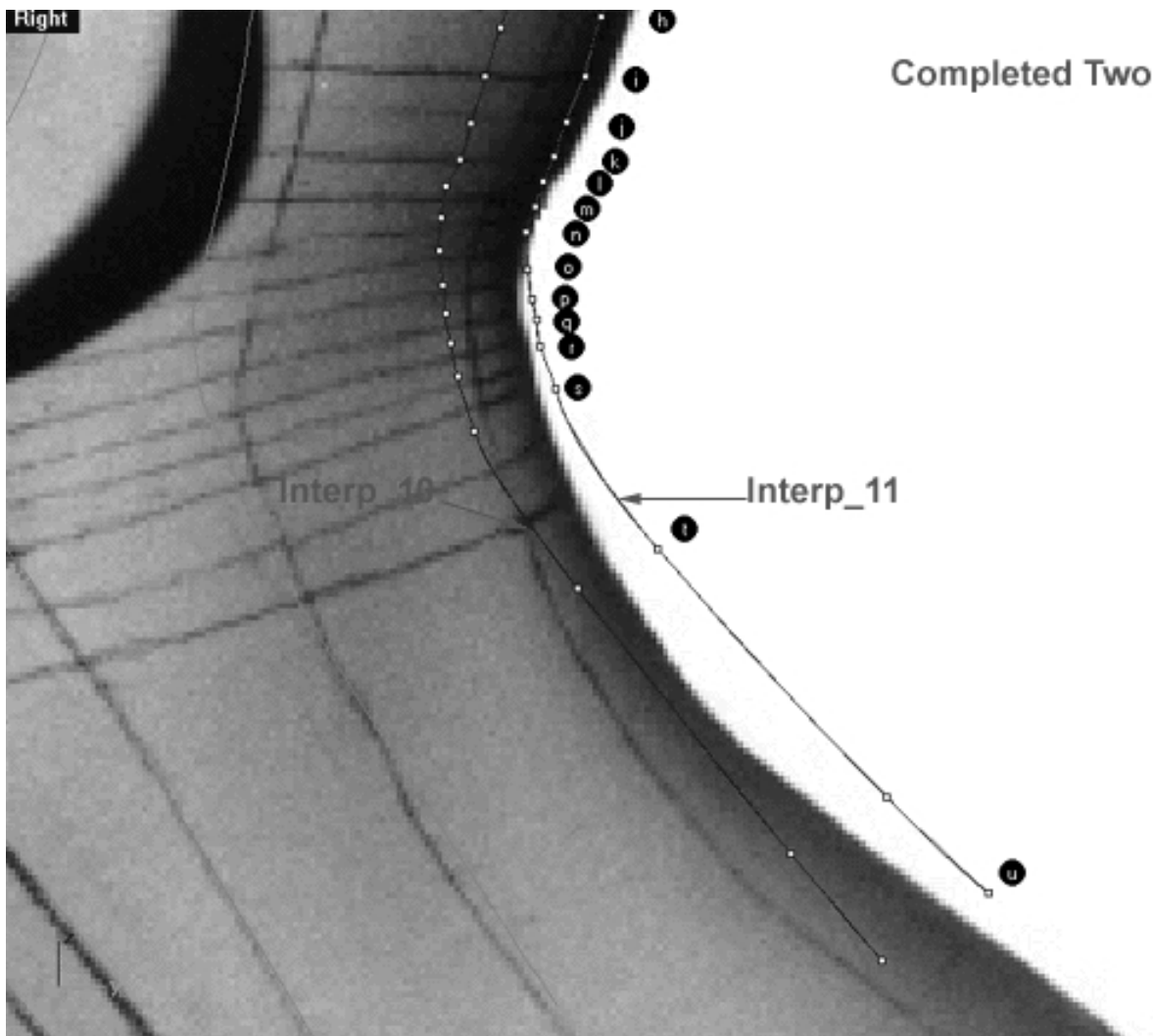


This **Right Viewport** screenshot shows the first set of points ( b - i ) **highlighted in orange** on the 11th curve (Interp\_11) which I've just moved into alignment with their "sister" points on the 10th (Interp\_10). The same procedure has been performed on the 2nd set of edit points as well ( j - u ) **highlighted in green**. The primary objective is only to "straighten" out the 11th curve in order to make the overall editing of its points easier to accomplish.





This **Right Viewport** screenshot shows that I've now moved edit points ( b - i ) on the 11th curve (Interp\_11) to their final positions along the Y axis on the red guide curve, having made educated judgements as to where they should go. Once done, I've then further refined all the edit points ( b - i ) making sure that they line up well with the guide and carefully double checked my work.



This **Right Viewport** screenshot shows that I've now moved edit points ( j - u ) on the 11th curve (Interp\_11) to their final positions along the Y axis on the red guide curve, having made more educated judgements as to where they should go. Once done, I've then further refined all the edit points ( j - u ) making sure that they line up well with the guide and carefully double checked my work for accuracy.






## Editing the 11th Curve

View an example movie [Click Here](#)

## Snapping things up on the 11th curve

The 11th curve has now been completed. Once again, test how well you've done overall at aligning the 11th curve to the guide. Display the points on the guide curve and see how close you came with your edited points. Once done, "snap" all of the 11th curves points to the guide just to stay in sync.

- Maximise the **Right Viewport** by **double left clicking** on its label.

- Now we must unlock the Guide\_11 curve so that we may select and display its points. At the bottom of your screen you will see the *Lower Status Bar*, **right click** on the Layer info box -- the Edit Layers dialogue box will open.
- In the *Name field list* find the layer called Guide\_11 and select the **ON** radio button -- click on **OK** to **Exit**.
- In any Viewport select the Guide\_11 curve by left clicking on it.
- Display its edit points by choosing the *Show edit points icon*  from the toolbar by **left clicking** on it or type the command: **EditPtOn** at the command line.
- Okay, here comes your test -- take a close look, how close did you manage to come this time?
- Let's refine the points still more. Once again lock the Guide\_11 curve so that we don't mess things up while snapping. At the bottom of your screen you will see the *Status Bar*, **right click** on the Layer info box -- the Edit Layers dialogue box will open.
- In the *Name field list* find the layer called Guide\_11 and select the **Lock** radio button -- click on **OK** to **Exit**.
- Open the *Osnap dialogue box* by moving your cursor to the *lower status bar* and **left clicking** on its title. The *Osnap dialogue box* will open, enable the *Point snap* by **left clicking** on **Point** -- a check will appear indicating that it is now active. If any boxes are checked/active other than "Point" disable them now.
- **Left click** on the **X** to Exit the Onsap dialogue.
- Temporarily turn off the background reference image by typing **the command: HideBackgroundBitmap** at the command prompt.
- Starting with point (**b.**) zoom in on a small group of points (about 3 is still a good number) and "snap" each curve point to its associated point on the guide curve, it's important that you re-snap each point -- be sure not to miss any!
- When you've finished working of the first group of 3 points choose and use the Pan View icon  from the toolbar and pan the view a bit further along the contour of the curve. Now start working on the next group of 3 points and continue snapping. Continue this procedure until you've snapped all the remaining points (**b - u**).
- Zoom out by choosing the *Zoom Extents All icon*  from the toolbar and **clicking** on it or typing the command: **ZoomExtentsAll** at the command line.
- Minimise the Right Viewport by double left clicking on its label.
- Carefully check over your work in all viewports.

- Restore the background reference image by typing the command: **ShowBackgroundBitmap** at the command prompt.
  - Congratulations! -- you've now completed editing the 11th Curve.
- 



## Snapping it up


View an example movie [Click Here](#)

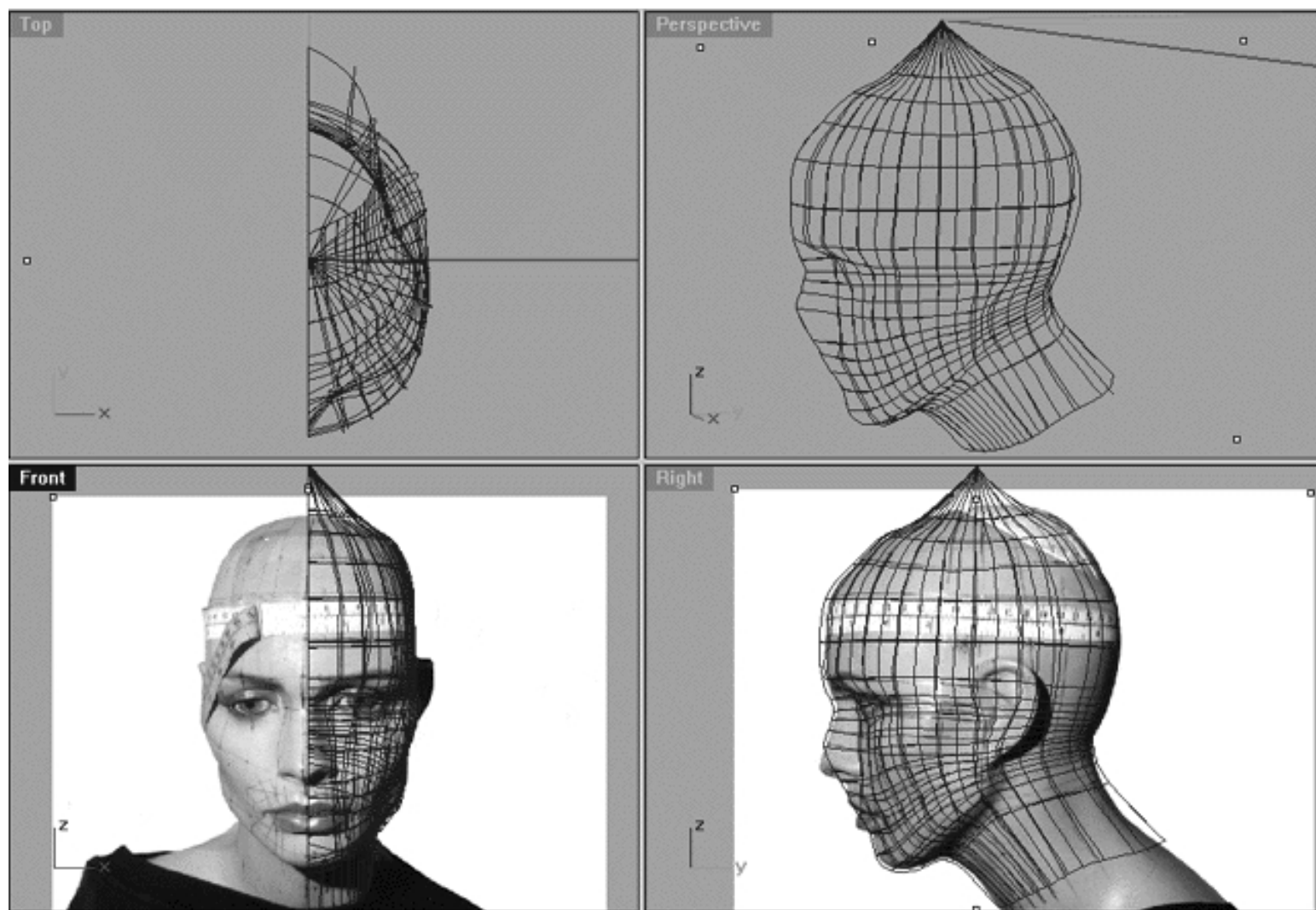
---

**Table Eleven - A list of points & coordinates**  
for the completed 11th Curve [Click Here](#)

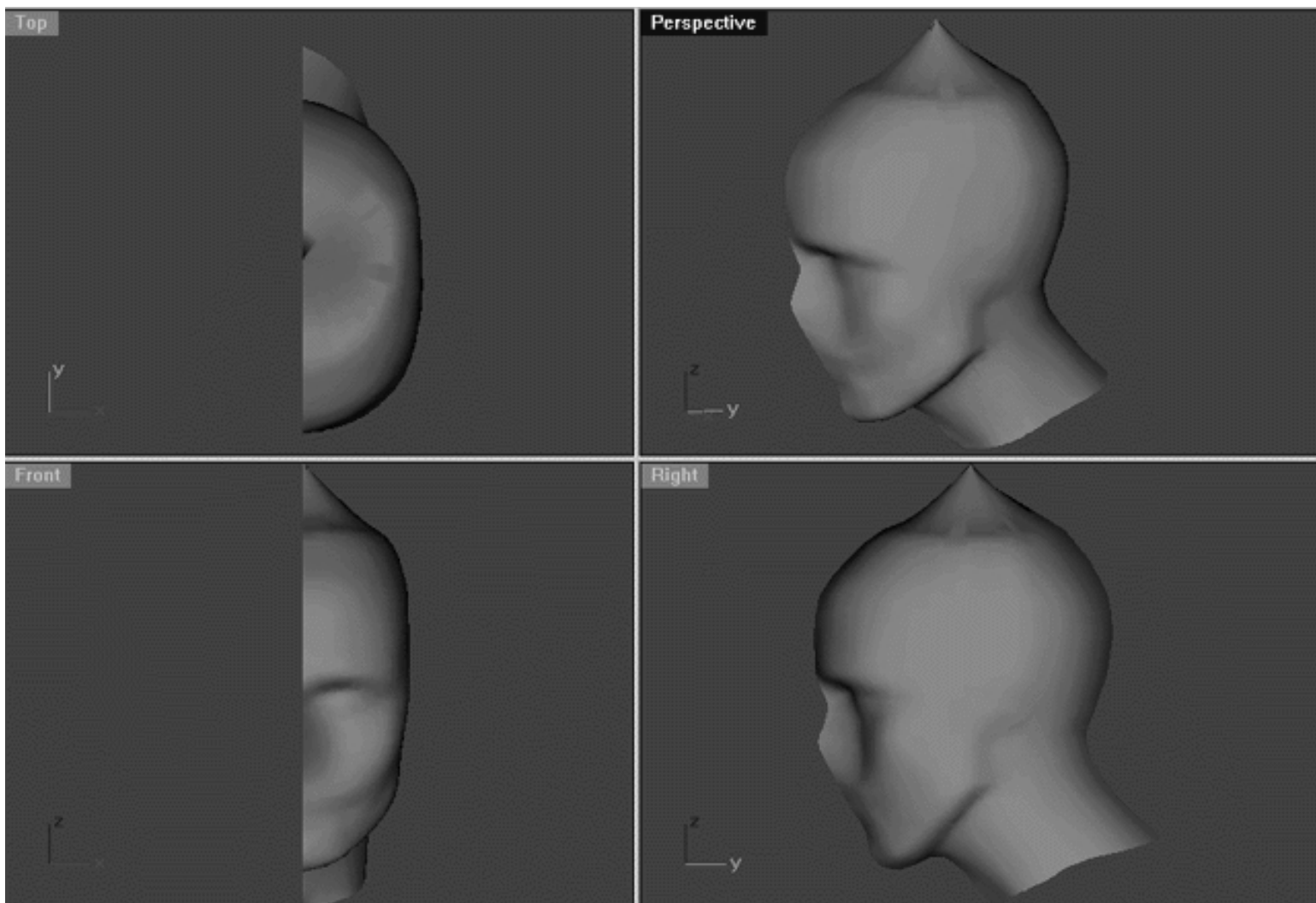
---

## Testing the Surface

- In the **Perspective Viewport**, zoom in on points ( **a - e** ) this will make it easier to select the curves.
- Open the Edit Layers dialogue box, locate the layer entitled: Annotated Dots\_2 and turn it OFF. Locate the layer entitled: Interp\_10 and turn it ON. Once done, press OK to Exit.
- Unlock all the curves by typing the command: Unlock at the command line. Once done, the curves should revert to their normal state.
- From the toolbar choose the Loft icon  or type the command: **Loft** at the command line.
- At the command line you will receive the following prompt: **Select curves to loft (point):**
- Now, in the **Perspective Viewport** click directly on curves 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 and 11.
- As you select each curve they should highlight, when you've finished selecting all 11 curves press **Enter**.
- The Loft Options dialogue box should appear. Set the Style drop down box to **Loose**. **Click** on the **Shaded Preview** box, a tick should appear. Make sure the Do Not Simplify radio button is active and **click** on the **Preview button**.
- Do a ZoomExtentsAll.
- When you've finished looking at the surface press Cancel to Exit.



This **All Viewport** screenshot shows an example of a loose loft applied to the curves without a quick rendered shaded preview.



This **All Viewport** screenshot shows an example of a surface created by lofting curves 1, 2, 3, 4, 5, 6, 7, 8, 9,10 and 11 using the "loose" type parameter with a quick rendered shaded preview.

## Shutting Down the Scene

- Save the file.
- Confirm that no Osnaps are currently active, disable any that are.
- Confirm that the newly created curve (Interp\_11) has in fact been associated with the correct layer.
- Open the Edit Layers Dialogue box and turn off Guide\_11.
- Confirm that Layer(s): Interp\_01, Interp\_02, Interp\_03, Interp\_04, Interp\_05, Interp\_06, Interp\_07, Interp\_08, Interp\_09, Interp\_10 and Interp\_11 are OFF.
- Confirm that the layer entitled Photopoints is ON.
- Confirm that the layer entitled SCENE START UP is ON
- Confirm that all other layers are OFF with the exception of Photopoints and SCENE START UP.



- Click OK to exit the Edit Layers Dialogue box.
- Left click on the Layer Info box at the Lower Status Bar, highlight the layer entitled SCENE START UP and click on it -- it should now become the active layer and its name should appear in the box.
- Hide any points that are currently displayed.
- Confirm that the background images (Front and Right Viewports) are visible.
- Zoom Extents All.
- **S A V E Y O U R W O R K ..!**

---

## Summary of Lesson - Curve 11

If you're still with us by this stage in the tutorial then congratulations, you've come a very long way indeed! You have now managed to create a usable series of 11 NURBS curves that will become the framework for the surface of our head. Although the previous exercises have not been easy, I think you will agree that this method of constructing a head is far more manageable than trying to build one from a primitive. By constructing this head one curve at a time we've only had to contend with a limited number of edit points at any given moment, thus making it far easier to make adjustments in order to produce the desired shape.

Next Chapter - [Click Here](#).

RETURN to Top of page -- [Click Here](#)

Written by Joseph R. Saltzman.

Co-produced in association with Steven Ståhlberg

©1998-1999 Cinemagic Productions Limited. All Rights Reserved.

Duplication of this document including images and text by any means is expressly forbidden without prior written consent of Cinemagic Productions Limited.

Web Site: <http://www.cmagic.co.uk> Telephone: +44 (0)1753 733 190 Fax: +44 (0)1753 736 619 email: [cmagic@cmagic.co.uk](mailto:cmagic@cmagic.co.uk)





To **PLAY** the example movie, double click below:

To **RETURN** to the head shape tutorial -- [click here](#).

# MOVIE EDITING THE 11TH CURVE PART ONE

To **PLAY** the example movie, double click below:

To watch **PART TWO** of this movie -- [click here](#).

To **RETURN** to the head shape tutorial -- [click here](#).

# MOVIE EDITING THE 11TH CURVE PART TWO

To **PLAY** the example movie, double click below:

To watch **PART THREE** of this movie -- [click here](#).

To **RETURN** to the head shape tutorial -- [click here](#).

# MOVIE EDITING THE 11TH CURVE PART THREE

To **PLAY** the example movie, double click below:

To **RETURN** to the head shape tutorial -- [click here](#).

## SNAPPING THE 11TH CURVE

To **PLAY** the example movie, double click below:

To **RETURN** to the head shape tutorial -- [click here](#).

## TABLE ELEVEN

POINT	X AXIS	Y AXIS	Z AXIS
a - North Pole	0.000	0.000	0.000
Phantom point 1	0.000	5.742	-6.288
b - Head top 1	0.000	33.191	-26.815
c - Head top 2	0.000	56.883	-40.324
d - Head top 3	0.000	71.843	-59.078
e - Hairline	0.000	83.927	-81.268
f - Temple	0.000	85.612	-108.673
g - Browbone	0.000	81.216	-132.796
h - Crease of top eyelid	0.000	77.371	-143.822
i - Eye centre line	0.000	75.782	-149.310
j - Under-eye area	0.000	74.072	-153.747
k - Bridge of nose	0.000	72.922	-157.045
l - Cheek apple	0.000	71.904	-159.386
m - Nose base, cheek bone	0.000	71.078	-161.890
n - Upr lip, cheek hollow	0.000	70.264	-164.206
o - Centre of mouth, cheek hollow	0.000	70.508	-167.728
p - Lwr lip under, cheek hollow	0.000	70.832	-170.630
q - Tip of chin	0.000	71.241	-172.579
r - Jawline	0.000	71.639	-175.098
s - Nape of neck	0.000	73.080	-179.172
t - Neck	0.000	82.802	-194.303
Phantom point 2	0.000	104.577	-217.894
u - Base of neck	0.000	114.342	-227.064

**RETURN** to tutorial -- [Click Here](#)

**RETURN** to previous lesson -- [Click Here](#)




## HALF AND HALF

### Contents:


- [Scene Setup](#)
  - [Half and Half](#)
  - [Translating the Singularity](#)
  - [Mirror--Mirror](#)
  - [Krafty Kurves](#)
  - [Shutting Down the Scene](#)
  - [Summary of Lesson - Half and Half](#)
- 

## Scene Setup



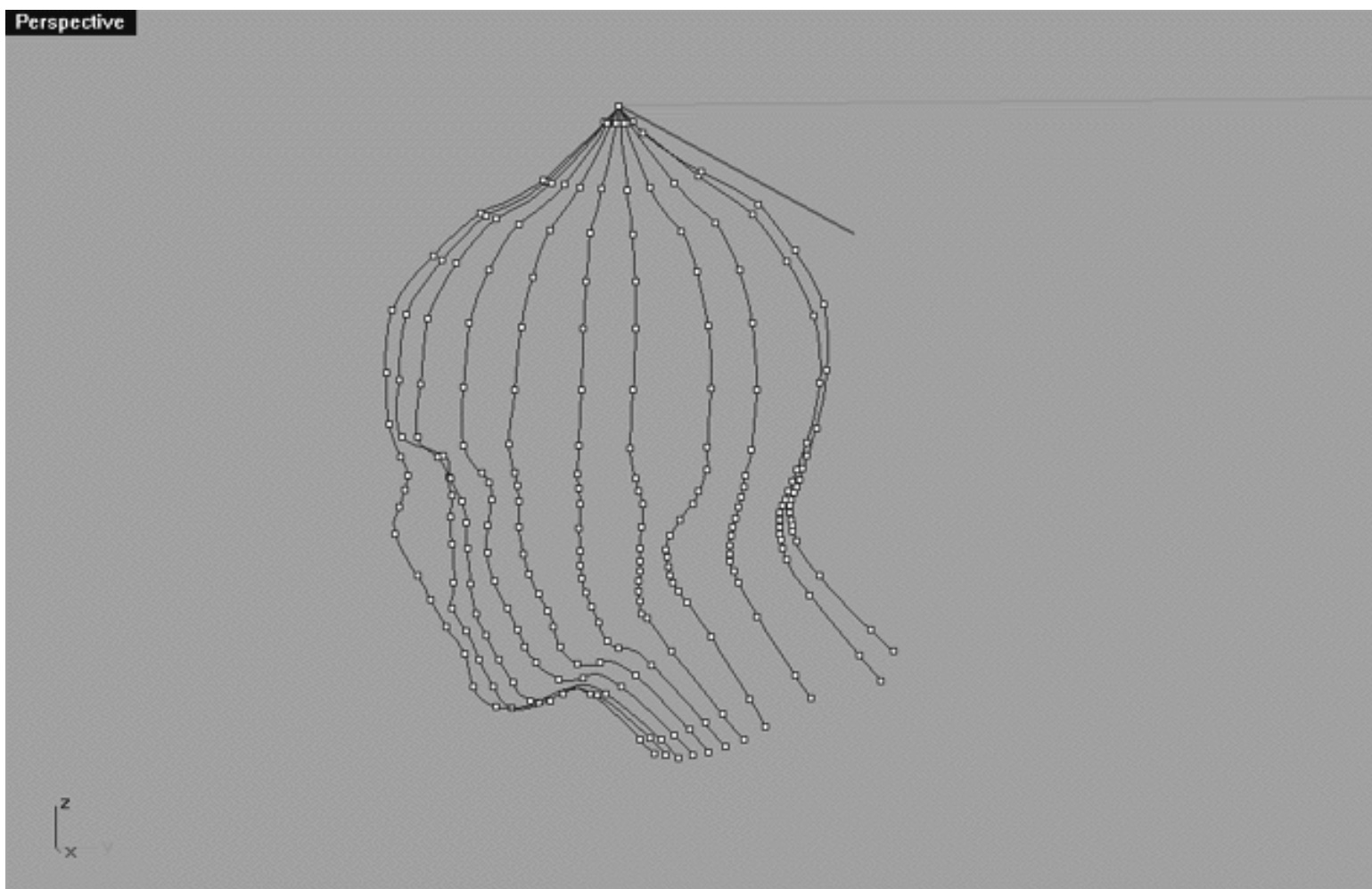
- If you've not done so already start a Rhinoceros session by **double clicking** on the desktop icon  the application will begin.
- Choose File, Open from the menu bar and double click on **START\_A.3DM** in the file list, it will load and open.
- Confirm at the Lower Status Bar the currently active layer is entitled SCENE START UP. If it is active proceed to the next step, if it's not then make it active by left clicking on the layer box, highlighting the correct layer and clicking on it.
- Again, at the Layers Box on the Lower Status Bar this time right click on the box, the Edit Layers Dialogue box will open. Confirm the following switches have been enabled or disabled:
- The Layer entitled Annotated Dots\_1 should be OFF.
- The Layers entitled Interp\_01 through Interp\_11 should be ON.
- The Layer entitled Photopoints should be OFF.
- The Layer entitled Frozen should be LOCKED.



- The Layer entitled SCENE START UP should be ON and active.
- All other layers should be set to OFF.
- When you've finished making your changes ( if any ) click on OK.
- Confirm that you can see the background image in the Front and right viewports.
- Confirm that the grid display in the viewports has been disabled, if not turn it off now.
- Confirm that no Osnaps are currently enabled, if any are disable them.
- Confirm that no edit points are currently displayed, if any are hide them.
- Zoom out all the viewports by selecting the Zoom Extents All icon  or by typing the command: **ZoomExtentsAll** at the command line and pressing ENTER.




---

## Half and Half





This *Perspective View* screenshot shows the 11 initial interpolated curves with edit points displayed.

By this stage in the project you will now have completed creating and editing 11 of the initial interpolated curves. The screenshot above shows these 11 initial curves in the Perspective Viewport. No doubt by now you will have noticed that our 1/2 head looks as if it has been extruded from a soft service ice cream machine, obviously we need to correct this situation before moving on much further. With this in mind our next task will be to translate the singularity ( point a. ) and the phantom point lying between edit points ( a - b ) downward along the Z axis. This will create a much more natural shape for the skull and prevent our character looking like an inhabitant from elsewhere in the universe.

- If you've not done so already, zoom out all the viewports by choosing the Zoom Extents All icon  from the toolbar and right clicking or type the command: **ZoomExtentsAll** at the command line.
- Create a new layer-- At the bottom of your screen you will see the *Lower Status Bar*, **right click** on the *Layer info box* -- the *Edit Layers dialogue box* will open.
- **Left click** on the **New** button and in the *Name field* type: **Trans\_Curves**.
- Move the cursor to the *colour field*, **left click** on the *Colour field*, the "*Select a colour*" dialogue and colour wheel will appear, choose a Dark Green (i.e. **R:0 G:127 B:0**) then click **OK**. Once done, click OK again to Exit.
- Make the new layer entitled Trans\_Curves active.
- In Any Viewport select all 11 interpolated curves by holding down the left mouse key and dragging the fence out so that it encompasses them all -- they will highlight.
- Choose the Copy icon  from your toolbar or type the command: **Copy** at the command line.
- The system will respond with the following prompt: Point to copy from ( Vertical InPlace):
- Type In and press ENTER.
- With all the curves still highlighted enable the End Osnap.
- Choose the Move icon  from your toolbar or type the command: Move at the command line.
- The system will respond with the following prompt: Point to move from ( Vertical ):
- In Any Viewport "snap" the cursor to the singularity point of all 11 interpolated curves at coordinates: X:0.000, Y:0.000, Z:0.000 and left click.
- The system will respond with the following prompt: Point to move to:
- Working in the Front Viewport, hold down the Shift key and "move" all 11 highlighted curves about 120 units along the X axis.




- With all the moved curves still highlighted choose the Layers icon  from your toolbar, select the Change Layers icon and right click -- the Layer for object dialogue box will open.
- Find the layer entitled: Trans\_Curves, select it by highlighting and press OK to exit.
- Press the Esc key -- all the curves should no longer be highlighted and will now be a dark green colour.
- Once again, in Any Viewport select all 11 dark green copies of the original interpolated curves by holding down the left mouse key and dragging the fence out so that it encompasses them all -- they will highlight.
- Choose the Move icon  from your toolbar or type the command: Move at the command line.
- The system will respond with the following prompt: Point to move from ( Vertical ):
- In the Top Viewport "snap" the cursor to the singularity point of all 11 copies and left click.
- The system will respond with the following prompt: Point to move to:
- Hold down the Shift key and move the copies back along the X axis to their original coordinates at X:0.000, Y:0.000, Z:0.000 and left click to finish. **NOTE** be certain to watch the coordinate window on the lower status bar carefully while moving!
- Press the Esc key to complete the operation -- once done the curves should no longer be highlighted.
- Open the Edit Layers dialogue box and turn OFF all the original interpolated curves ( Interp\_01 through Interp\_11). Once done, press OK to exit.
- Confirm that Interp\_01 through Interp\_11 are really off -- hold down your left mouse key and drag a fence around all the visible curves.
- The system will respond with the following prompt at the command line: Found 11 curves.
- Press the Esc key to finish.
- Save your work.

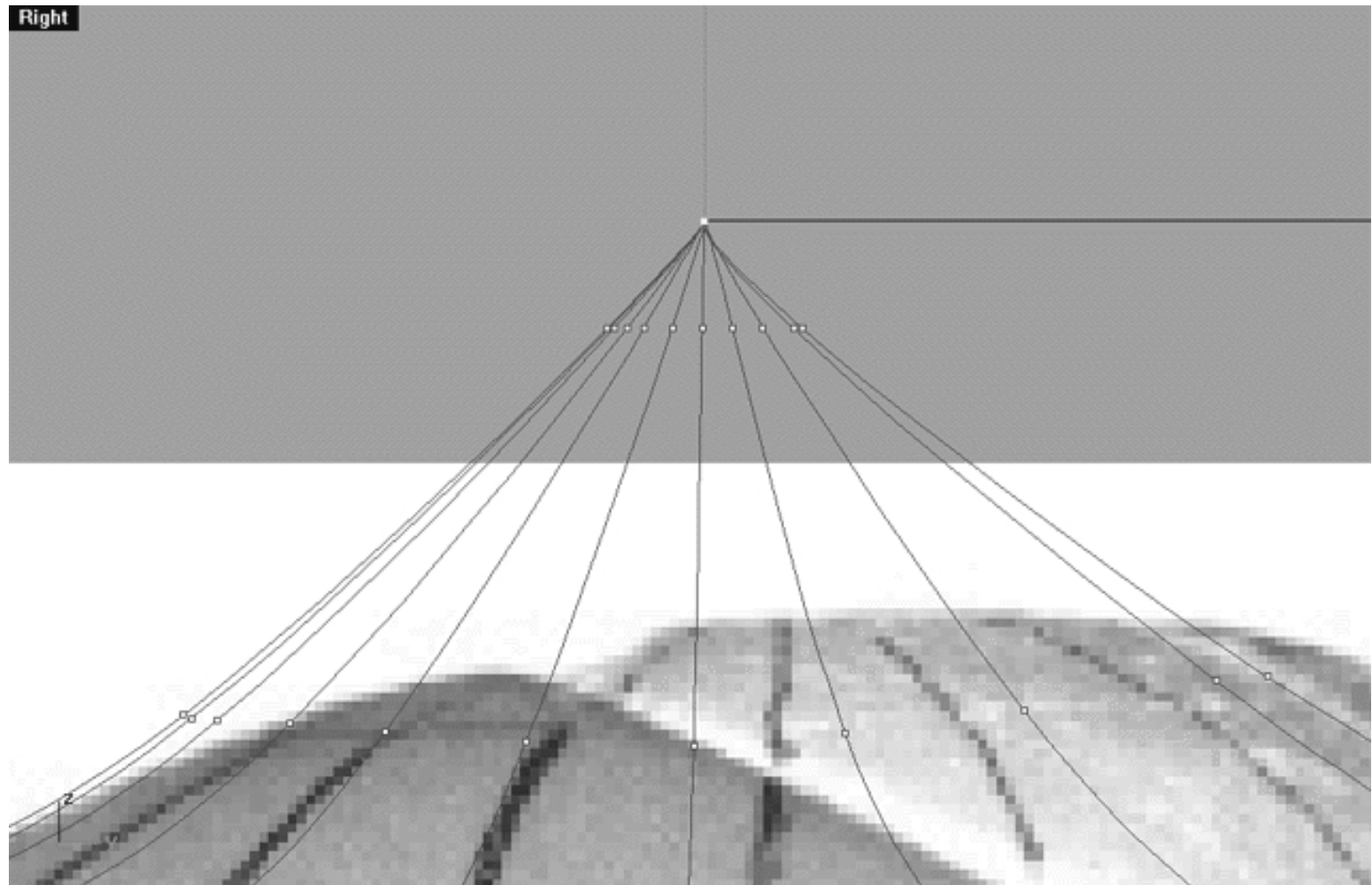
---

## Translating the Singularity


Now at long last we can set about creating a more realistic shape for the top of the skull, however, in order to do this we are going to have to move some edit points.

- In Any Viewport select all 11 curves by holding down the left mouse key and dragging the fence out so that it encompasses them all -- they will highlight.

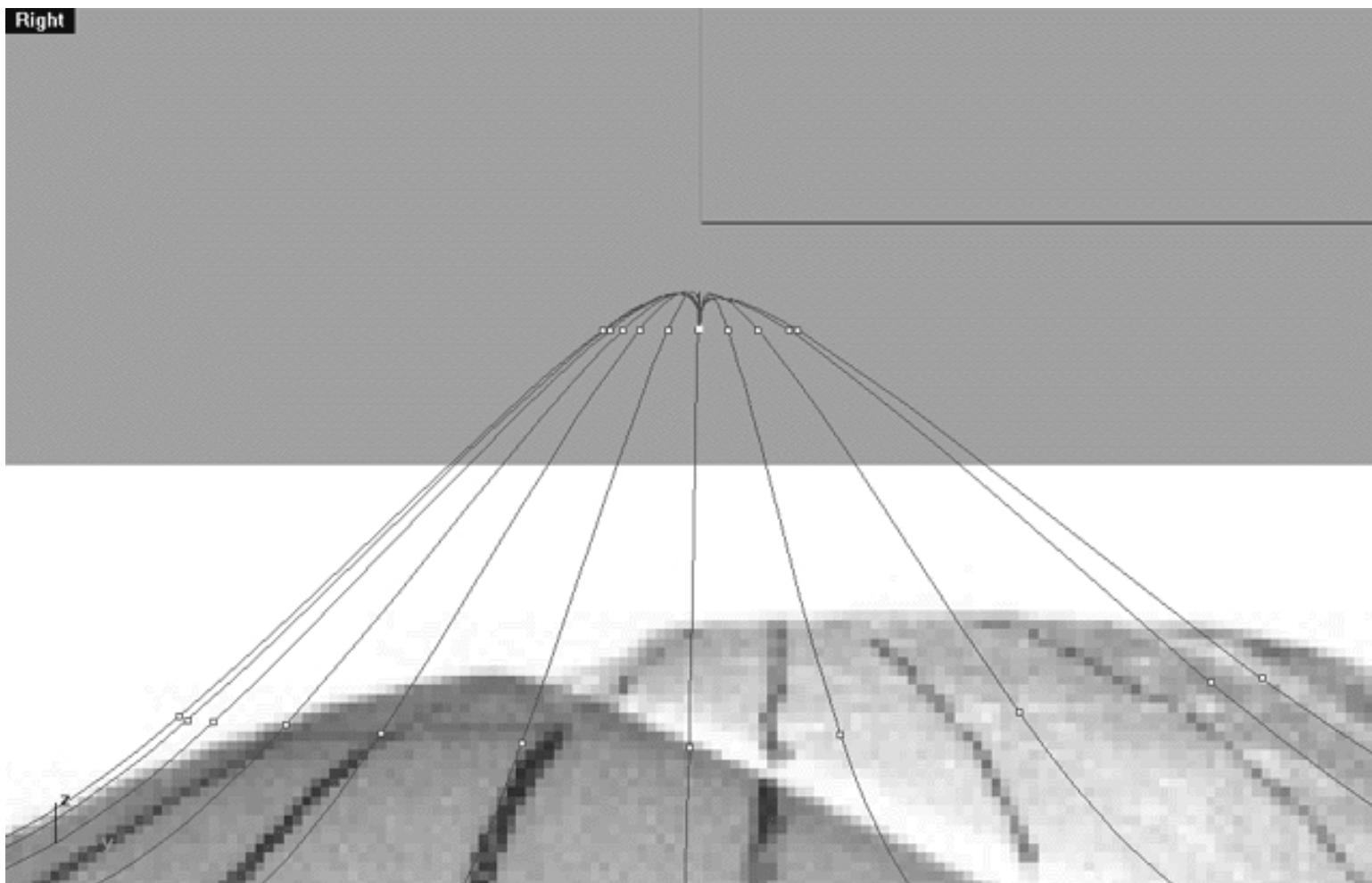
- Display the edit points for all the curves by choosing the Edit Point On/Off icon  from the toolbar and left clicking or type the command: **EditPtOn** at the command line and press Enter -- the edit points should now be displayed.
- Maximise the Right Viewport and Zoom in tightly on top 3 rows of points.
- Select the singularity by holding down the left mouse key and dragging the fence around it -- the point should highlight.



*This screenshot of the **Right Viewport** shows the first 3 rows of points. **\*Note--the singularity has been selected (top point highlighted in yellow).***

- Confirm that the End Osnap is still active, if not enable it.
- Choose the Move icon  from your toolbar or type the command: Move at the command line.
- The system will respond with the following prompt: Point to move from ( Vertical ):
- In the Right Viewport "snap" the cursor to the singularity point of all 11 copies and left click.
- The system will respond with the following prompt: Point to move to:

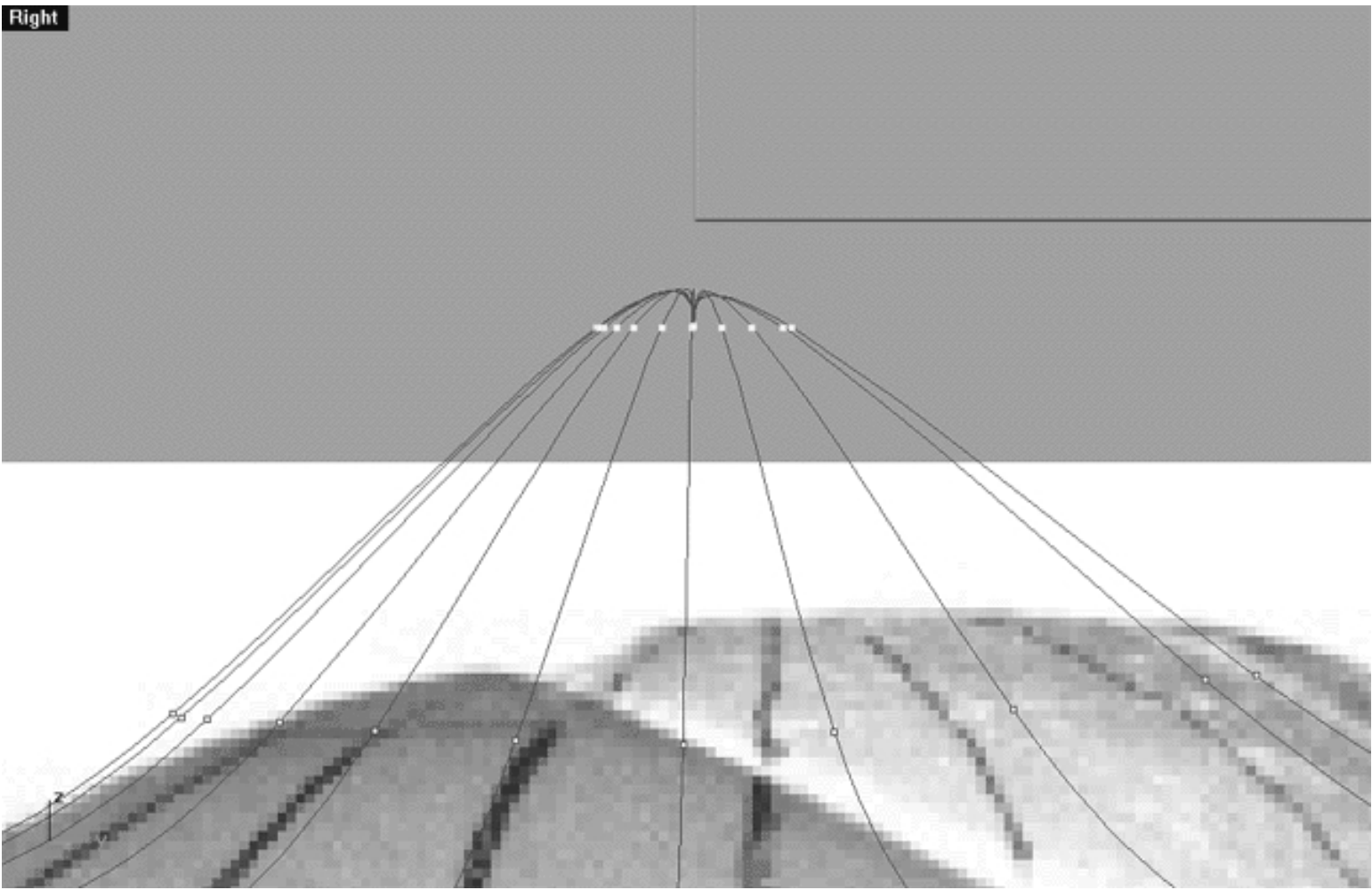
- Hold down the Shift key and move the singularity downward along the Z axis approximately 6.300 units until the point is at about the same level as the second row of points and left click to finish.
- Press the Esc key to complete the operation -- once done the curves should no longer be highlighted.



*This screenshot of the **Right Viewport** shows the singularity (highlighted in yellow) has now been moved downward approximately 6.300 units and is now level with the 2nd row of edit points.*

- In the Right Viewport select all the points on the 2nd row (including the singularity) by holding down the left mouse key and dragging the fence out so that it encompasses them all -- they will highlight.
- Disable all Osnaps.

Right

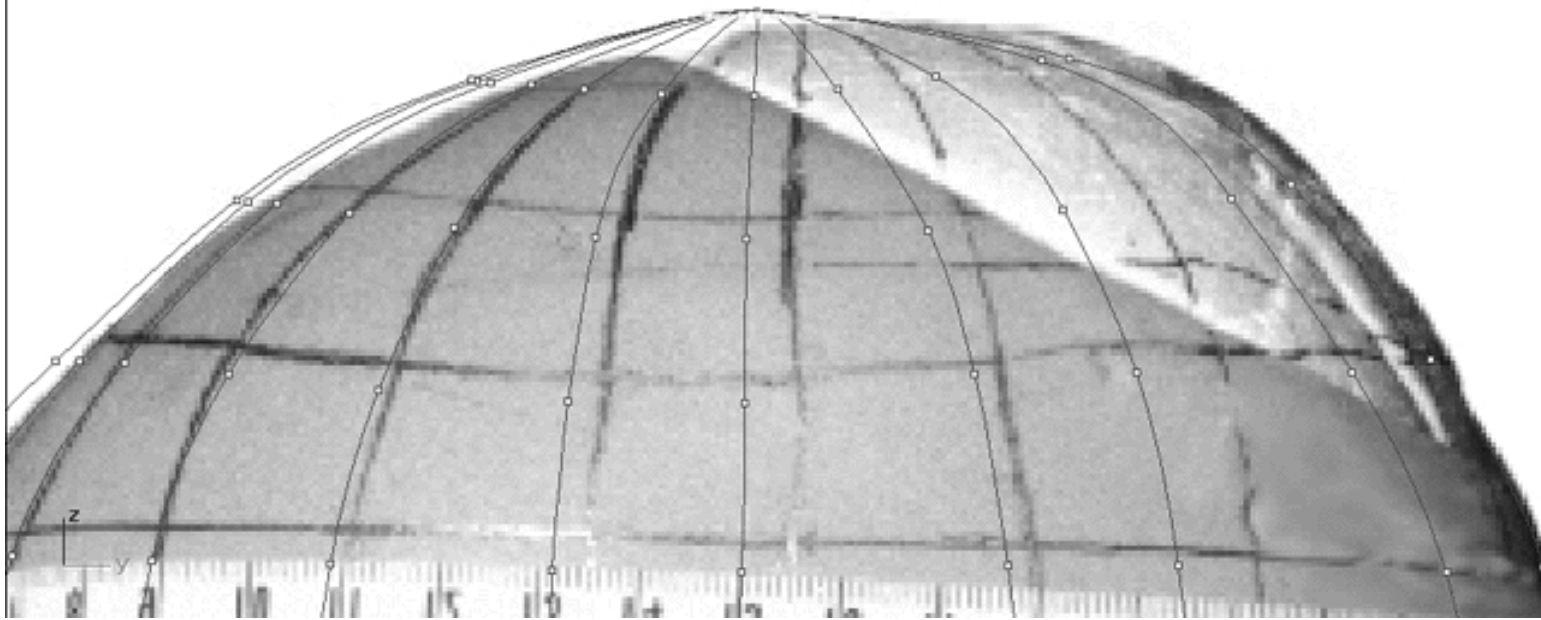


*This screenshot of the **Right Viewport** shows all the points on the 2nd row (including the singularity) after having been selected and prior to moving.*

- Zoom out slightly so that you can see more of the head.
- Hold down the Shift key and left click on the currently highlighted points and drag downward along the Z axis about 15.946 units.



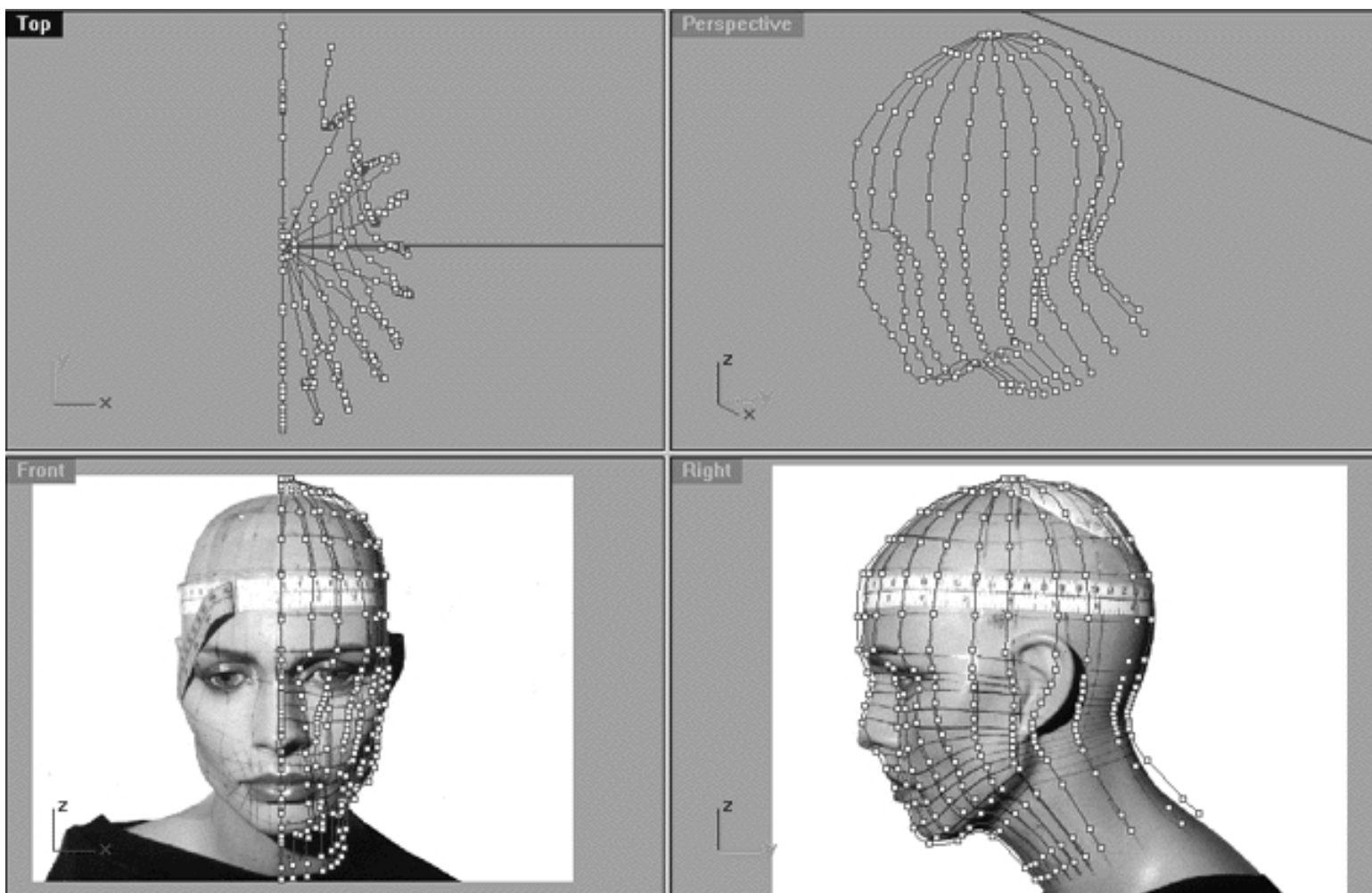
Right



*This screenshot of the **Right Viewport** shows all the points on the 2nd row (including the singularity) after having been moved downward along the Z axis about 15.946 units.*

- Press the Esc key to complete the operation.
- Zoom out using Zoom Extents All.
- Minimise the Right Viewport by double left clicking on its label.
- Save your work.






*This **All Viewport** screenshot shows how your monitor should now look.*

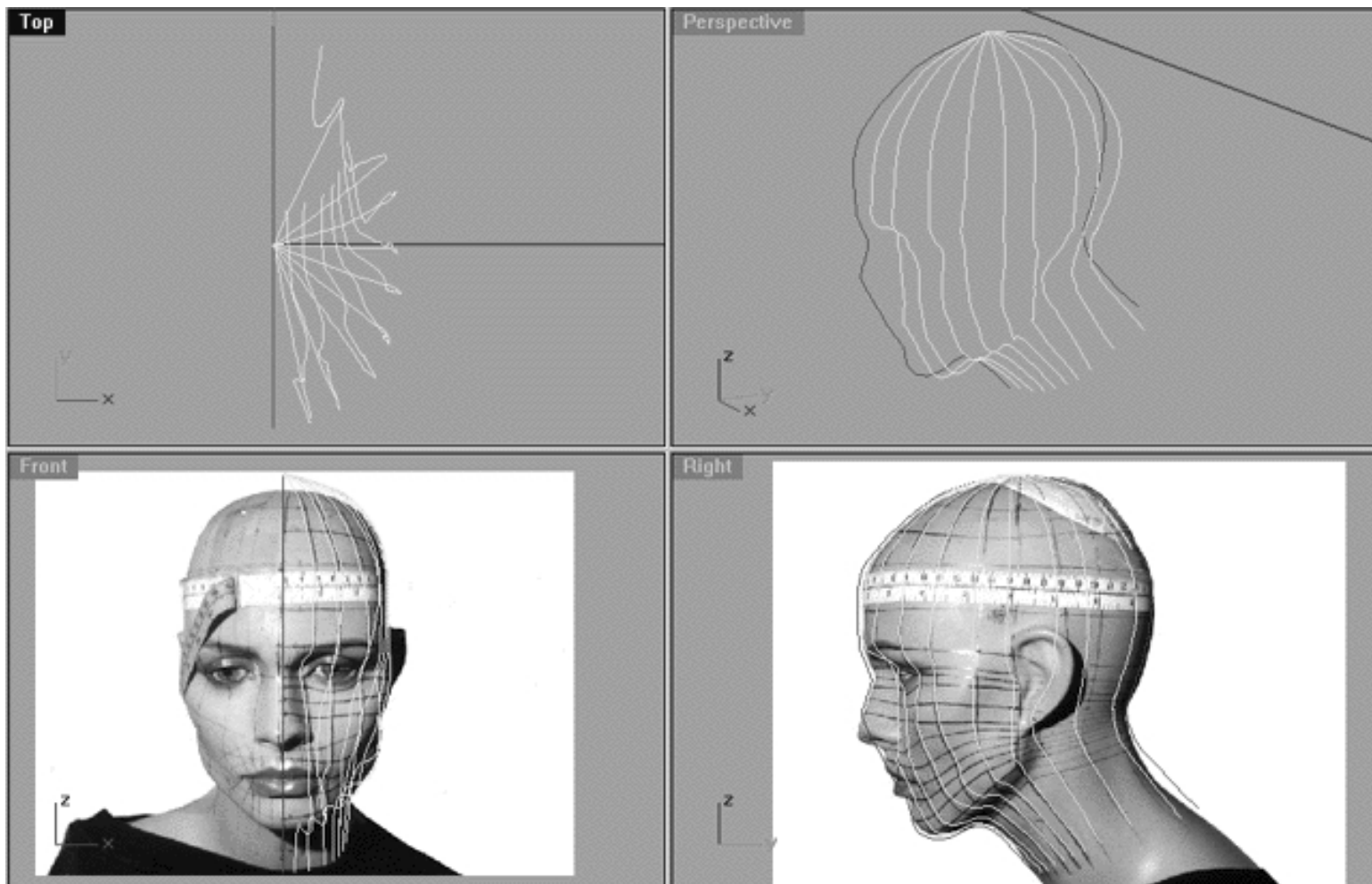
## Mirror--Mirror

Having now created a far better shape for the top of the skull our half head is very close to being finished. Before we refine the shape any further we are going to have to create another 11 curves. Don't panic or start freaking out because you don't have to go through all of that nasty point pulling all over again. We can speed the modelling process up by producing a mirror copy for the opposite side of the head from the 11 curves that we've already created.


Now something that I should mention is this. Real life human heads are never perfectly symmetrical which of course is what you get when you make a mirror copy for the other side as I'm suggesting that you do now. To a large extent perfect symmetry in a face is a dead giveaway that it's not real and something that is subconsciously picked up by the brain. So, if you want to really create a true to life photo realistic image you may want to consider rather than making a mirror copy modelling the entire other side instead. Of course this will take a lot of time and the results may or may not be better, this depends a great deal of your current level of modelling skill. The very advanced and highly experienced modellers amongst you may achieve better results by doing this, however it is doubtful that anyone else will and it's hard to justify the extra time required.

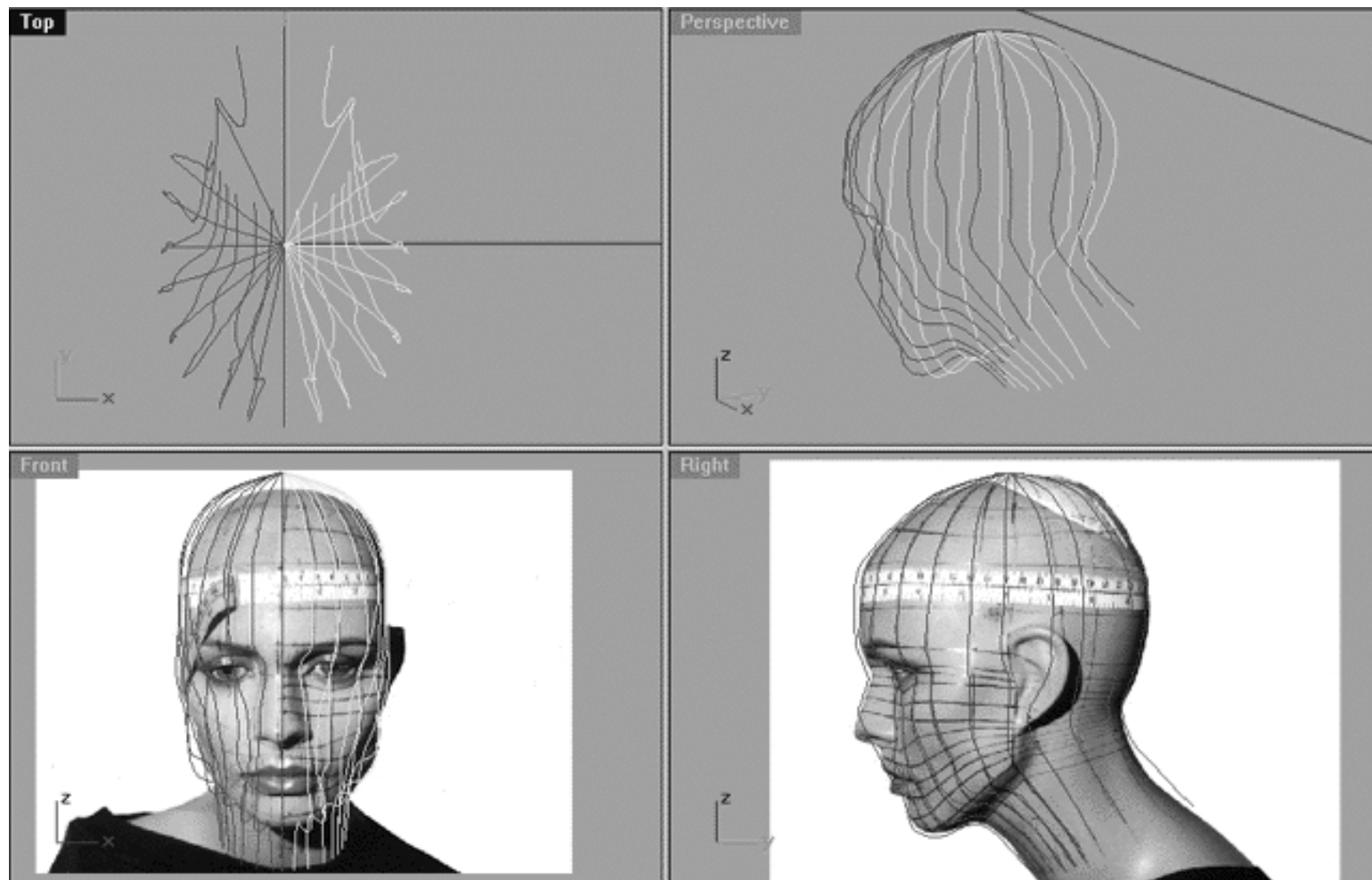
- Turn all currently displayed edit points off by choosing the Edit Point On/Off icon  from the toolbar and right clicking or type the command: **PtOff** at the command line and press Enter -- no edit points should now be displayed.

- Select all 11 currently displayed curves by holding down the left mouse key and dragging the fence around them -- the curves will highlight.
- Hold down the Ctrl key and left click the two front and rear profile curves (Interp\_01 and Interp\_11) -- they will become de-selected.



*This **All Viewport** screenshot shows how your monitor should now look.*

- Enable the End Osnap.
- Choose the Mirror icon  from your toolbar and left click on it.
- The system will respond with the following prompt at the command line: Start of mirror plane:
- Move the cursor to singularity at coordinates: X: 0.000 Y: -0.000 Z: -22.162 -- it should "snap" to this location, when it does left click.
- The system will respond with the following prompt at the command line: End of mirror plane:
- The mirror image will now appear, pivoting upon the end snap at the singularity.
- In the Top Viewport, hold down the Shift Key and move your cursor about 50 units along the Y axis (as if heading for 12 o'clock) then press Enter.





This **All Viewport** screenshot shows how your monitor should now look having made a mirror copy.

- Press the Esc key to complete the operation.
- Save your work

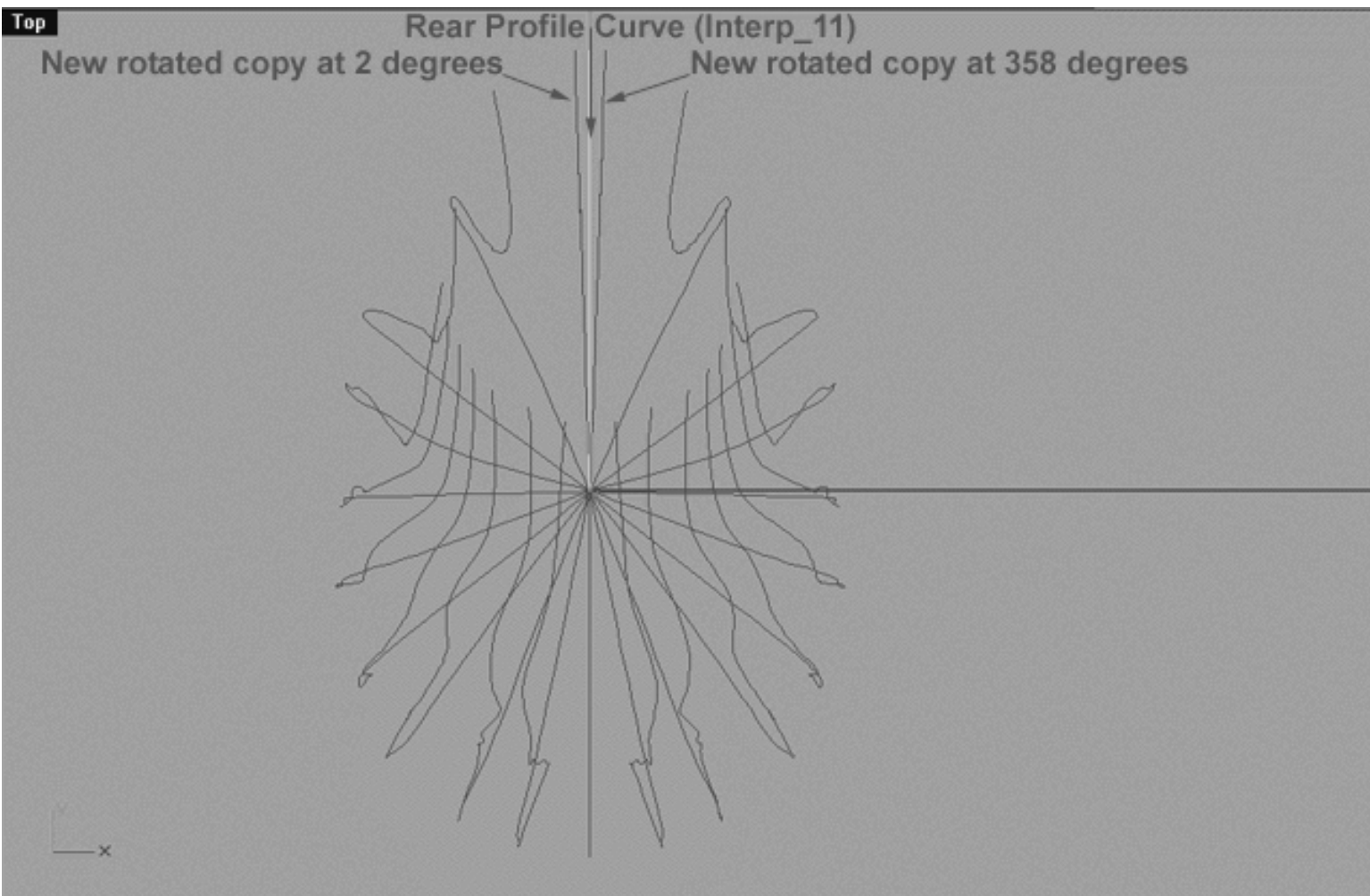
## Krafty Kurves

Okay, next we will copy and rotate the rear profile curve (Interp\_11).



- Maximise the Top Viewport by double left clicking on its label.
- Choose the Options icon  from your toolbar and left click on it.
- Select the Modelling Aids tab and in the Ortho field tick the box and enter the value 2.0 in the Snap Every field and click OK to exit.
- Left click on Interp\_11, it will highlight.

- Choose the Rotate 2D icon  from your toolbar and left click on it.
- The system will respond with the following prompt at the command line: Centre of rotation (copy):
- At the command line type: copy and press Enter.
- Move the cursor to singularity at coordinates: X: 0.000 Y: -0.000 Z: -22.162 -- it should "snap" to this location, when it does left click.
- The system will respond with the following prompt at the command line: Angle or first reference point:
- Press the F9 key to turn on the grid snap.
- Hold down the Shift key and move the cursor along the Y axis 50 units, when you've done so left click.
- The system will respond with the following prompt at the command line: Second reference point:
- Rotate the curve 2 degrees and left click -- a new curve will appear.
- Once again, rotate the curve this time 358 degrees and left click -- another new curve will be created.
- Press the Esc key to complete the operation.



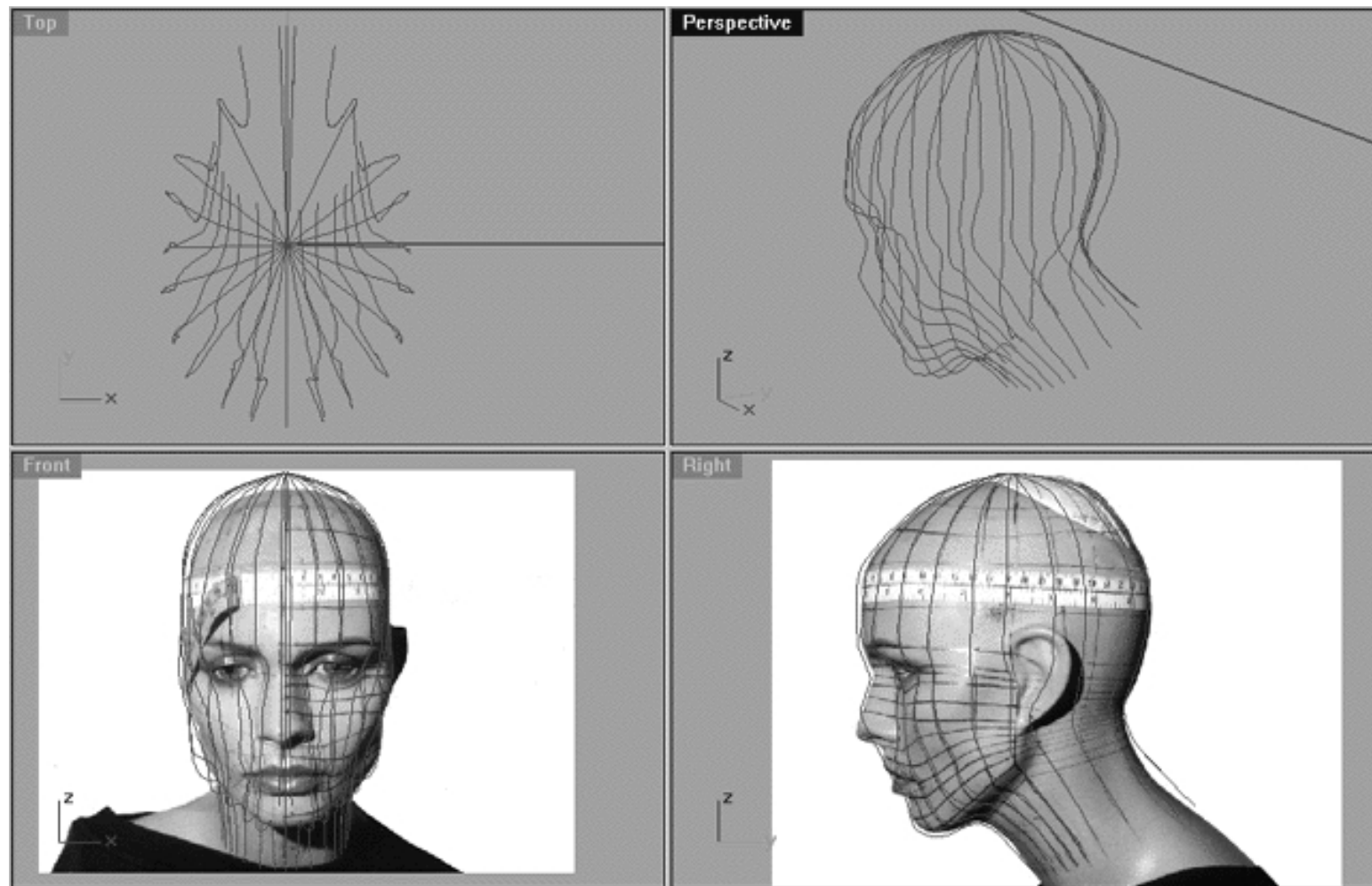


*This **Top Viewport** screenshot shows how your monitor should now look.*

- Choose the Options icon  from your toolbar and left click on it.
- Select the Modelling Aids tab and in the Ortho field un-tick the box and enter the value 90.00 in the Snap Every field and click OK to exit.
- Press F9 to disable the grid snaps.
- Disable any currently active Osnaps.
- If you've not done so already, left click on the rear profile curve (Interp\_11) -- it should now be highlighted.
- Choose the Copy icon  from your toolbar or type the command: **Copy** at the command line.
- The system will respond with the following prompt: Point to copy from ( Vertical InPlace):
- Type In and press ENTER.

You've just created an exact copy of the rear profile curve (Interp\_11) on top of itself -- that's why nothing looks much different. Confirm that you have in fact done this correctly:

- Select all the visible curve by holding down the left mouse button and dragging a fence around all the curves -- they will highlight.
- The system should respond with the following prompt at the command line: Found 23 curves.
- Press the Esc key to complete the operation.
- Minimise the Top Viewport by double left clicking on its label.
- Save your work.



*This **All Viewport** screenshot shows the head model as it should now look on your monitor.*

# Shutting Down the Scene

- Save the file.
  - Open the Edit Layers Dialogue box and confirm that the layer entitled SCENE START UP is ON and assign it as the ACTIVE LAYER.
  - Confirm that the layer entitled Photopoints is ON.
  - Confirm that the newly created layer entitled: Trans\_Curves is OFF.
  - Confirm that all other layers are OFF with the exception of Photopoints and SCENE START UP.
  - Click OK to exit the Edit Layers Dialogue box.
  - Confirm that no Osnaps are currently active, disable any that are.
  - Hide any edit points that are currently displayed.
  - Confirm that the background images (Front and Right Viewports) are visible.
  - Zoom Extents All.
  - **S A V E Y O U R W O R K ..!**
-



# Summary of Lesson - Half and Half

In this lesson you've learned to move selected points and curves using the Move command. Prior to the exercise the curves which make up our model all came to a single point (known as a singularity) which was rather stretched out making our head look somewhat like it had been dripped from out of a tap. We therefore set about creating a more realistic and pleasing overall shape by translating (moving) the singularity in addition to other selected points downward along the Z axis. Once the 1/2 head had been appropriately adjusted we then created the opposite half by using the Mirror command.

You've seen that creating a mirror image is a good way of really speeding up the modelling process. While it may not lead to the most Photorealistic results as human heads are never perfectly symmetrical it is generally the best solution for most people with advantages far outweighing the disadvantages.

We also created 2 new curves for our model by copying and rotating the rear profile curve (Interp\_11) and placing the copies just to either side with one of them at 2 degrees and the other at 358. Why did we create these extra curves? You find out soon when we create the surface in a forthcoming lesson!

Lastly you saw how to make an exact copy of an object on top of itself by using the Copy command with the InPlace option.

In the next lesson we will learn to refine the shape of the head yet further using one of Rhino many powerful commands.

Next Chapter - [Click Here](#).

RETURN to Top of page -- [Click Here](#)

Written by Joseph R. Saltzman.

Co-produced in association with Steven Ståhlberg

©1998-1999 Cinemagic Productions Limited. All Rights Reserved.

Duplication of this document including images and text by any means is expressly forbidden without prior written consent of Cinemagic Productions Limited.

Web Site: <http://www.cmagic.co.uk> Telephone: +44 (0)1753 733 190 Fax: +44 (0)1753 736 619 email: [cmagic@cmagic.co.uk](mailto:cmagic@cmagic.co.uk)

**RETURN** to previous lesson -- [Click Here](#)




## SMOOTH OPERATOR


### Contents:

- [Scene Setup](#)
  - [Smooth Operator](#)
  - [Smoothing the Singularity](#)
  - [Shutting Down the Scene](#)
  - [Summary of Lesson - The Smooth Operator](#)
- 

## Scene Setup



- If you've not done so already start a Rhinoceros session by **double clicking** on the desktop icon  the application will begin.
- Choose File, Open from the menu bar and double click on **START\_A.3DM** in the file list, it will load and open.
- Confirm at the Lower Status Bar the currently active layer is entitled SCENE START UP. If it is active proceed to the next step, if it's not then make it active by left clicking on the layer box, highlighting the correct layer and clicking on it.
- Again, at the Layers Box on the Lower Status Bar this time right click on the box, the Edit Layers Dialogue box will open. Confirm the following switches have been enabled or disabled:
- The Layer entitled Annotated Dots\_1 should be OFF.
- The Layer entitled Photopoints should be OFF.
- The Layer entitled SCENE START UP should be ON.
- The Layer entitled Trans\_Curves should be ON.
- All other layers should be set to OFF.
- When you've finished making your changes ( if any ) click on OK.

- Confirm that you can see the background image in the Front and Right viewports.
- Confirm that the grid display in the viewports has been disabled, if not turn it off now.
- Confirm that no Osnaps are currently enabled, if any are disable them.
- Confirm that no edit points are currently displayed, if any are hide them.
- Zoom out all the viewports by selecting the Zoom Extents All icon  or by typing the command: **ZoomExtentsAll** at the command line and pressing ENTER.

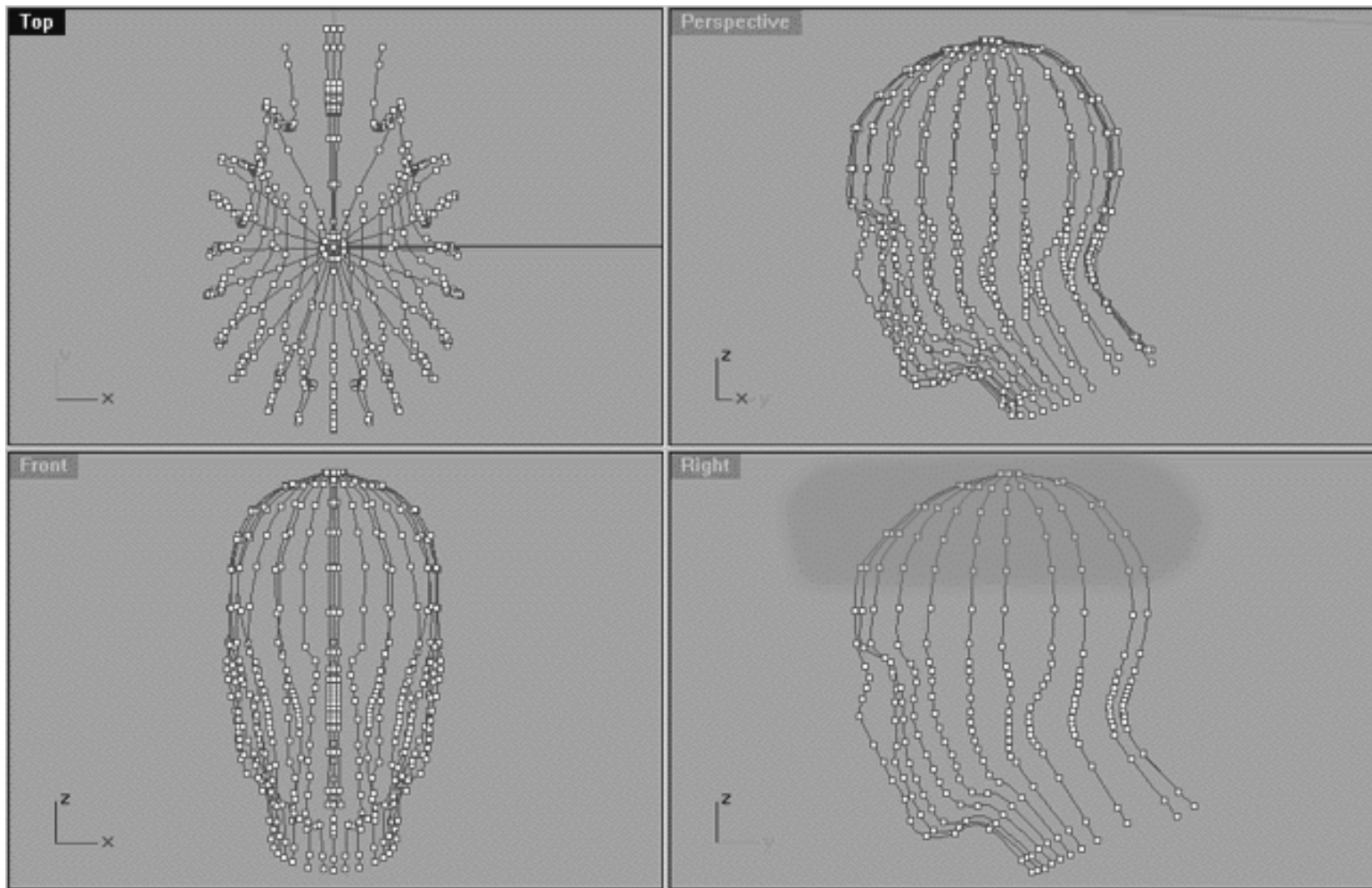
## Smooth Operator

In the previous lesson we took steps to refine the head shape so that the top of the skull follows a more natural curvature. Now that we've managed to get all the curves pretty close to their final shape all that remains is to tweak them just a little bit more. Take a look at the following screenshot, now with the edit points displayed if you look carefully you'll see that the forehead area is just a bit flatter than it should be. While the back of the head is looking pretty good overall, there is a slight bump however, so room for improvement still exists. We will now concentrate on sorting out all the points in the area with the blue highlight as seen in the Right Viewport below.


Rhino has a great command for "automatically" tweaking points and it's called Smooth. Smooth does just that, it eases the tension between the points to a variable degree which you can set. Smooth can be a real life-saver under certain circumstances and can sometimes quickly fix a rippled or uneven surface that otherwise might take a very long time using other editing methods. While smooth can sometimes seem like a magical solution, it is NOT and you should exercise some caution when using it. I'm warning you, don't use smooth too much or you'll ruin your work and I'd strongly recommend that you apply it sparingly under all conditions. If you over use smooth at the very worst your model may not render correctly and at the very least may look featureless and without form -- yuck.

Another perfect use for smooth is to remove the singularity at the top pole of the skull which is something I generally like to do when modelling heads. When you get right down to it it doesn't matter if there is a hole up on top because it gets covered up with hair anyway -- unless your character is going to be bald (not unlike myself). If you can't live with the idea of there being a hole in your head you can always use an n-sided patch to plug it up when you are done. More importantly however be aware that we are going to completely re-construct this head with a new parameterisation a bit later on in the tutorial. So at the end of the day, hole or no hole will not matter as we are not going to use the surface produced in the final model anyway. So why would I use smooth to remove a singularity? Basically because using a command like scale to "open up" the points just simply will not work, but smooth will and does a cracking job of it too!

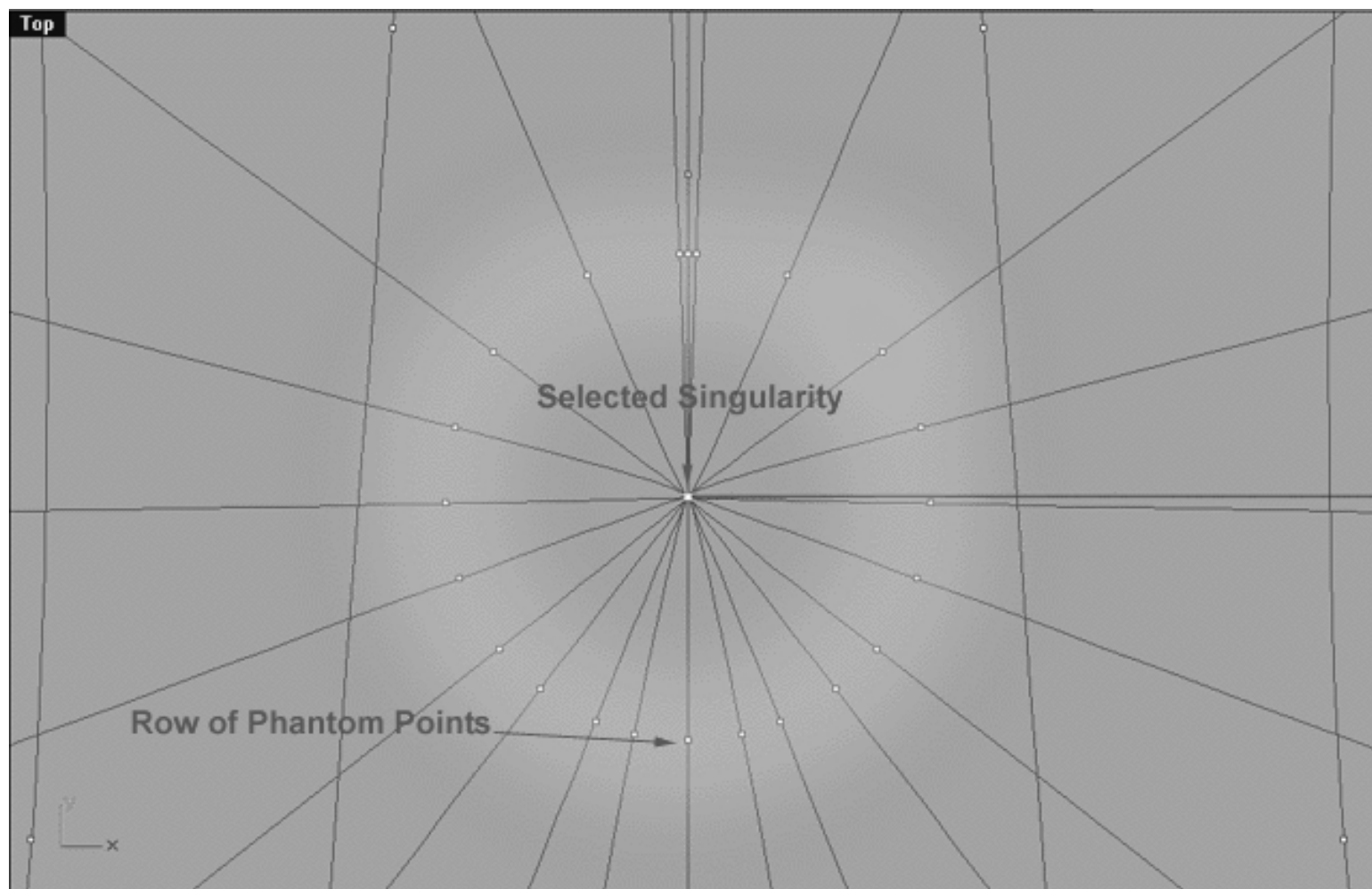
# Smoothing the Singularity



This **All Viewport** screenshot shows the area of points we will focus on (highlighted in blue).

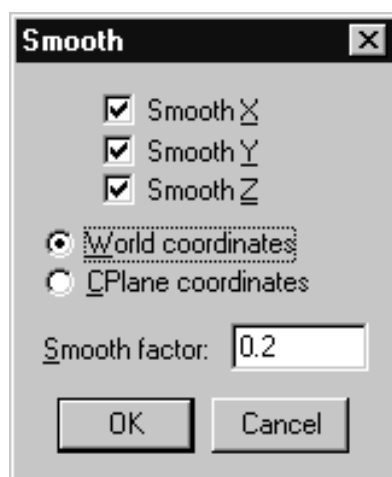
- Make the layer entitled Trans\_Curves currently active. To do this left click on the Layer Info Box at Lower Status Bar, a dialogue box will open, find the layer entitled Trans\_Curves, move your mouse over it as you do it will highlight then left click on it. The dialogue box should close and the layer entitled Trans\_Curves should now appear in the Layer Info Box.
- Now right click on the Layer Info Box the Edit Layers dialogue box will appear. Find the layer entitled Scene Start up and set it to OFF, then click OK to exit.
- If you've not done so already, In Any Viewport select all the visible curves by holding down the left mouse button and dragging the fence around them -- they will highlight.
- Display the edit points for all the curves by choosing the Edit Point On/Off icon  from the toolbar and left clicking or type the command: **EditPtOn** at the command line and press Enter -- the edit points should now be displayed as in the prior screenshot above.
- Maximise the Top Viewport by double left clicking on its label.
- Zoom in very tightly on the singularity and the 1st circular row of points (the phantom points).

- Select the singularity by holding down the left mouse button and carefully dragging a fence around it -- it will highlight and your screen should look like the following screenshot:



*In the screenshot above the **Top Viewport** has been zoomed in very tightly, focusing on the singularity (dead centre) and the first row of points (the phantom points) which are highlighted in yellow. The singularity has been selected by dragging a fence around it and is currently highlighted.*

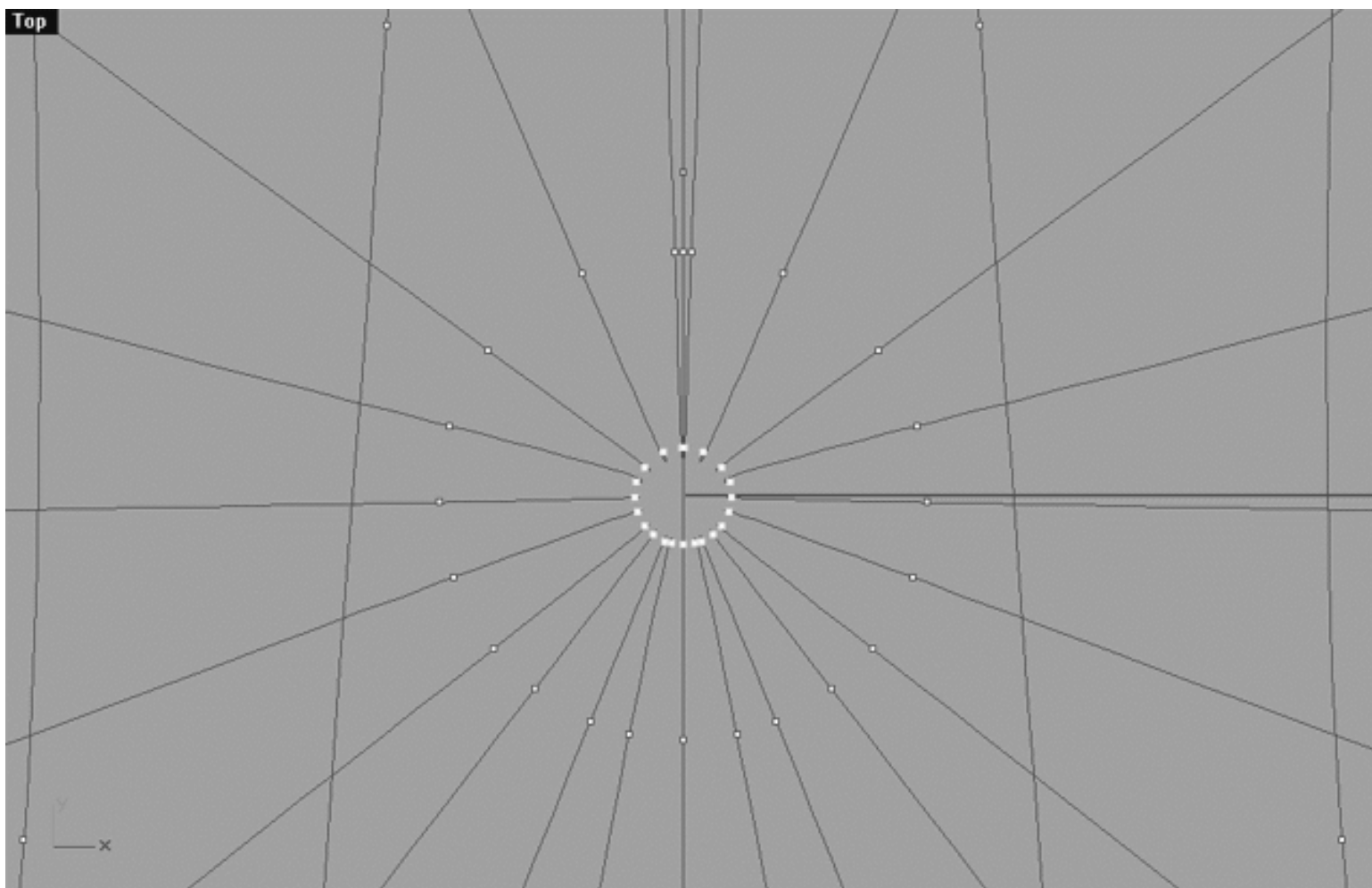
- From the Transform menu select Smooth or type the command: **Smooth** at the command line -- a dialogue box will appear as in the following screenshot:



*The Smooth dialogue box.*

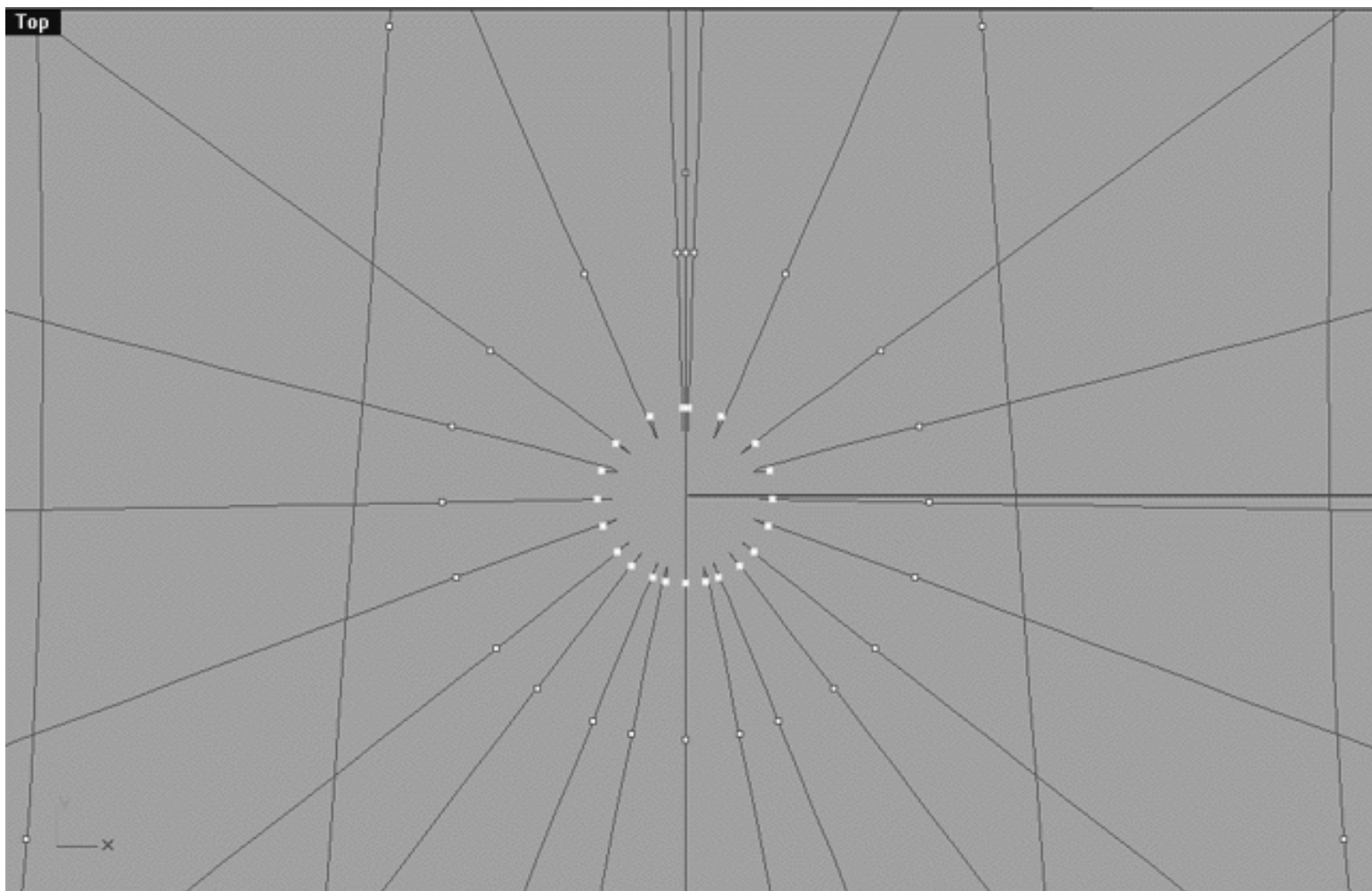


- Leaving all the values at their default, press OK -- the dialogue box will disappear and in the Top Viewport you will now notice that at the singularity the points have jumped outward, opening up into circle as in the following screenshot:



*This **Top Viewport** screenshot shows the the points at the singularity have now expanded and moved outward.*

- Let's open it up just a little bit more, press your right Mouse button (this should recall the last command issued) and once again the Smooth dialogue box will appear. Once again, leaving all the values at their default, press OK -- the dialogue box will disappear and in the Top Viewport you will now notice that at the singularity the points have jumped outward even more, opening up into a larger circle as in the following screenshot:



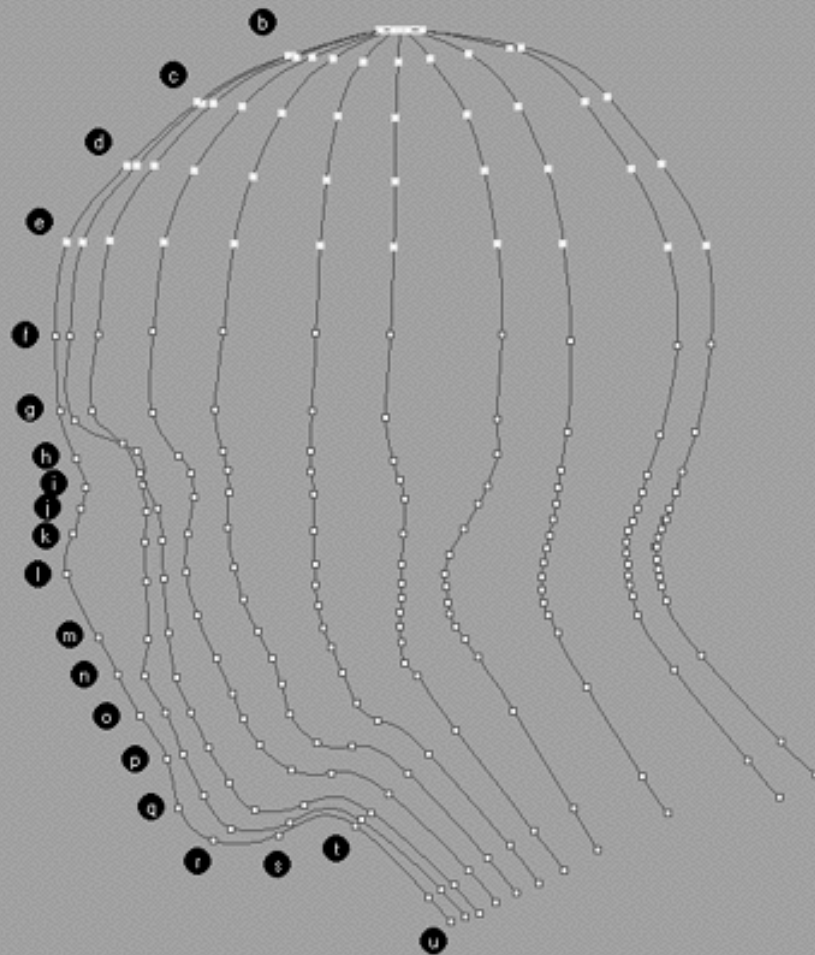
*This **Top Viewport** screenshot shows the result of continued smoothing.*

Okay that's far enough, we don't want to go crazy and make the hole any bigger than it is now. If you look carefully you may have noticed that the ends of all the curves seem to be curling back a bit. Don't worry about this, we are going to resolve this issue and clean up the overall shape of the top of the head in the next step.

- Minimise the Top Viewport by double clicking on its label.
- Maximise the Right Viewport by double clicking on it's label.
- Select all the points between the very top pole and row ( e. ) by holding down the left mouse button and dragging a fence around them. **\*Note** -- select only these points, your viewport should now look like the following screenshot:

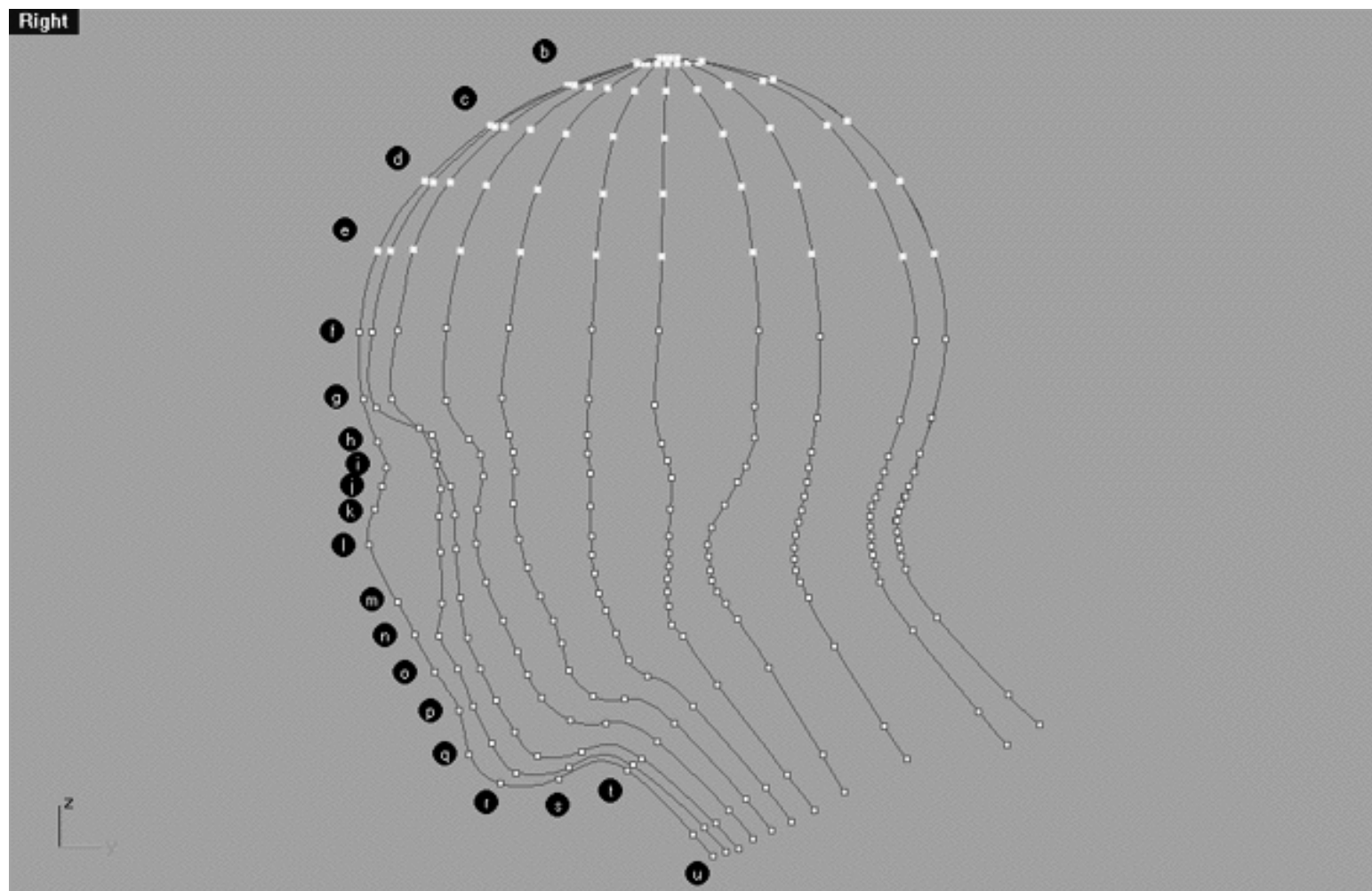


Right



This **Right Viewport** screenshot shows that the points in rows ( a - e ) have been selected and are currently highlighted. \*Note -- I've temporarily turned on the annotated dots just to make it easier for you to identify the rows.

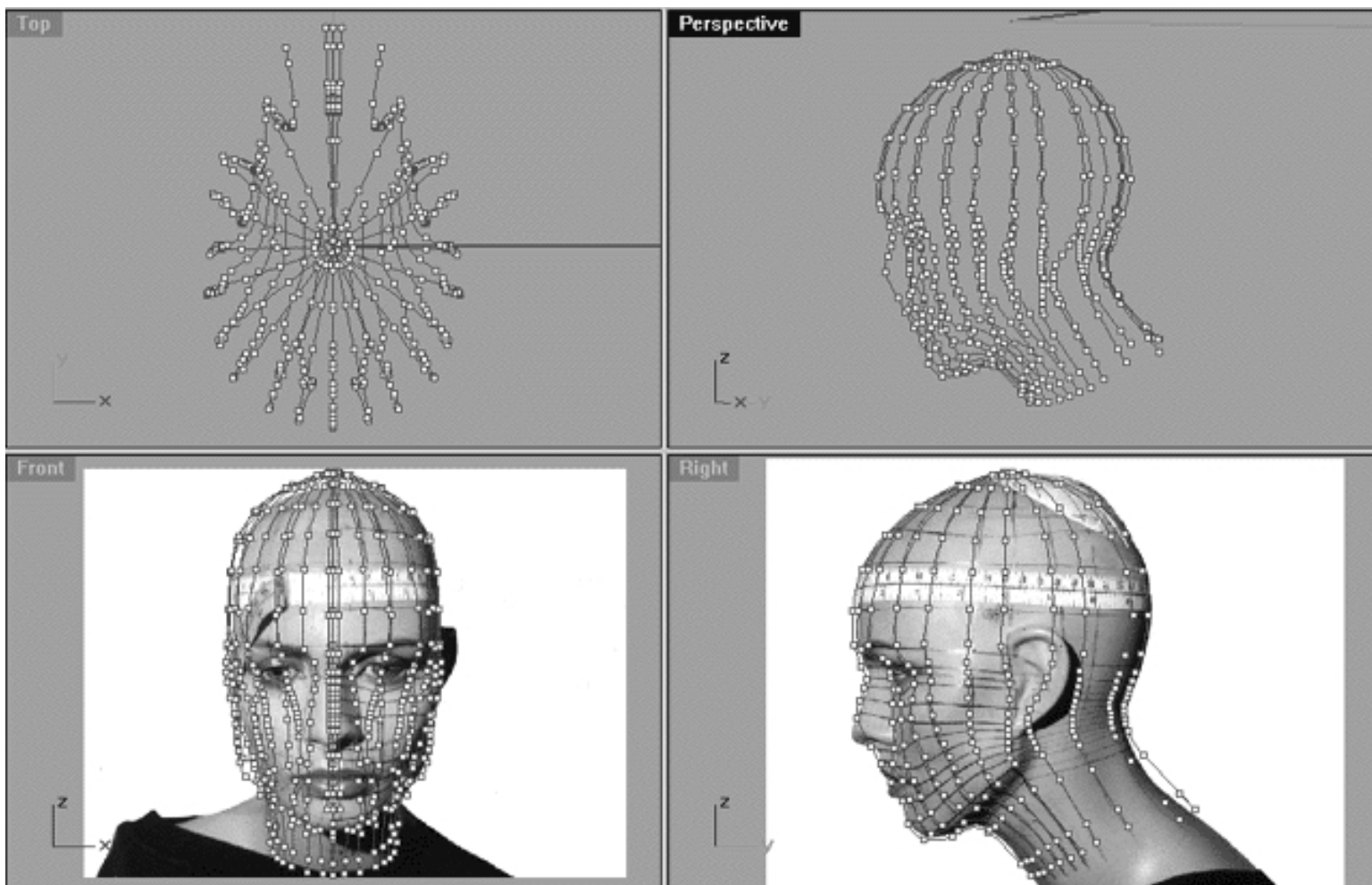
- Once again, from the Transform menu select Smooth or type the command: **Smooth** at the command line -- the Smooth dialogue box will appear.
- Leave all values at their defaults and press OK. The dialogue box will disappear and the selected points will smooth out, your viewport should now look like the following screenshot:



*This **Right Viewport** screenshot show the result of applying smooth the the selected points.*

Compare the last two screenshots. It's clear to see that the overall shape of the top of the head has been vastly improved by using the smooth command. The forehead now slopes at a far more pleasing and natural angle and the back of the head no longer has an annoying flat spot. Tip -- do not be tempted by using smooth much more than this, if you do it will probably ruin the shape of the head and it will wind up looking like a light bulb rather than anything else. Truth be told, I rarely use the default smooth factor of 0.2 as I find this rather a high value which is sometimes like using a sledgehammer to crack open a peanut. I usually use something like 0.02 and apply it several times watching the results carefully as I do. If something goes wrong or starts looking bad I'll use the Undo to get back again, having said that it's also a very good idea to save your file prior to using smooth and create a back up just in case things go horribly wrong -- which they sometimes can do.

- Minimise the Right Viewport by double left clicking on its label.
- Press the escape key to de-select all edit points.
- Select the Zoom Extents All icon and right click or type the command: **ZoomExtentsAll** at the command line -- your screen should now look similar to the following screenshot:



The above *All Viewport* screenshot shows all the edit points on all the curves have now been displayed.

As you can see there are now lot's of points making up our head about 529 of them! I think you can now understand why we've constructed our head using this curve by curve method, quite plainly it's easier. Can you seriously imagine trying to effectively edit the points any other way? Well not unless you enjoy driving yourself completely crazy that is! Sure, as I've said before there are lots of ways to construct a head and this is only one of them. What I prefer about this method is that you can concentrate on a single curve at a time and you can then choose to show or hide as my curves or points as you wish while working. Obviously the fewer points on your screen at any one given moment the easier they are to work with as you just avoid loads of confusion as to what exactly you're looking at.

## Shutting Down the Scene

- Save the file.
- Open the Edit Layers Dialogue box and confirm that the layer entitled SCENE START UP is ON and assign it as the ACTIVE LAYER.
- Confirm that the layer entitled Photopoints is ON.
- Confirm that the layer entitled: Trans\_Curves is OFF.
- Confirm that the layer entitled: Annotated Dots\_1 is OFF.

- Confirm that all other layers are OFF with the exception of those mentioned.
- Click OK to exit the Edit Layers Dialogue box.
- Confirm that no Osnaps are currently active, disable any that are.
- Hide any edit points that are currently displayed.
- Confirm that the background images (Front and Right Viewports) are visible.
- Zoom Extents All.
- **S A V E Y O U R W O R K ..!**

---

## Summary of Lesson - The Smooth Operator

In this lesson you've seen that the smooth command in Rhino can be a powerful tool but one that should be used with some degree of caution. You've seen that smooth can be used to open up a singularity something that you could not do using the scale command. In addition, we used smooth to "automatically" create a nice overall shape to the top the portion of the head by applying it to selected points.

You've really come a very long way and we are now at the stage where our initial curves are complete for all practical purposes -- you should be feeling pretty proud of yourself, you've accomplished a great deal -- very well done indeed..!

In the next lesson we will set about "skinning" the curves and creating the first "real" surface for our model -- now things start to get exciting!

---

Next Chapter - [Click Here](#).

RETURN to Top of page -- [Click Here](#)

Written by Joseph R. Saltzman.

Co-produced in association with Steven Ståhlberg  
©1998-1999 Cinemagic Productions Limited. All Rights Reserved.

Duplication of this document including images and text by any means is expressly forbidden without prior written consent of Cinemagic Productions Limited.  
Web Site: <http://www.cmagic.co.uk> Telephone: +44 (0)1753 733 190 Fax: +44 (0)1753 736 619 email: [cmagic@cmagic.co.uk](mailto:cmagic@cmagic.co.uk)



**RETURN** to previous lesson -- [Click Here](#)




## ON THE SURFACE


### Contents:

- [Scene Setup](#)
  - [On the Surface -- Plan A](#)
  - [Starting Over -- Plan B](#)
  - [Shutting Down the Scene](#)
  - [Summary of Lesson - On the Surface](#)
- 

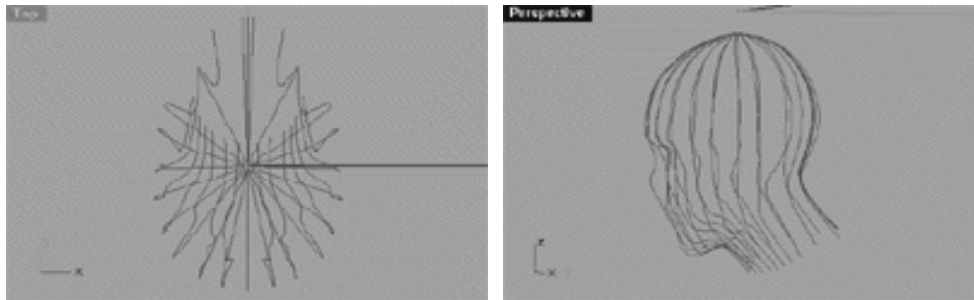
## Scene Setup



- If you've not done so already start a Rhinoceros session by **double clicking** on the desktop icon  the application will begin.
- Choose File, Open from the menu bar and double click on **START\_A.3DM** in the file list, it will load and open.
- Confirm at the Lower Status Bar the currently active layer is entitled SCENE START UP. If it is active proceed to the next step, if it's not then make it active by left clicking on the layer box, highlighting the correct layer and clicking on it.
- Again, at the Layers Box on the Lower Status Bar this time right click on the box, the Edit Layers Dialogue box will open. Confirm the following switches have been enabled or disabled:
- The Layer entitled Annotated Dots\_1 should be OFF.
- The Layer entitled Photopoints should be OFF.
- The Layer entitled Frozen should be LOCKED.
- The Layer entitled SCENE START UP should be ON.
- The Layer entitled Trans\_Curves should be ON.
- All other layers should be set to OFF.

- When you've finished making your changes ( if any ) click on OK.
- Confirm that you can see the background image in the Front and Right viewports.
- Confirm that the grid display in the viewports has been disabled, if not turn it off now.
- Confirm that no Osnaps are currently enabled, if any are disable them.
- Confirm that no edit points are currently displayed, if any are hide them.
- Zoom out all the viewports by selecting the Zoom Extents All icon  or by typing the command: **ZoomExtentsAll** at the command line and pressing ENTER.

## On the Surface -- Plan A



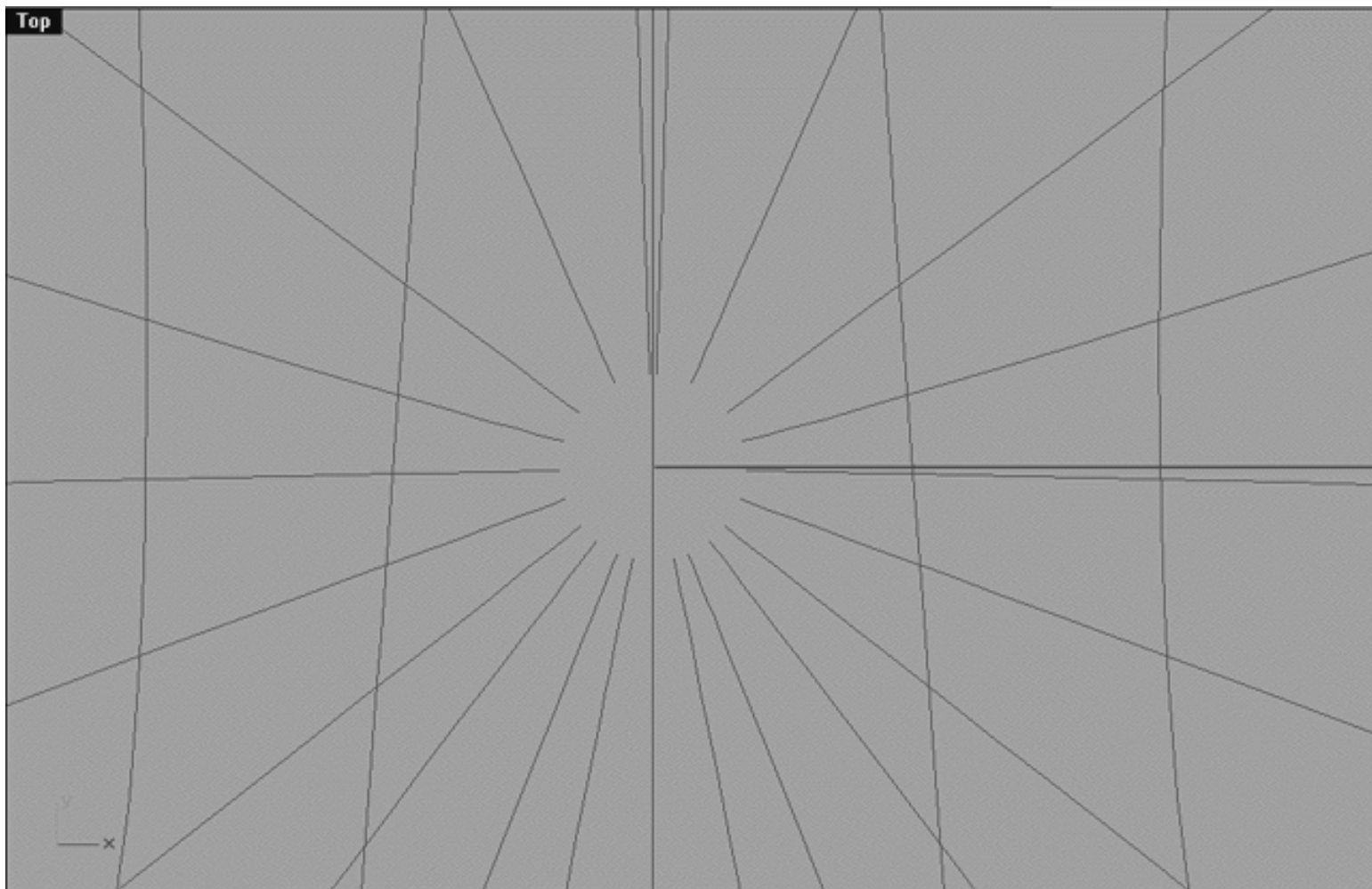
Now that we've edited all the curves and the shape has been sorted out, it's time to create our first real surface and see what our whole head looks like.

I am going to show you two ways to more or less do the same thing. The first way that I will show you involves more work, takes more time, and produces less desirable results. Hey wait a minute, so why am I going to put you to the trouble then? So that you learn yet another way of doing things -- that's why.


Actually, until McNeel and Associates re-vamped and improved the loft command this is how you had to construct a closed surface using loose loft. The second way I'll show you produces better results, is faster and much more sensible -- I guess that's why they improved it :-)

- Let's begin by creating a new layer-- At the bottom of your screen you will see the *Lower Status Bar*, **right click** on the *Layer info box* -- the *Edit Layers dialogue box* will open.
- **Left click** on the **New** button and in the *Name field* type: **Secondary\_Surf**.
- Move the cursor to the *color field*, **left click** on the *Colour field*, the "*Select a colour*" dialogue and colour wheel will appear, choose a cyan like colour (i.e. **R:0 G:255 B:255**) then click **OK**.

- Make the layer entitled **Secondary\_Surf** currently active. To do this left click on the Layer Info Box at Lower Status Bar, a dialogue box will open, find the layer entitled **Secondary\_Surf**, move your mouse over it as you do it will highlight then left click on it. The dialogue box should close and the layer entitled **Secondary\_Surf** should now appear in the Layer Info Box.
- Now right click on the Layer Info Box the Edit Layers dialogue box will appear. Find the layer entitled Scene Start up and set it to OFF, then click OK to exit.
- Maximize the Top Viewport by double left clicking on it's label.
- Zoom in tightly on the area surrounding the hole in the top of the head, your viewport should look like the following screenshot:

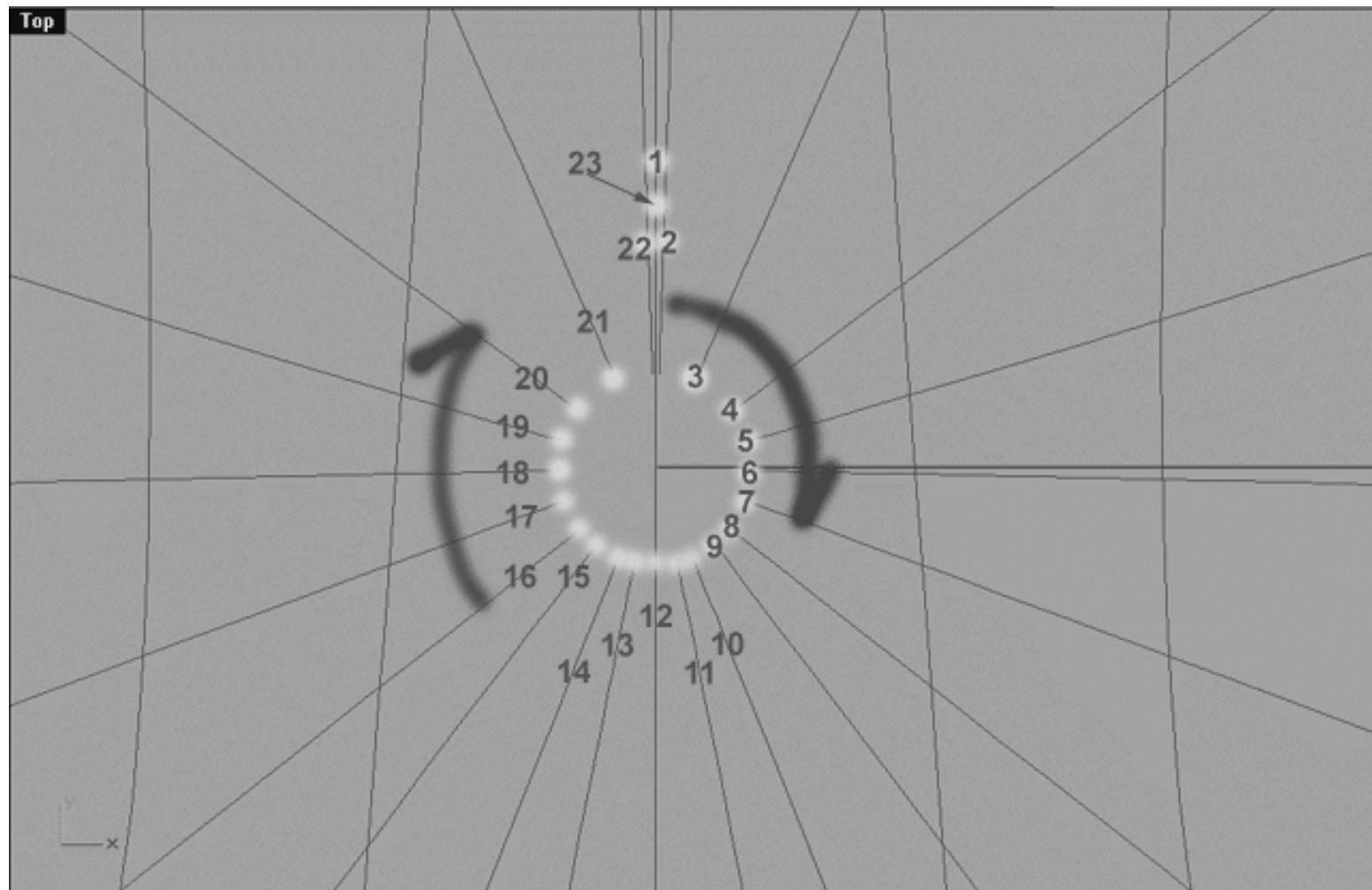


*This **Top Viewport** screenshot shows a detailed view of the region surrounding the now open singularity at the top of the head.*

- From the toolbar select the loft icon  or type the command: loft at the command line.
- The system will respond with the following prompt at the command line: Select curves to loft ( point ):
- Begin by picking each of the curves by left clicking on them while working in a clockwise direction and starting with the rear profile curve (Interp\_11).

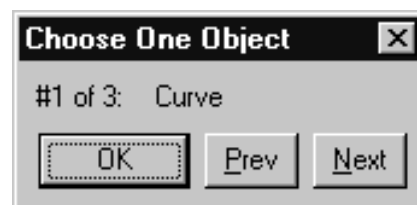


- See the following screenshot :



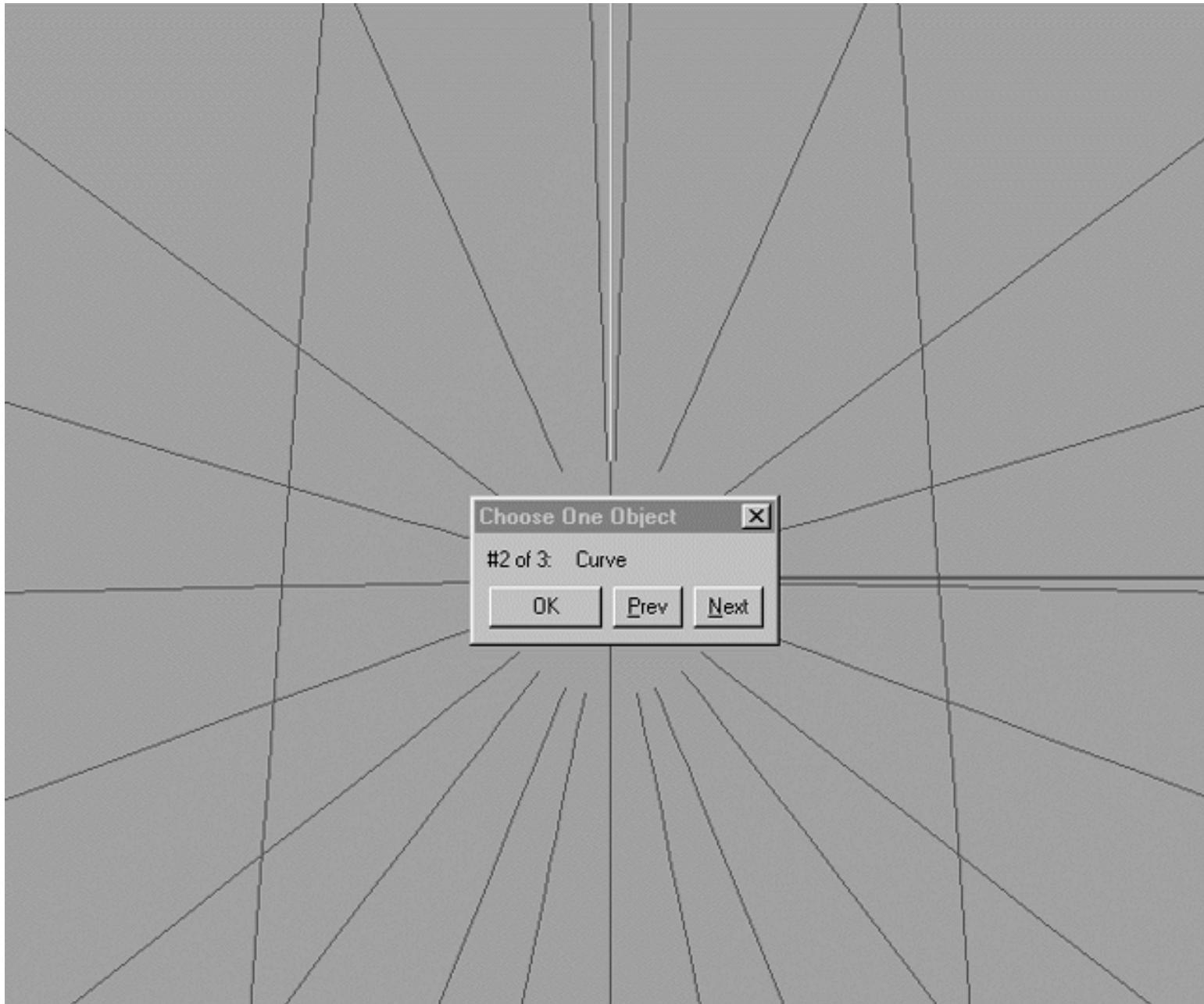
*This **Top Viewport** screenshot shows all 23 curves and the sequence and direction in which you should pick them for lofting by left clicking on them with your mouse. \*Note-- the numbers in red for curves 10 - 23 are only placed as they are for purposes of clarity, so don't be confused. You should be picking each of the curves at about the location of the yellow dots as seen in the screenshot.*

- **IMPORTANT** -- it is quite likely that when you start by picking the rear profile curve (Interp\_11) you will see the following dialogue box:



*This screenshot shows the "Choose One Object" dialogue box.*

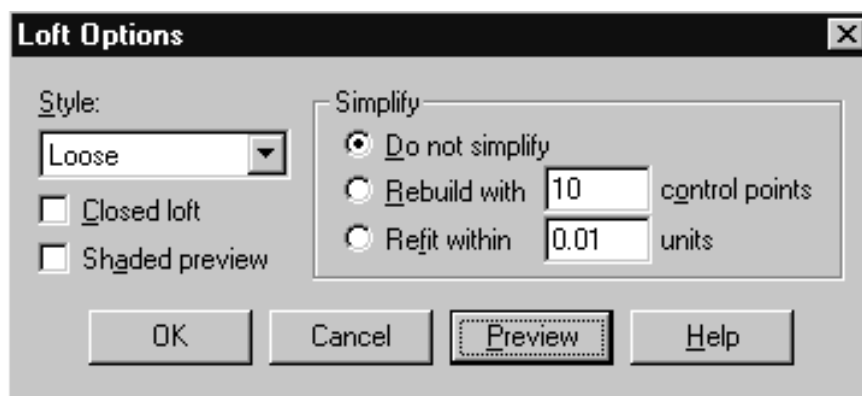
- What this dialogue box is telling you is that Rhino can't be sure which curve you are trying to pick and that the one currently highlighted is one of 3 possible objects that you might be trying to select. There are a few really good reasons for this. Firstly the curves are very close to each other and this can confuse Rhino. Secondly because we made an exact copy of this curve in a previous lesson which is located directly on top of itself, Rhino is saying "hey chaps, which of these do you want?" Okay then, look at your screen, the highlighted object is the current selection. Press the Next button to move incrementally through all the possible objects. In our case we don't want object #1 because that's the front profile curve, so press Next. That leaves us to choose either object #2 or #3, so which do we pick? Well, it does not really matter because they are both exact copies of each other, so for the sake of being consistent choose **object #2** and press **OK** -- see the following screenshot:



*This **Top Viewport** screenshot shows the active Choose One Object dialogue box.*

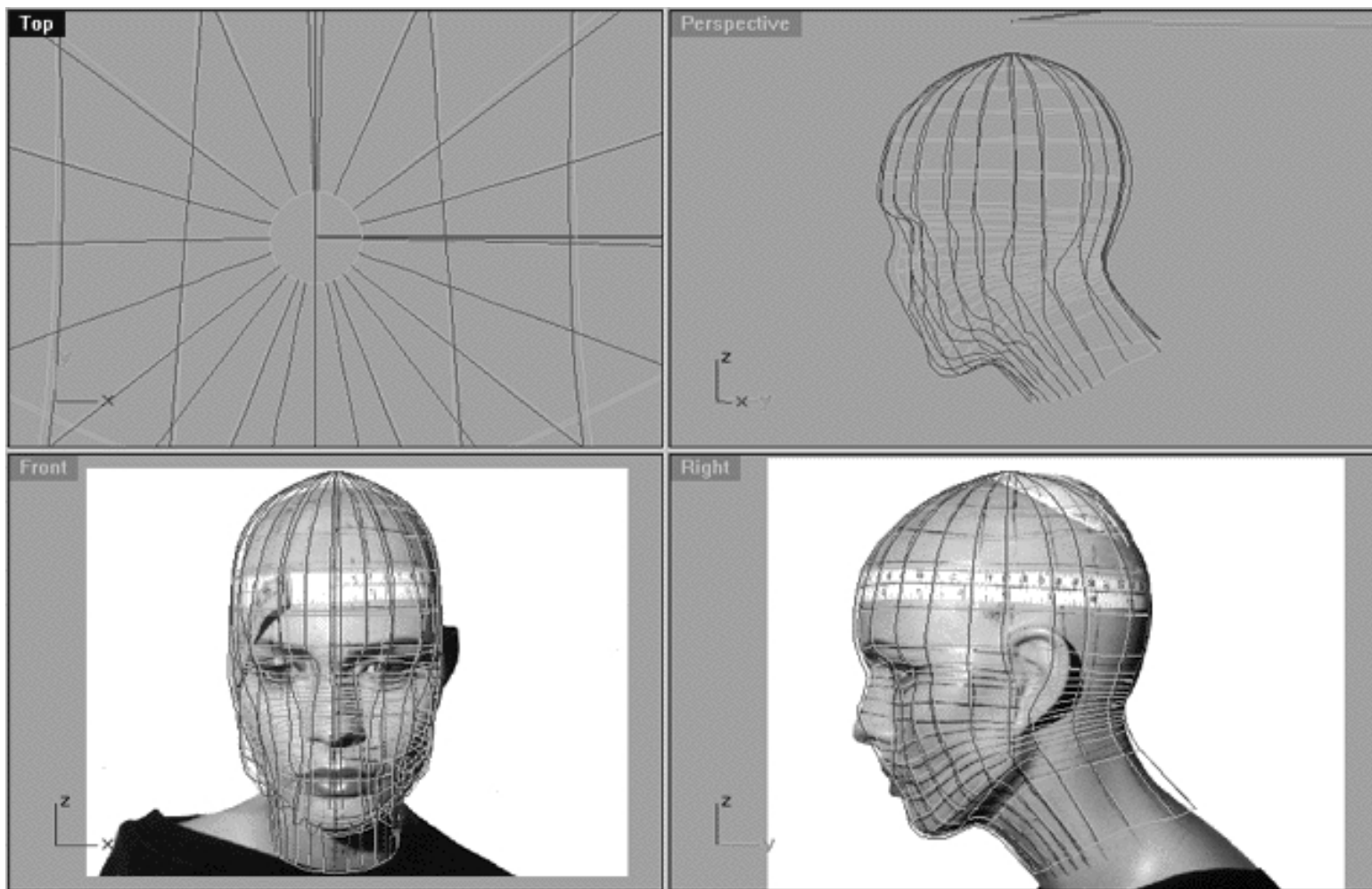
- Now continue picking each curve one by one in a clockwise manner -- as you do each will highlight in turn.

- **VERY IMPORTANT:** When you reach curve 22 all the curves will be lit, however, you still are not finished. **You MUST click once again on the curve you started out with!** Actually you are not picking the same curve, you're really picking the copy that is underneath it -- see how smart Rhino is to have known that! Be aware that when you pick the curve you will not see any noticeable change in the viewport, command line or anywhere else for that matter, so don't click more than once.
- Now press ENTER.
- Bright cyan lines should now be following on nearby the all the highlighted curves and the Loft Options dialogue box should now have appeared -- see the following screenshot:



*This screenshot shows the Loft Options dialogue box.*

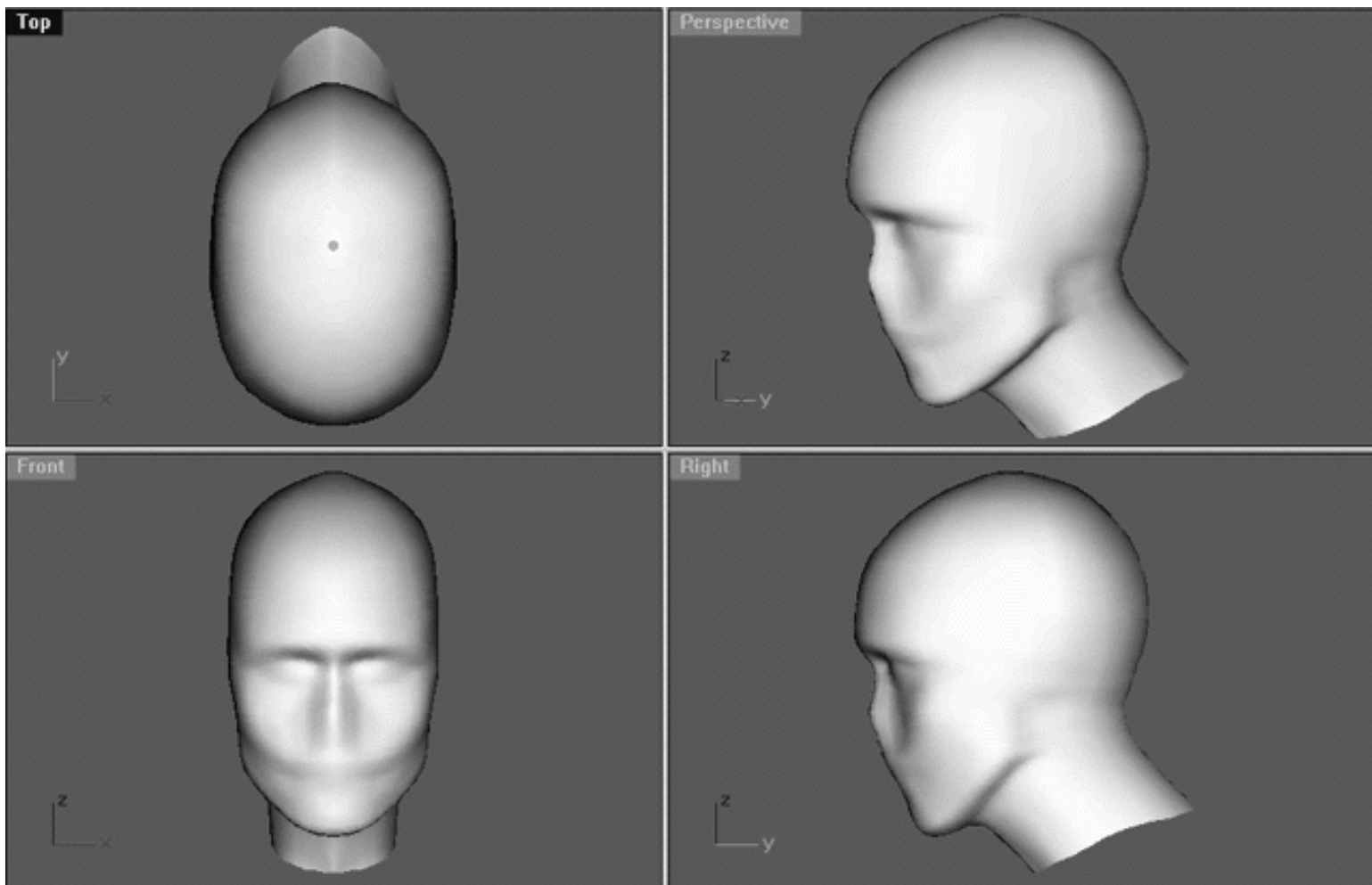
- Make sure that you set the Style field to Loose. Make certain that the Do not simplify radio button has been enabled. Leave all other options at their default values and **Do NOT select closed loft** option under any circumstances..!
- Press OK to complete the operation.
- Minimize the Top Viewport by double left clicking on its label and take a look at what you've now got in all viewports -- your monitor should now resemble the following screenshot:



*This **All Viewport** screenshot shows that a new surface has now been created by the loft command. Because we selected a loose loft type the surface does not follow the initial interpolated curves perfectly, this is normal and exactly what we want. We could have used a normal type loft which would have created a much tighter surface. If we had done this we would have to spend a great deal of time smoothing out and creating a more rounded and natural surface, something that we get almost every time from using loose loft. I've said it before and I'll say it again, I love this command, its brilliant and something I wish more software applications would incorporate.*

Also despite the fact that our head looks like a closed surface, it is not. Now would be a good time to do a shaded preview as in the following screenshot:



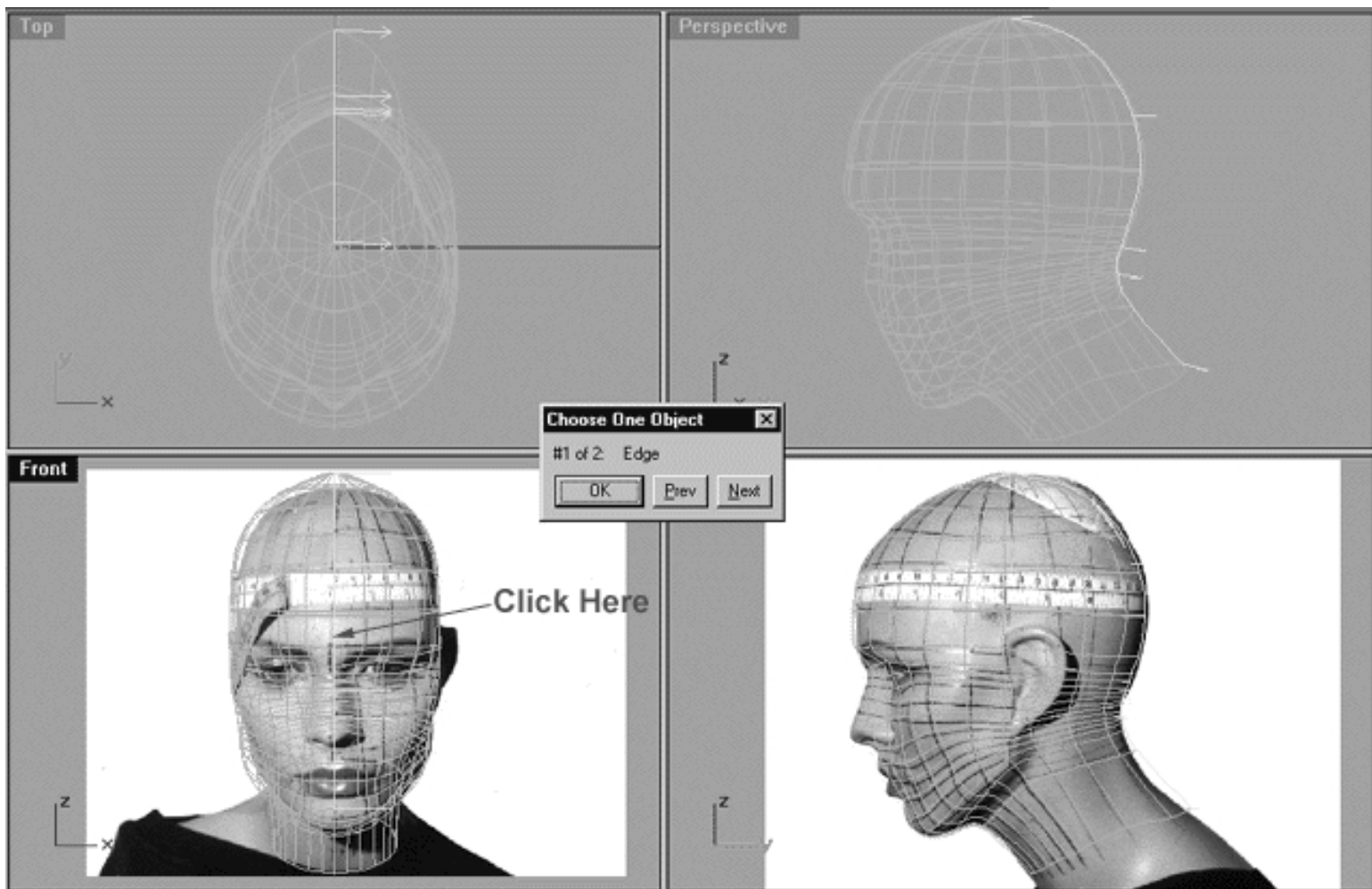


*This **All Viewport** screenshot shows a shaded preview of the surface created by the loose loft.*

Wow, now you've got to admit this is really starting to look like a human head and this is exactly where all your hard work really starts to pay off..!

Okay, we are almost done now there are just one little bit of magic we need to perform yet. Remember what I said about the head not being a true closed surface well because of that we need to perform the following operation.


- Turn off the Trans\_Curves layer -- right click on the layers info box at the lower status bar (you should know how to do this by now).
- In Any Viewport select the new surface by clicking on the cyan lines -- it will highlight.
- From the Surface Menu choose Edit Tools, Make Periodic.
- The system will respond with the following prompt at the command line: Select edge to make periodic:
- In the Front Viewport click on seam at the back of the head (i.e. at the location of the Interp\_11 curve -- now hidden). See the screenshot below:

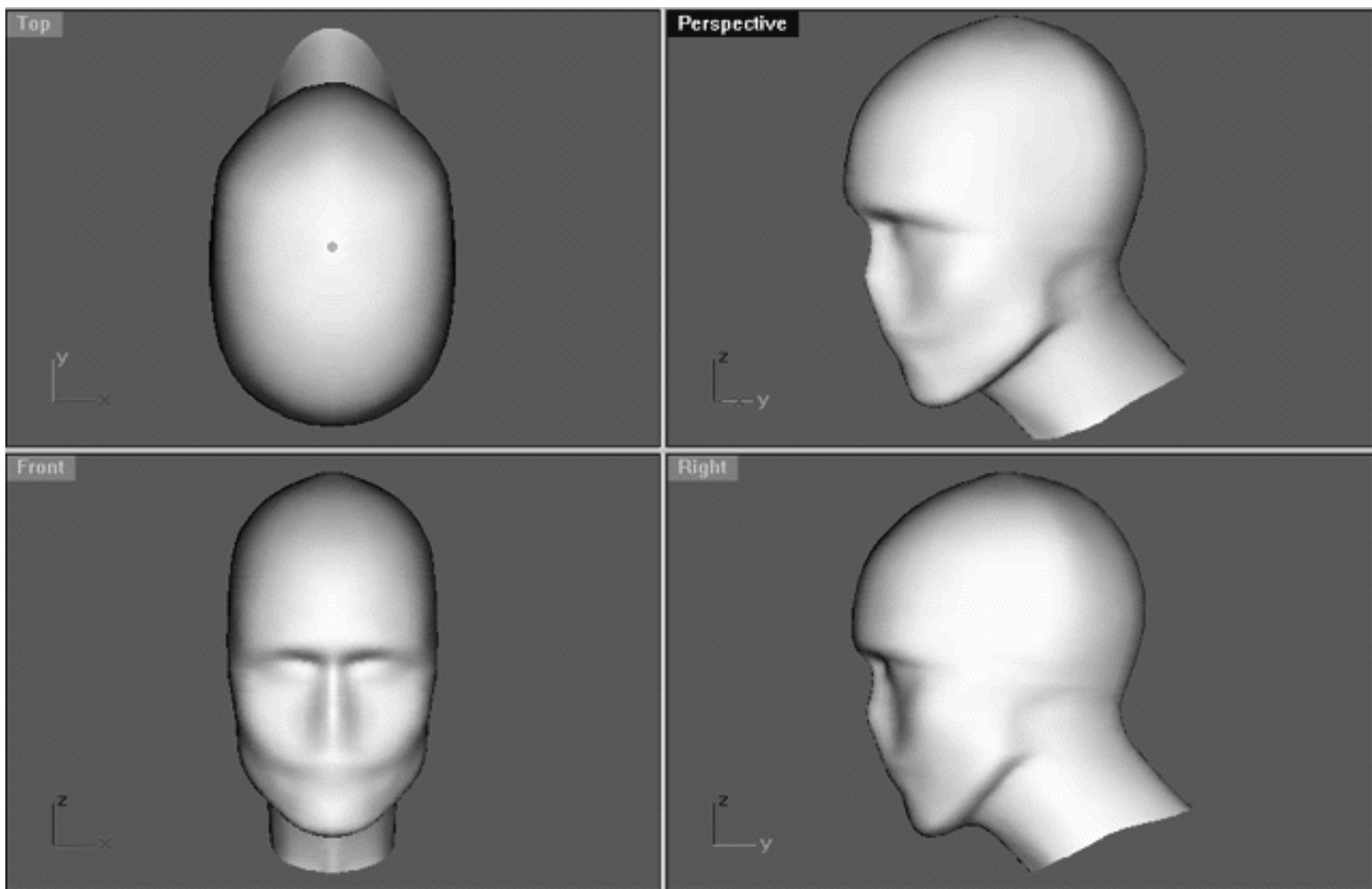


This **All Viewport** screenshot shows where you should pick in response to the *Select edge to make periodic prompt*. You'll notice that when you click in this location that the *Choose One Object* dialogue box appears and you can see that an edge has now been highlighted with directional arrows. You can choose either edge, it does not matter which one you pick.

- In response to the *Choose One Object* dialogue box press OK in respect to edge #1 of 2.
- When you do the highlighted edge and dialogue box will disappear. You will then notice that the surface seems to tighten up, especially at the back and there is now a much nicer more rounded shape being produced.
- If you've not done so already do a *Zoom Extents All*.
- Now is an excellent time to **SAVE YOUR WORK**.

Just before we wrap this up this exercise let's do a quick render of all the viewports...

- From the toolbar select the *Shade All Viewports* icon  and right click -- your monitor should now resemble the following screenshot:



*Now I want you to really observe this head -- are you looking at it? Good. Right then, what do you see? It's looks fairly good doesn't it? Yes it does, but it could look even better because there is still room for improvement (there's always room for improvement -- but not always time!). Take a look at the Top Viewport in the previous screenshot. Notice how the sides of the head sort of come together at an angle at the rear, which makes it look pointy and a bit unnatural. We can fix this very easily by doing what we should have done in the first place so let's start over.*


## Starting Over -- Plan B

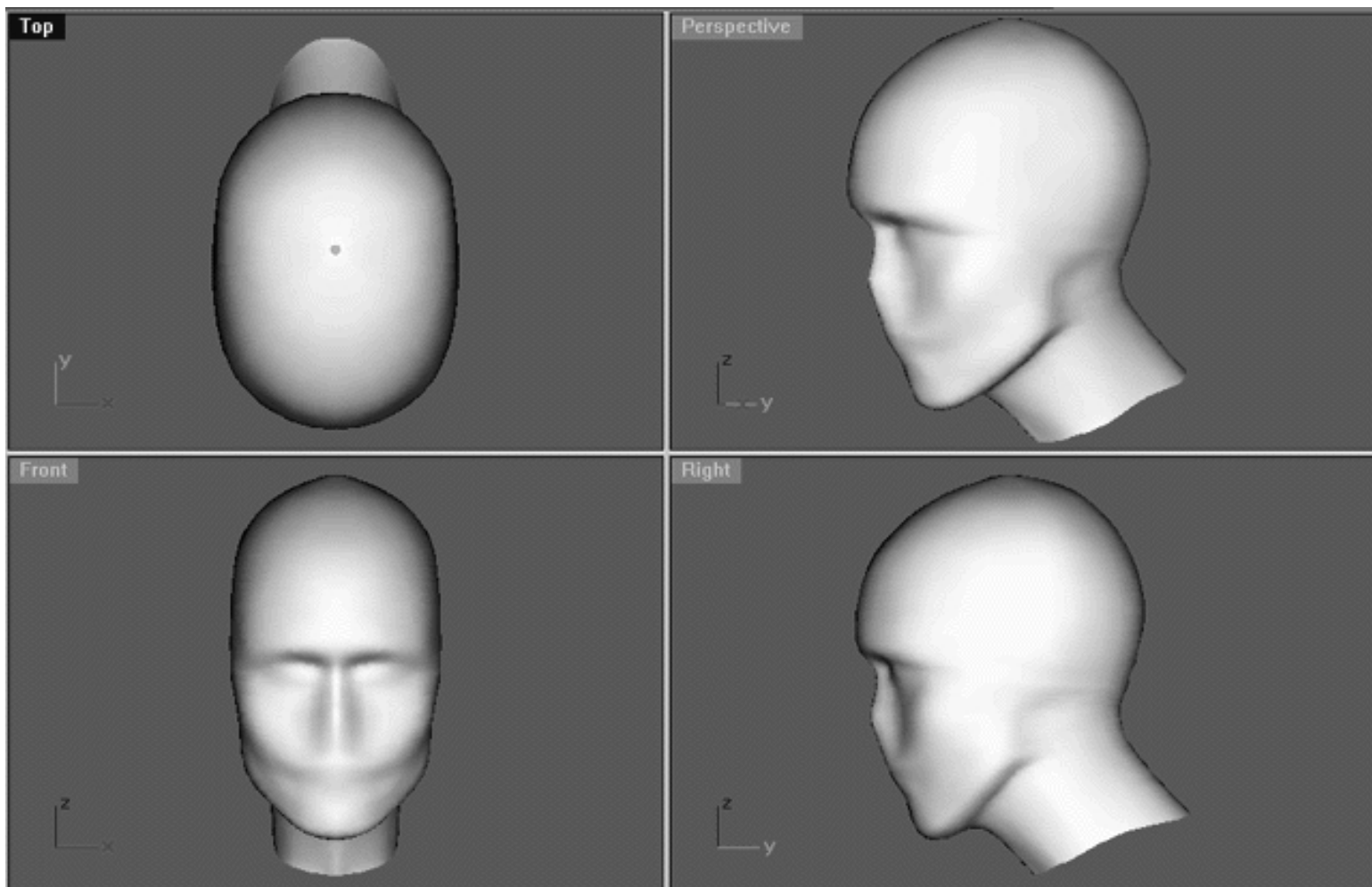
- Press the spacebar to exit from the shaded mode.
- In Any Viewport left click anywhere on the Secondary\_Surf -- it will highlight.
- Hit the delete key -- it's gone.
- Right click on the Layer Info Box at the lower status bar, then in the Edit Layers dialogue find the layer entitled: Trans\_curves and turn it on, then click OK to exit.
- Maximize the Top Viewport and zoom in tightly on the area surrounding the hole in the head.
- Hold down the Ctrl key and select the "anchor" curves just to either side of the rear profile curve -- they will highlight.
- Hit the delete key -- they are gone. Don't feel bad we don't really need them anyway!



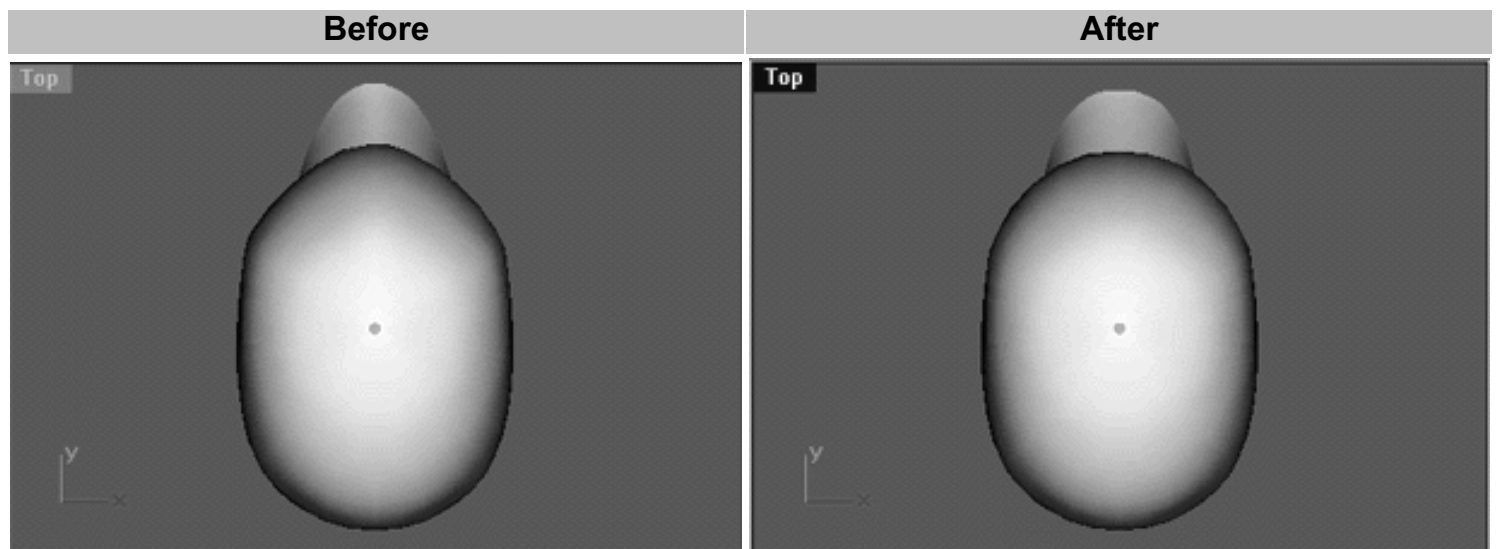
- Now select the rear profile curve by left clicking on it. As usual expect to see the Choose One Object dialogue box appear. When it does press Next until you're sure you've got the correct curve selected. As you increment through one will be the Front Profile curve (DON'T SELECT THAT) and the other two will be the rear profile (remember one is a copy). Select either one of the rear profile copies, it does not matter which one you choose just as long as it is the rear profile -- it will highlight, then press OK.
- Hit delete -- it's gone.

Right, now we are ready to loft all the curves up again.

- Choose the loft icon  from the toolbar or type the command: loft at the command line.
- The system will respond with the following prompt at the command line: Select curves to loft ( point ):
- Once again, starting with the rear profile curve and working in a clockwise manner select each curve one by one -- they will highlight.
- When you come to the last curve and they are all highlighted press ENTER. Do NOT select the first curve again as you did earlier.
- The Loft Options dialogue box will appear, this time select style as Loose and enable the closed loft option by ticking the box. The do not simplify radio button should enabled -- click OK to complete the operation.
- Minimize the Right Viewport.
- Do a Zoom Extents All.
- In the Edit Layers dialogue box turn OFF the Trans\_Curves layer (you should know how to do this now) and press OK to exit.
- In Any Viewport left click on the Secondary\_Surf -- it will highlight.
- From the Surface Menu choose Edit Tools, Make Periodic.
- The system will respond with the following prompt at the command line: Select edge to make periodic:
- In the Front Viewport click on seam at the back of the head (i.e. at the location of the Interp\_11 curve -- now hidden).
- The Choose One Object dialogue box will appear, select either edge with Next, then press OK.
- A periodic surface should now be produced and your monitor should resemble the following screenshot:



*This **All Viewport** screenshot shows the new *Secondary\_Surf*, this time produced without anchor curves and using the options included in the *Loft Options* dialogue box such as closed.*



*As you can see from these before and after screenshots, the shape of the head has now be considerably improved!*

# Shutting Down the Scene

- If you've not done so already press the ESC key to return to a wireframe view.
  - Perform a ZoomExtentsAll.
  - Save the file.
  - Open the Edit Layers Dialogue box and confirm that the layer entitled SCENE START UP is ON and assign it as the ACTIVE LAYER.
  - Confirm that the layer entitled Photopoints is ON.
  - Confirm that the layer entitled: Trans\_Curves is OFF.
  - Confirm that the layer entitled: Secondary\_Surf is OFF.
  - Confirm that all other layers are OFF with the exception of those mentioned.
  - Click OK to exit the Edit Layers Dialogue box.
  - Confirm that no Osnaps are currently active, disable any that are.
  - Hide any edit points that are currently displayed.
  - Confirm that the background images (Front and Right Viewports) are visible.
  - Perform a ZoomExtentsAll.
  - **S A V E Y O U R W O R K..!**
-

# Summary of Lesson - On the Surface

In this lesson you've seen how to create a surface by lofting using the loose option. We then created a closed surface using the Make Periodic command which will enable it to be further deformed without developing troublesome kinks. You may remember that in the previous lesson we created three new curves for our head, two which were produced by copying the rear profile curve (Interp\_11) and then rotating them to either side and one which was an exact duplicate made inplace. So why did we do this? Because quite simply the new curves on either side of the rear profile acted as anchors to hold the open surface more or less in place whilst it was created.

The reason that we duplicated the rear profile curve in place (on top of itself) was so that we could attach the other side of the open surface to it, thus creating a seam. So couldn't we just have created a surface by lofting only with the 2 additional anchor curves and without the copied inplace profile curve and choosing the closed option? Of course, and that's just what we did in the second example. Once again, you've seen almost without exception that there are many ways to achieve similar results when working in 3D.

The fun really starts in the next lesson where you will learn how to create a mouth and plan for the entire reparameterisation of the surface!

---

Next Chapter - [Click Here](#).

RETURN to Top of page -- [Click Here](#)

Written by Joseph R. Saltzman.

Co-produced in association with Steven Ståhlberg

©1998-1999 Cinemagic Productions Limited. All Rights Reserved.

Duplication of this document including images and text by any means is expressly forbidden without prior written consent of Cinemagic Productions Limited.

Web Site: <http://www.cmagic.co.uk> Telephone: +44 (0)1753 733 190 Fax: +44 (0)1753 736 619 email: [cmagic@cmagic.co.uk](mailto:cmagic@cmagic.co.uk)

**RETURN** to previous lesson -- [Click Here](#)

**GOTO** the [NEXT LESSON](#)



## THE MOUTH PART ONE

### SKIP TO:


- The Mouth -- [Part 2](#)
- The Mouth -- [Part 3](#)
- The Mouth -- [Part 4](#)
- The Mouth -- [Part 5](#)
- The Mouth -- [Part 6](#)
- The Mouth -- [Part 7](#)
- The Mouth -- [Part 8](#)


### Contents:

- [Scene Setup](#)
- [The Mouth](#)
- [Where Do We Go From Here?](#)
- [Creating the 1st Mouth Curve](#)
- [Example Movie -- Creating the 1st mouth curve](#)
- [Projecting the Right Image](#)
- [Example Movie -- Projecting the 1st mouth curve](#)
- [Example Movie -- Establishing the Curve Direction](#)
- [Rebuild It](#)
- [Example Movie -- Rebuilding the 1st Mouth Curve](#)
- [Shutting Down the Scene \(optional\)](#)

---

## Scene Setup

- If you've not done so already start a Rhinoceros session by **double clicking** on the desktop icon  the application will begin.

- Choose File, Open from the menu bar and double click on **START\_A.3DM** in the file list, it will load and open.
- Confirm at the Lower Status Bar the currently active layer is entitled SCENE START UP. If it is active proceed to the next step, if it's not then make it active by left clicking on the layer box, highlighting the correct layer and clicking on it.
- Again, at the Layers Box on the Lower Status Bar this time right click on the box, the Edit Layers Dialogue box will open. Confirm the following switches have been enabled or disabled:
  - The Layer entitled Photopoints should be OFF.
  - The Layer entitled SCENE START UP should be ON.
  - With the exception of those mentioned, ALL other layers should be set to OFF.
  - When you've finished making your changes ( if any ) click on OK.
  - Confirm that you can see the background image in the Front and Right viewports.
  - Confirm that the grid display in the viewports has been disabled, if not turn it off now.
  - Confirm that no Osnaps are currently enabled, if any are disable them.
  - Confirm that no edit points are currently displayed, if any are hide them.
- Zoom out all the viewports by selecting the Zoom Extents All icon  or by typing the command: **ZoomExtentsAll** at the command line and pressing ENTER.

---

## The Mouth

You are now about to begin one of the most important phases in the construction of your model, that of the mouth. The mouth is a critical component for several reasons. Firstly, with exception of the eyes the mouth is one of the most expressive and meaningful areas of the face, imparting emotion and feeling with smallest variation in pose and movement. As humans our brains can detect the minuscule change in this area of the face, this is because since birth we have been imprinted with what and how a mouth should look. As babies our mouth and mouths of others have been of extreme physical and psychological importance and remain so throughout our lives. In terms of the construction of our model the mouth is important for reasons of geometry and ultimately the decision as to how we will approach construction our final model.

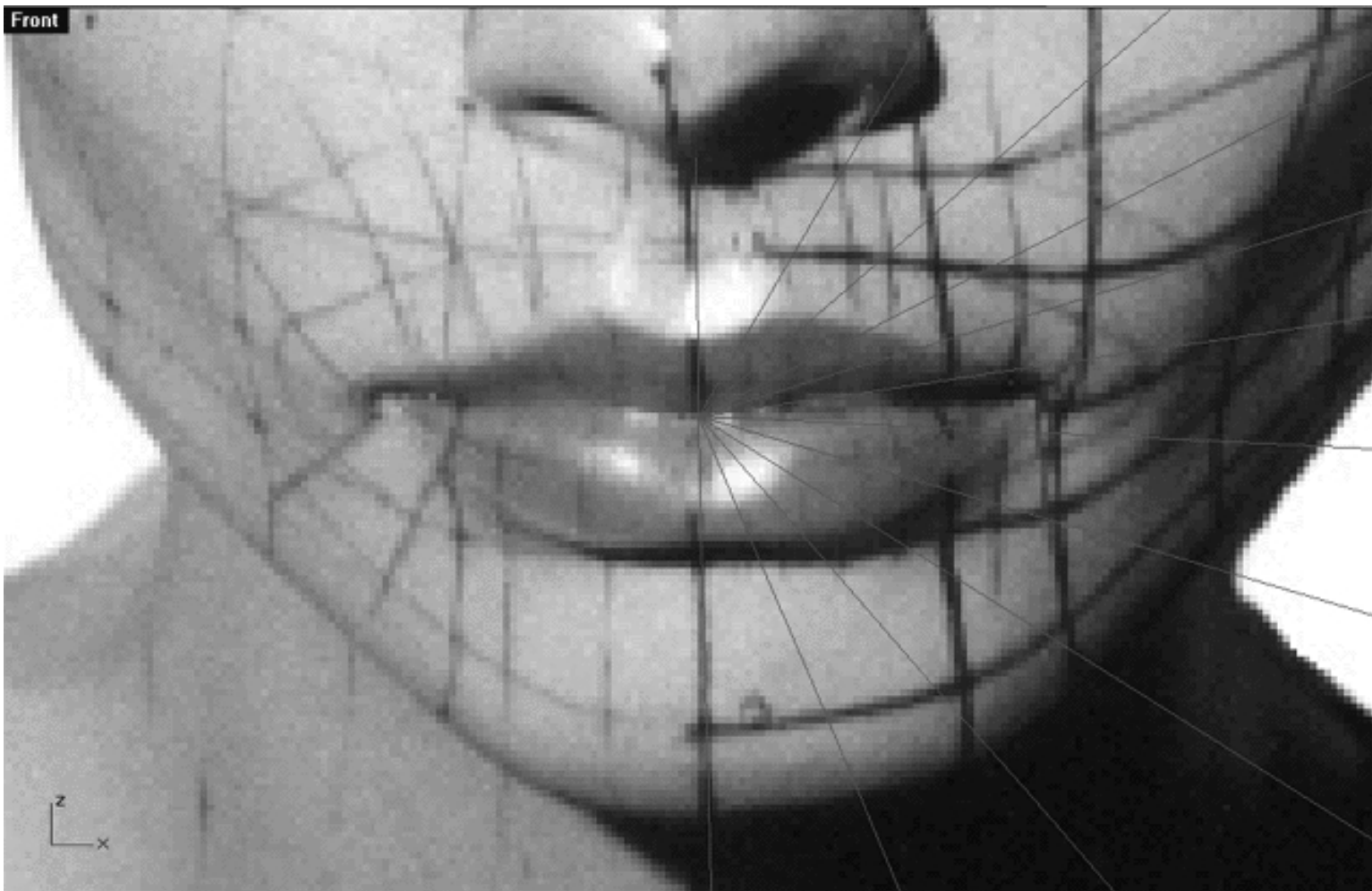


Up till now we've been constructing our head using the north / south pole method, that is to say a pole at the top of the head and a pole at the base of the neck. As you know this is only one of many possible type of parameterisation. Some other possible types of construction for spherical heads that you may be familiar with are: pole at the ears and pole at the mouth, etc. As with so many things in 3D there is no one perfect solution, technique or method; some parameterisations just work better under certain circumstances and conditions. So then, the important question you must ask yourself is this: What do I plan on doing with this character that I'm creating and what will it's ultimate use be?

Most other tutorials that you may have seen or tried already tend to focus on the north / south pole method. This is a completely acceptable way of building a head and in fact that is just what we've done so far. The main problem with this type of head construction is that if you plan on animating it and especially if you plan on doing any type of lip sync it can be highly problematic if not near impossible to get really good results. Now before you write me to say "Well I've animated a north / south pole head with no problem -- what are you talking about?" Yes I agree with you, it can be done, I've done it myself, but the point is that in *comparison* you will get far better overall results with lip animation using a head with a pole in the mouth. Again, as with everything 3D there are positive and negative aspects to each type of construction method. With a north / south pole head you can build in loads of detail which is great if you're just creating a still image. Just look at some of the north / south pole heads that have been created by artists such as Jeremy Birn, David Gallagher, etc. and you'll soon see that this method can and does produce outstanding photorealistic results.

That said, in my view the pole at the mouth method of parameterisation is a far more sophisticated and elegant solution, especially for purposes of animation. Why do I say this? Firstly, with the pole in the mouth the geometry flows in a far more efficient way, with the isoparms following the natural muscles of the face which around the mouth run in a radial fashion. This method of construction has the added benefit of producing lighter models that use far less geometry to describe the overall shape of the head. As a result, less geometry means faster update times and more interactivity when animating, something that simply has to be a good thing. On the down side, it is far more difficult to build in detail especially in areas of the face such as the eyes and nose.

So armed with the knowledge that north / south pole heads don't animate as well as they might what are we going to do? The simple answer is that over the course of this lesson and the next we are going to re-parameterise (rebuild) our north / south pole head to one with radial flowing isoparms emanating from a pole in the centre of the mouth instead, see the following screenshot:



This **Front Viewport** screenshot shows the basic concept of radial isoparms emanating from a centre pole at the mouth.

## Where Do We Go From Here?

So where do we begin then? The process of converting a model such as a head from one parameterisation to another is can be a difficult and somewhat mind bending process. However, it needn't be too awful to contemplate as long as you think about exactly what have to do before you do it. During this phase, advance planning is your ultimate key to success.

What are the considerations? We know that we want to have our curves emanating out from the mouth but where will the opposite pole be placed? Good question, there are several places that it could be placed and of course one that comes to mind is at the base of the neck. As interesting a concept as this might be, from a modelling standpoint it is quite difficult to achieve and you could spend far too much time trying to do it. A far better and easier strategy would be to place the pole at it's logical position of 180 degrees in the opposite direction which in this case is at the back of the head/neck nape area.

Okay now we know that we are going to have one pole at the centre of the mouth and the other at the back of the head, now what?

The next logical thing to consider is how may isoparms we are going to need, that is how many curves are going to emanate from the pole in the mouth?

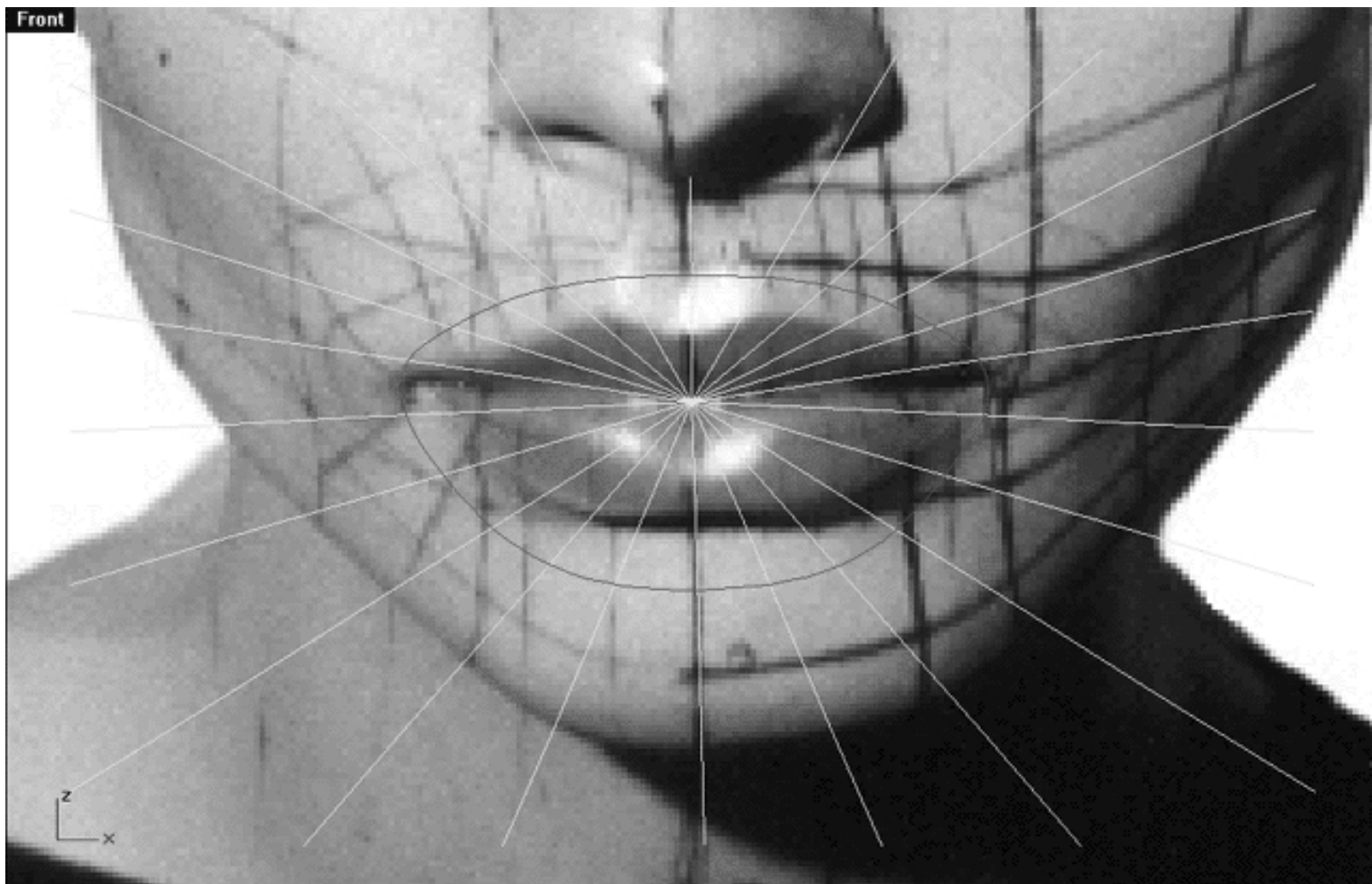
Again this is a very good question and not easily answered. As with any NURBS modelling exercise the single most important question to ask yourself is: "How FEW curves can I get away with using in order to produce the shape that I want?" At the same time you want to be sure to always keep the isoparms that make up your geometry as evenly spaced out as you can over the model generally.

Let's get started...

- Right click on the Layers Info Box at the Lower Status Bar, the Edit Layers dialogue box will open. Find the layer entitled: **Mouth\_Guides\_01** and turn the layer **ON**.
- Next, find the layer entitled: **Mouth\_Curve\_Guide\_01\_EX** and turn the layer **ON**, once done, press OK to Exit.

Your monitor should now resemble the following screenshot, a series of gold coloured isoparms emanating from a point in the centre of the mouth and a red circular curve encompassing the mouth should have appeared.

At the end of the day, how many curves you can or can't get away with is largely down to your individual modelling skill and experience, but again the fewer the better. In my experience a total of 22 curves is almost a magic number, for me this nearly works every time -- again, see the following screenshot:



This **Top Viewport** screenshot shows our proposed plan for a total of 22 isoparms emanating from a pole at the centre of the mouth. Note--This layer, (Mouth\_Guides\_01) is *only* a rough guide.

Right then, now that we know where we are going to place the poles and how many isoparms (curves) we intend to be working with, the next phase is to actually create a mouth.

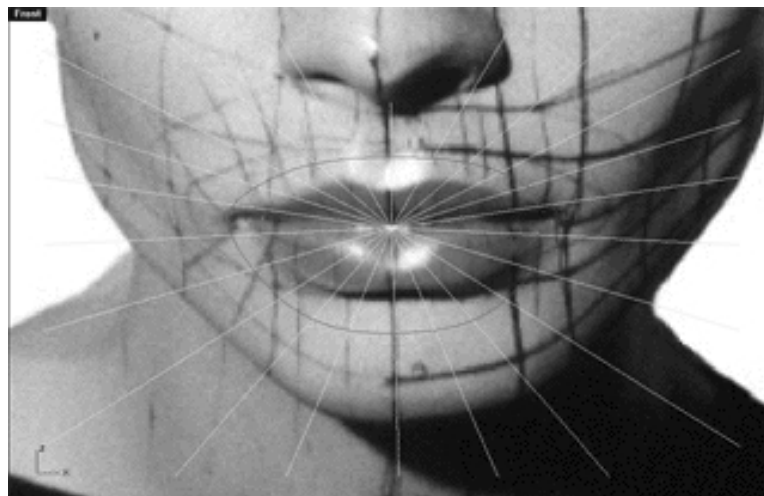
You may have noticed that the prior screenshot I've drawn a red curve around the mouth shown on the background image. This curve, Mouth\_Curve\_Guide\_01\_EX is a temporary guide for purposes of orientation that I will now explain more about in a few moments.

Before proceeding any further consider something else of great importance. That is, in what position will the mouth we create be in? Will it be open, closed, etc? Certainly the background reference image shows the mouth in the closed position which for modelling purposes is not really ideal. I recommend that when modelling a head that you consider constructing the mouth in a slightly open pose. There is good reason for this, as it will be far easier to edit the mouth into other poses later on. I think you'll find that that it is generally more difficult when pulling points to open up a closed mouth and have it look natural than it is to close the mouth down. So by modelling the mouth in the semi open pose you get the best of both worlds.

Okay, so what is the story with that red curve that I've drawn around the mouth, why is it there and how did I arrive at it?

Like I said earlier it's for purposes of orientation and since we are going to create the mouth in a slightly open pose some adjustments are going to be called for, take a look at the following screenshot:

:




In this screenshot of the Front Viewport you will notice that red curve is defining both sides of the mouth -- right and left, simply so that we know where they are. The upper half runs in a gentle arc along the top lip much as the underlying natural muscle structure (Orbicularis oris) would do in life and then meets itself near the lower third of the filtrum (that little dented bit in the upper lip) at the profile curve (now hidden). The lower half again starts at both sides of the mouth following a gentle arc maintaining it's distance from the lower lips and meeting itself on the upper chin at the profile curve ( also now hidden).

About now some of you might be thinking, "Why not build the mouth from a revolved surface?" You could certainly do this, and in fact that is exactly how I used to go about it. Again, there are many ways to achieve similar results when working in 3D and building a mouth from a revolve is as good a method as any. So why don't we do that then? The problem with building a mouth from a revolve is that it requires a lot of point pulling and unless you're really skilled at doing that the chances are it will take a long time and the results will not be as expected.

---

# Creating the 1st Mouth Curve

Okay, now that we have a firm strategy it's time to get down to the real business. The first curve that we will create will mimic the red curve that encircles the mouth (as in the previous screenshot above) and you will want to place each of the edit points at the location where the gold guides (radiating from the centre of mouth) intersect with the circular curve.

- Maximize the Right Viewport by double left clicking on its label.
- In the Edit Layers dialogue, create a new layer and name it **NU\_Mouth\_Curve\_01**, then set it's colour to a very dark blue R:0, G:0, B:63, when complete press OK to Exit.
- Left click on the Layers Info Box at the lower status bar, find the new layer NU\_Mouth\_Curve\_01 in the list and select it by highlighting it with your mouse, when you've done so left click to make the new layer NU\_Mouth\_Curve\_01 active.
- Zoom in tightly on the mouth area as required.
- Now lets draw a new curve, from your toolbar choose the Interpolated Curve icon  and left click on it.
- We will now want to "trace" this new curve over the top of the red guide. Starting at the top lip and just slightly to one side of the guide place the first point by left clicking. Hint -- Leave a little "tail" at the beginning and end of the curve. Once you've done this continue tracing along the curve until you reach the bottom placing enough points to keep the lines following each other faithfully Be aware that it does not matter how few or how many points you place, what is important is that the tracing follows the guide as best possible. When you've reached the bottom continue on just a bit further and place another point, then press Enter to complete the operation. To see how this is done watch the following example movie:



## Creating the 1st mouth curve

View an example movie - [Click Here](#)

---

Right then, the next step it to retrieve the surface that we built in the last lesson.


- Open the Edit Layers dialogue box, select the layer entitled: Secondary\_Surf and turn it ON, once done click OK to exit -- the cyan coloured wireframe surface should now appear in the viewport. Your screen should now resemble the following screenshot:



This **Right Viewport** screenshot shows the temporary guide in red (Mouth\_Curve\_Guide\_01\_EX), the curve that we just created (NU\_Mouth\_Curve\_01) and the cyan coloured wireframe surface that we created in the last lesson (Secondary\_Surf).

## Projecting the Right Image

We will now use a technique known as projection to "project" the curve that we just created in the Right Viewport on to the Secondary\_Surface.

- With your mouse, left click on the slight overhang of the curve we just created NU\_Mouth\_Curve\_01 to select it -- it will highlight.
- From the toolbar choose the Project Curve to Surface icon  or type the command: **Project** at the command line.
- The system will respond with the following prompt at the command line: **Select object(s) to project onto:**
- Now click on any one of the cyan lines that make up the wireframe surface Secondary\_Surf -- it will highlight.
- Press Enter to complete the command -- in a few moments something will have happened.



- Minimize the Right Viewport by double left clicking on it's label.
- You should now see that a new circular curve has been created and is highlighted.



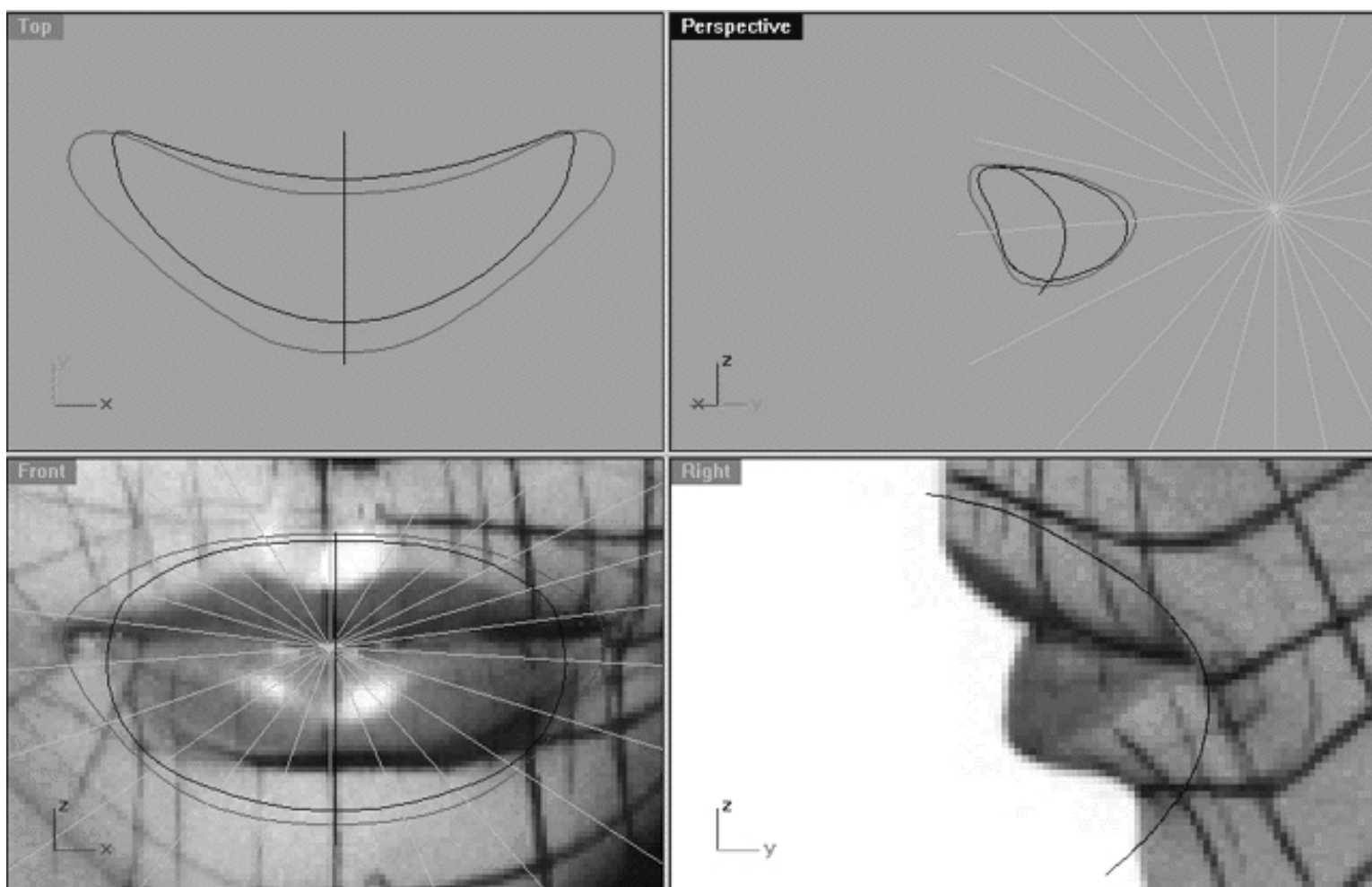
## Projecting the 1st mouth curve

View an example movie - [Click Here](#)

- Select the wireframe surface Secondary\_Surf by left clicking on it -- it will highlight.




- From the toolbar choose the Hide icon and left click on it -- the wireframe mesh will disappear from view and your monitor should now resemble the following screenshot.

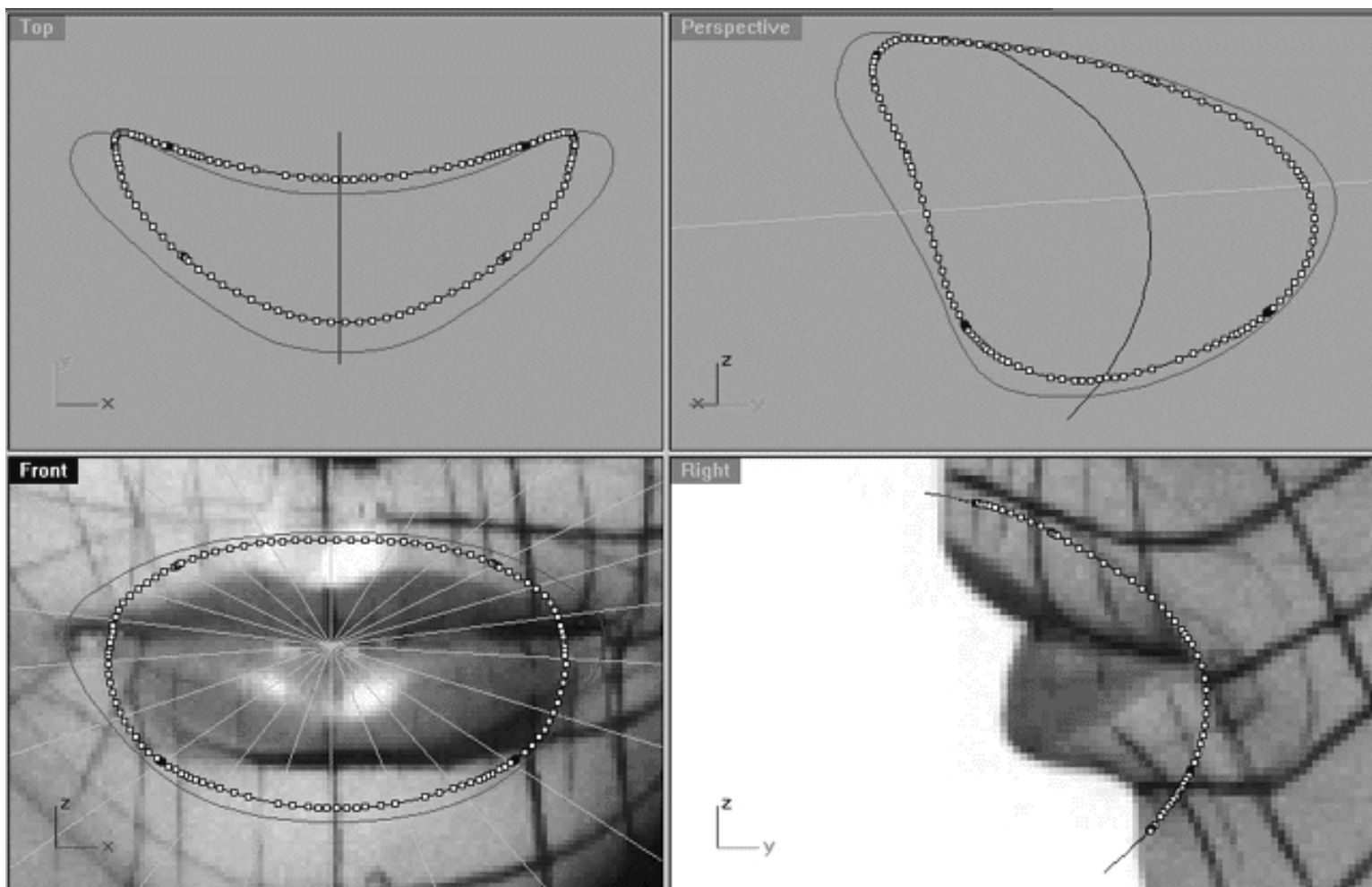


This **All Viewport** screenshot shows the temporary guide in red (Mouth\_Curve\_Guide\_01\_EX), the "J" shaped curve that we created earlier and the new circular shaped curve that was just created by projecting the "J" shaped curve onto the wireframe surface (now hidden). Also visible are the gold coloured array of guide curves which are emanating from a single point and will be essential tool for the next few steps.

So as you've just seen it is possible to take a curve and project it upon upon a surface which is a very powerful and often used feature. Projecting curves upon a surface has many uses when modelling and it's a feature of Rhino that you will no doubt use very often. Projecting a curve is especially useful when you need to determine the shape of a curve that will lie upon a surface as we've just done. Some of the most common uses for projecting curves are to create templates for trimming (cutting holes) in surfaces, such as for eyes, mouths, etc. Projection is also very useful if not absolutely essential in creating tangent surfaces or fillets for use in blending one object to another, such as arms or legs to a body. The point is you can do a lot with projected curves, they are very useful and you should take the time to experiment with them.

Despite all the good things one can say about projected curves there is a slight downside which can be seen quite clearly in the next example...

- Make the Front Viewport active by clicking in it with your mouse, then zoom in on the mouth area as required.
- In the Front Viewport select the projected curve by left clicking on it -- it will highlight.
- Display its edit points by choosing the Edit Points On icon  from the toolbar and left clicking on it -- your viewport should now resemble the following screenshot:



This **All Viewport** screenshot shows the projected curve with its edit points displayed.

Wow, look at all those edit points! As you can see there are literally hundreds of the little blighters on this very small curve, but where did they all come from? -- after all, the "J" shaped curve that was used to create the projected curve only had a few points in total. This is precisely the downside to creating and using projected curves -- they contain loads of edit points! The reason for this is simple, even if the original curve that you use to project with (in this case the "J") shaped curve has only a few points, when Rhino projects it needs to approximate the shape and topology of the receiving surface so it uses loads of points because it's not quite smart enough to tell ultimately which points are needed and which ones are not -- this still requires human intervention. Luckily for us however, Rhino has some really neat commands that make this job very easy indeed.

By now I'm sure you can gather what is coming up next. Our main task shall now be to take the projected curve with a few hundred points on it and reduce the number to a total of 22 points only.


Why we've chosen 22 points should now be quite obvious -- it's the same number of isoparms (curves) that will radiate from the mouth and we will use reconstruct our head with. Look at the Front Viewport, this is what that array of gold guide curves radiating out from the centre point are for. These gold guide curves will now help us to place the points on the projected curve in a logical and evenly spaced manner. Before we can do that however, we need to reduce the number of points on the projected curve.

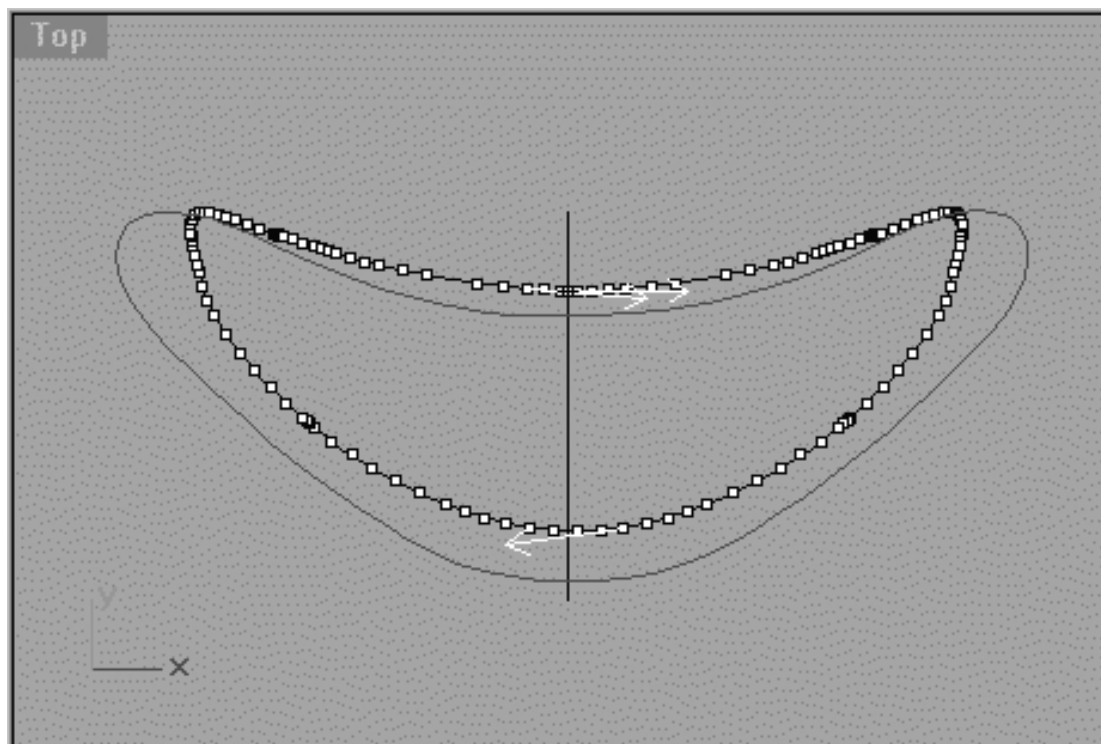
One thing that you should be aware of is that all NURBS curves have a in built direction to them. Some run clockwise others run anti-clockwise depending on how they were drawn. Why is this important? Well, when you create a surface by lofting for example it is crucial that all the curves are running in the same direction. Suppose you try and loft up two curves, one runs clockwise the other anti-clockwise what do you think the result will be? The answer is a twisted bloody mess! As a rule when I create curves I always try and draw them in a clockwise manner, however sometimes one does forget. Luckily, Rhino has a command that will display the direction of a curve so determining this is easy.

Okay, but why is direction important to us now? Since we want to reduce the number of points from a few hundred down to 22 we need to be able to keep the points spaced in a relatively logical way that will be useful to us. After all if we just said, "Okay Rhino, reduce the points" it could choose *any* of the points on the curve to delete and the resulting spacing could be less than ideal. With this in mind, our objective is to tell Rhino where our starting point will be placed, the direction in which the curve will run, and the number of points we need to use. It will then be Rhino's job to keep the curve as close to it's current shape as possible using only 22 points.

- All Viewports should be visible and the edit points for the projected curve should still be displayed.



- From the toolbar choose the Direction icon  and left click on it.
- The system will respond with the following prompt at the command line: **Select object for direction display:**
- In the Front Viewport left click on the projected curve.
- You should now see some arrows appear on the curve, they might be pointing clockwise or anti-clockwise, see the following screenshot:



This **Top Viewport** screenshot above shows the projected curve running in a anti-clockwise direction.

We want the curve to run in a clockwise direction. If it is not, you can "Flip" the direction of the curve.

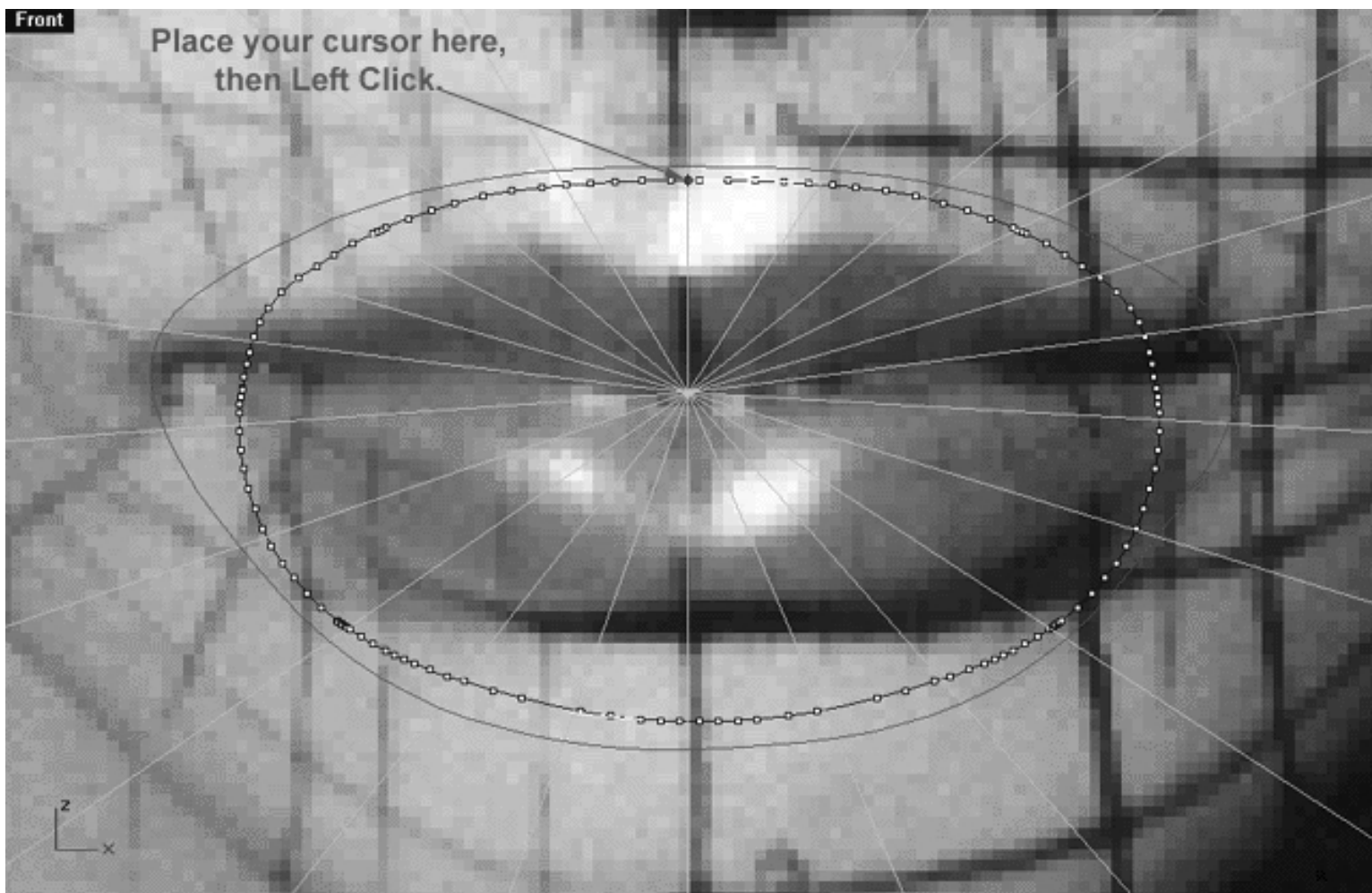
- The system should have responded with the following prompt at the command line: **Press Enter to finish viewing direction ( Flip ):**

So, if your curve is not running in a clockwise direction then...

- Type Flip and press Enter.

The arrows should now be heading in the opposite direction. Once you've got the curves heading in the correct direction the next step is to set the start point.

- Maximize the Front Viewport by double left clicking on it, zoom in as required.
- Move your cursor the 12 o'clock position exactly where the vertical gold curve intersects with the projected curve as in the following screenshot:



- When you've aligned the cursor & arrow with the vertical guide left click to complete the operation -- the arrows and cursor will disappear.



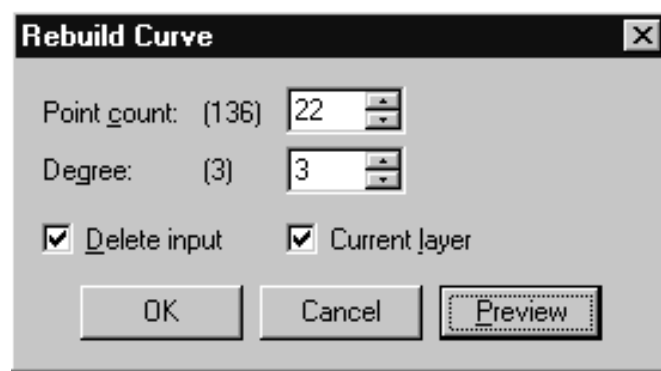
## Establishing the Curve Direction

View an example movie - [Click Here](#)

## Rebuild It

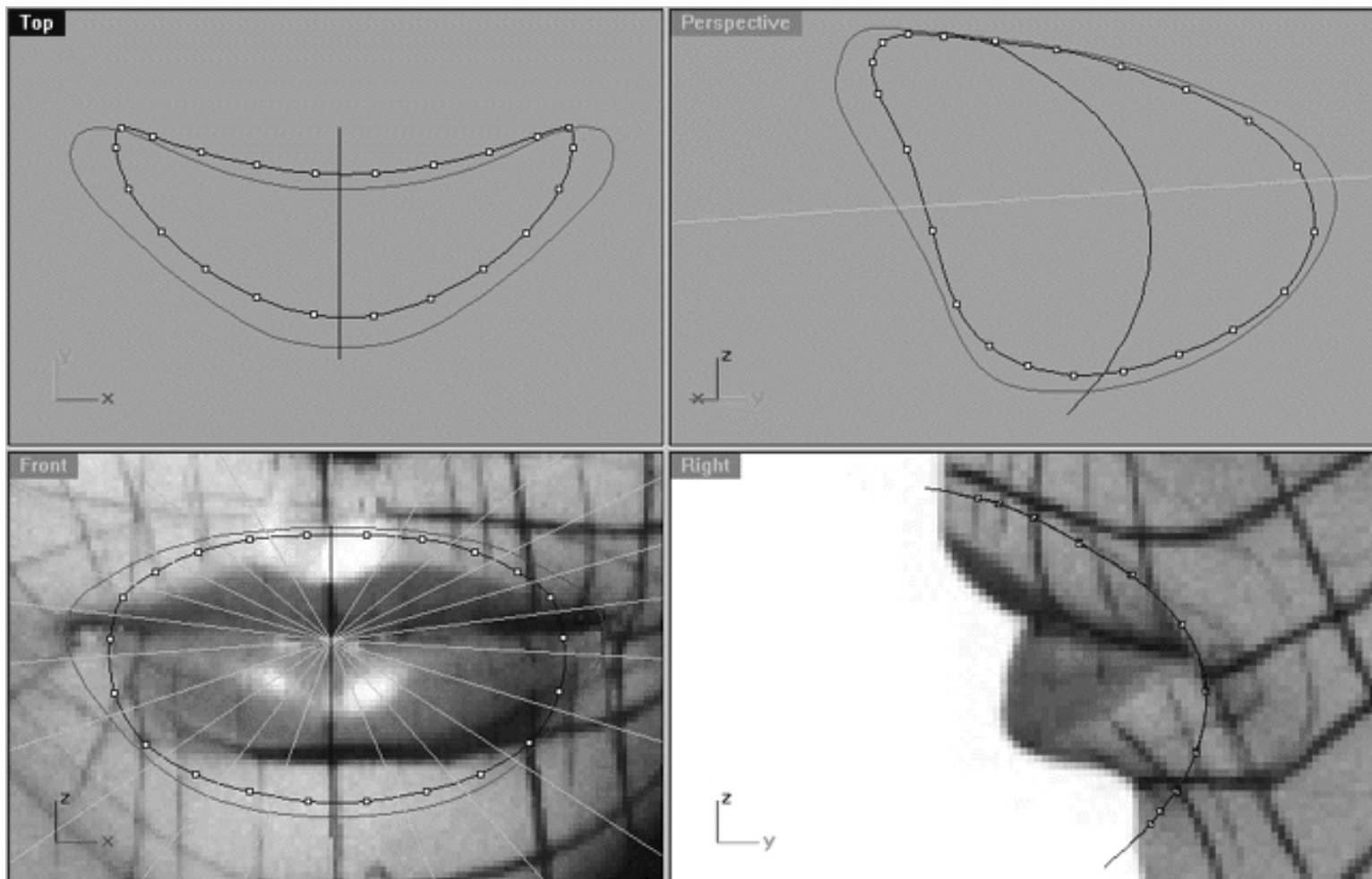
- From the Curve menu choose Edit Tools, Rebuild.
- The system will respond with the following prompt at the command line: **Select curves to rebuild:**
- Left click on the projected curve to select it, then press Enter -- the Rebuild Curve dialogue will appear, see the following screenshot:





*This screenshot shows the Rebuild Curve dialogue box.*

- Enter the following values, Point count: 22, Degree: 3, Delete input (enable), Current layer (enable) as in the screenshot above, then press OK to complete the operation.
- The old curve will be deleted and a new curve should now appear.
- Left click on the new curve to select it and display it's edit points as in the following screenshot:



*This **All Viewport** screenshot shows that the number of points on the projected curve has now been reduced from hundreds to only 22 points..!*

As you can see from the screenshot above we are now a whole lot closer to our concept, now it's a matter of editing the points to match the desired configuration of points which we will cover in the next lesson.





## Rebuilding the 1st Mouth Curve

View an example movie - [Click Here](#)

---

# Shutting Down the Scene

If you plan on continuing immediately to the next lesson then you can skip this procedure, however, we do recommend that you save your scene now anyway. In the event that you wish to take a break and continue working later, than please perform the following procedure:

- Save the file.
  - Unhide any objects that may no longer be visible. Type the command: Show at the command line and press Enter.
  - Open the Edit Layers dialogue box and...
  - Turn ON the layer entitled: SCENE STARTUP and make it the active layer.
  - Turn ON the layer entitled: Photopoints.
  - Turn OFF the layer entitled: Mouth\_Curve\_Guide\_01\_EX.
  - Turn OFF the layer entitled: Mouth\_Guides\_01.
  - Turn OFF the layer entitled: NU\_Mouth\_Curve\_01.
  - Turn OFF the layer entitled: Secondary\_Surf.
  - Press OK to complete the operation and exit.
  - Perform a ZoomExtentsAll.
  - SAVE THE FILE.
- 

Go to the [NEXT PAGE](#)

**RETURN** to Top of Page -- [Click Here](#)

Written by Joseph R. Saltzman.

Co-produced in association with Steven Ståhlberg  
©1998-1999 Cinemagic Productions Limited. All Rights Reserved.

Duplication of this document including images and text by any means is expressly forbidden without prior written consent of Cinemagic Productions Limited.  
Web Site: <http://www.cmagic.co.uk> Telephone: +44 (0)1753 733 190 Fax: +44 (0)1753 736 619 email: [cmagic@cmagic.co.uk](mailto:cmagic@cmagic.co.uk)

**RETURN** to previous page -- [Click Here](#)

**GOTO** the [NEXT LESSON](#)




## THE MOUTH PART TWO


### Contents:

- [Scene Setup](#)
- [Creating the 1st Mouth Curve -- The Outer Ring](#)
- [Shutting Down the Scene \(optional\)](#)

---

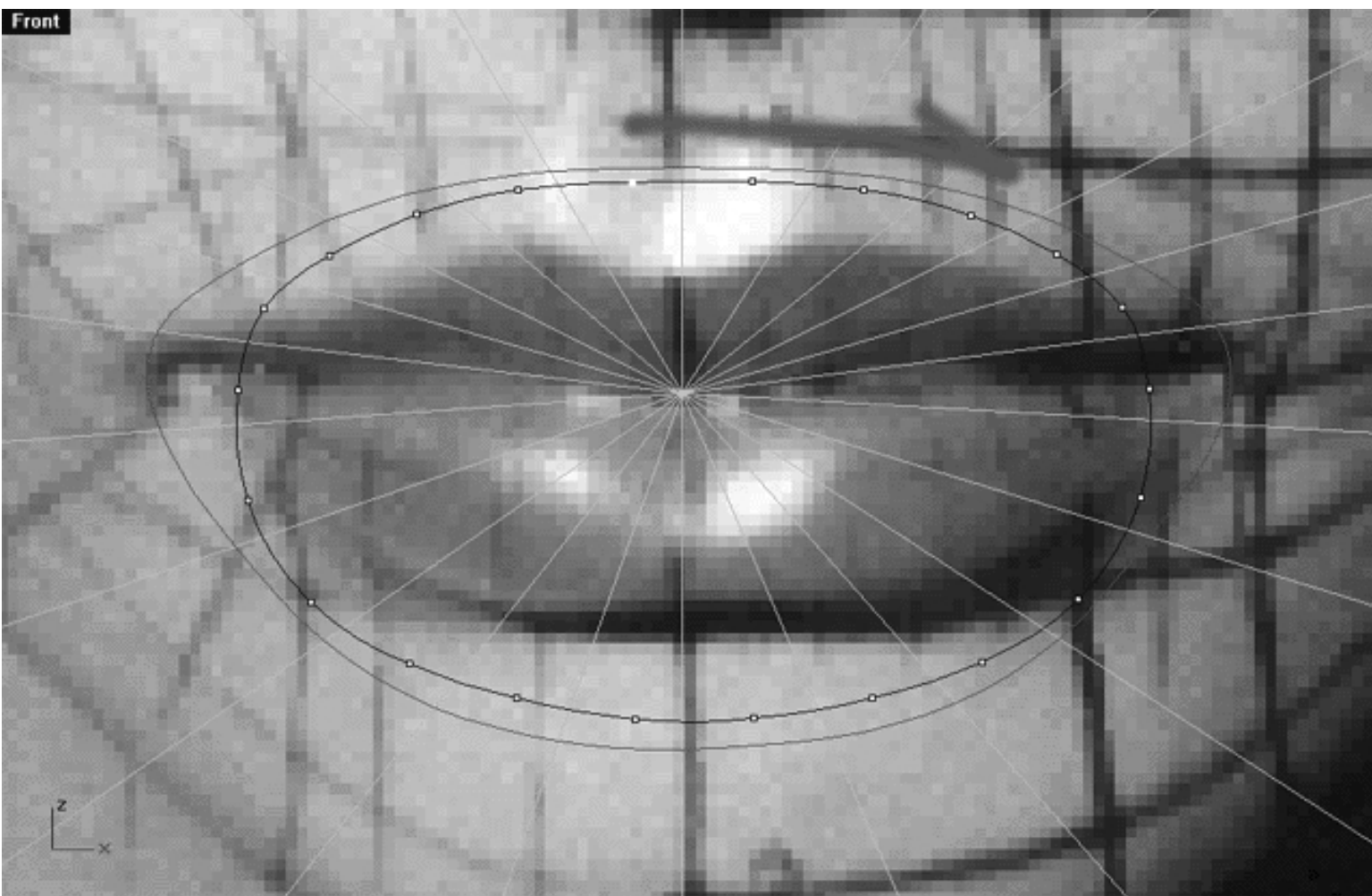
## Scene Setup

- If you've not done so already start a Rhinoceros session by **double clicking** on the desktop icon  the application will begin.
- Choose File, Open from the menu bar and double click on **START\_A.3DM** in the file list, it will load and open.
- Confirm at the Lower Status Bar the currently active layer is entitled SCENE START UP. If it is active proceed to the next step, if it's not then make it active by left clicking on the layer box, highlighting the correct layer and clicking on it.
- Again, at the Layers Box on the Lower Status Bar this time right click on the box, the Edit Layers Dialogue box will open. Confirm the following switches have been enabled or disabled:
- The Layer entitled Photopoints should be OFF.
- The Layer entitled SCENE START UP should be ON.
- The Layer entitled Mouth\_Curve\_Guide\_01\_EX should be ON.
- The Layer entitled Mouth\_Guides\_01 should be ON.
- The Layer entitled Nu\_Mouth\_Curve\_01 should be ON.

- With the exception of those mentioned, ALL other layers should be set to OFF.
- When you've finished making your changes ( if any ) click on OK.
- Confirm that you can see the background image in the Front and Right viewports.
- Confirm that the grid display in the viewports has been disabled, if not turn it off now.
- Confirm that no Osnaps are currently enabled, if any are disable them.
- Confirm that no edit points are currently displayed, if any are hide them.
- Zoom out all the viewports by selecting the Zoom Extents All icon  or by typing the command: **ZoomExtentsAll** at the command line and pressing ENTER.

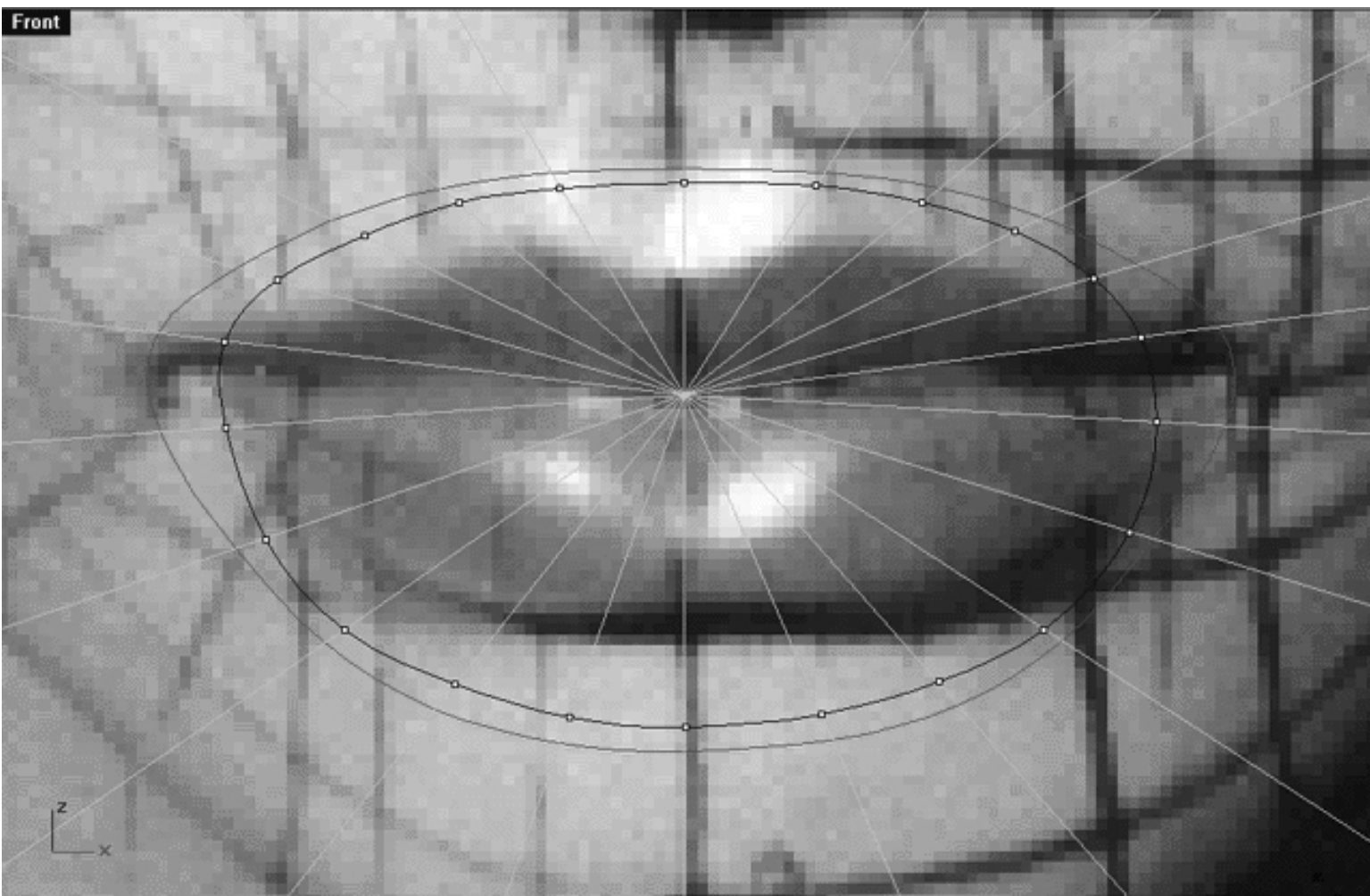
## Creating the 1st Mouth Curve The Outer Ring

- Maximise the Front Viewport by double left clicking on its label.
- Set the layer entitled: (Nu\_Mouth\_Curve\_01) as the CURRENTLY ACTIVE layer, do this by left clicking on the layer box, highlighting the correct layer and clicking on it. Alternatively, you can also set it as active by opening the Edit Layers dialogue box, locating the layer, placing a tick in the leftmost column and pressing the Apply button. Once done confirm that the layer is now active -- it should be now showing in the Layers Info Box on the Lower Status Bar.
- In the Front Viewport, select the curve (Nu\_Mouth\_Curve\_01) by clicking on it, then display its edit points.
- Lock the layers entitled: Mouth\_Curve\_Guide\_01\_EX, Mouth\_Guides\_01.
- Zoom in as required.
- Starting with the point closest to the 12 o'clock position and working in a clockwise fashion, drag each successive point to the location where the gold guide isoparms intersect with the new mouth curve (Nu\_Mouth\_Curve\_01), see the following screenshot:



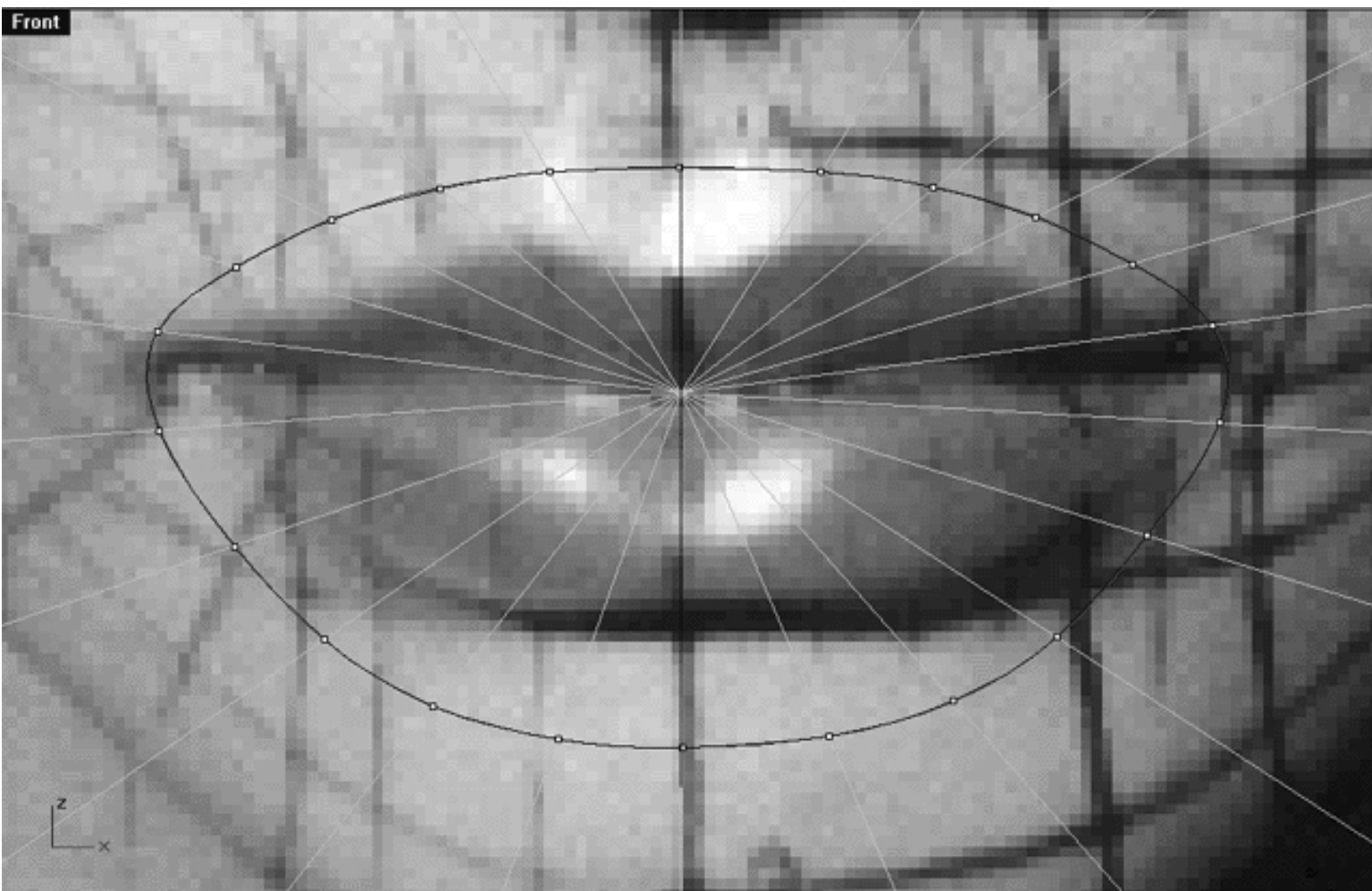
This **Front Viewport** screenshot shows the point (highlighted) on the new mouth curve (Nu\_Mouth\_Curve\_01) and where it should be dragged to, indicated by the red arrow. Working in a clockwise fashion, this procedure should be repeated for each successive point until all points have been relocated at the locations where the gold guide isoparms intersect.

Once completed your monitor should now resemble the following screenshot:



This **Front Viewport** screenshot shows the new mouth curve (Nu\_Mouth\_Curve\_01) with each of its points having now been dragged to the locations where the gold guide curves intersect.

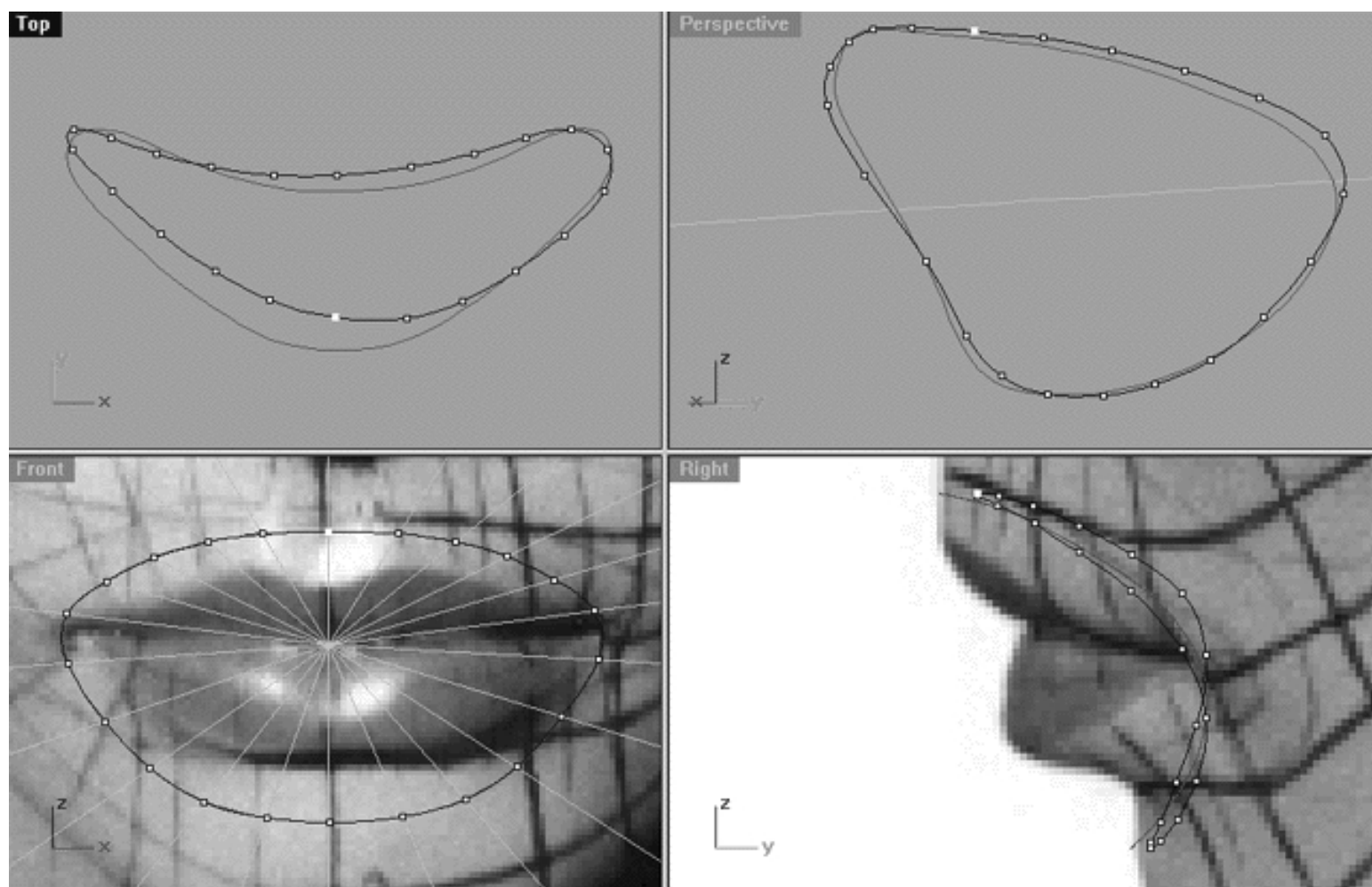
- Once again, starting with the point at the 12 o'clock position and working in a clockwise fashion move each of the points outward until they lie upon the red guide curve (Mouth\_Curve\_Guide\_01\_EX) as in the following screenshot:



- Minimise the Front Viewport by double left clicking on its label, zoom view as required.

Your monitor should now resemble the following **All Viewport** screenshot:

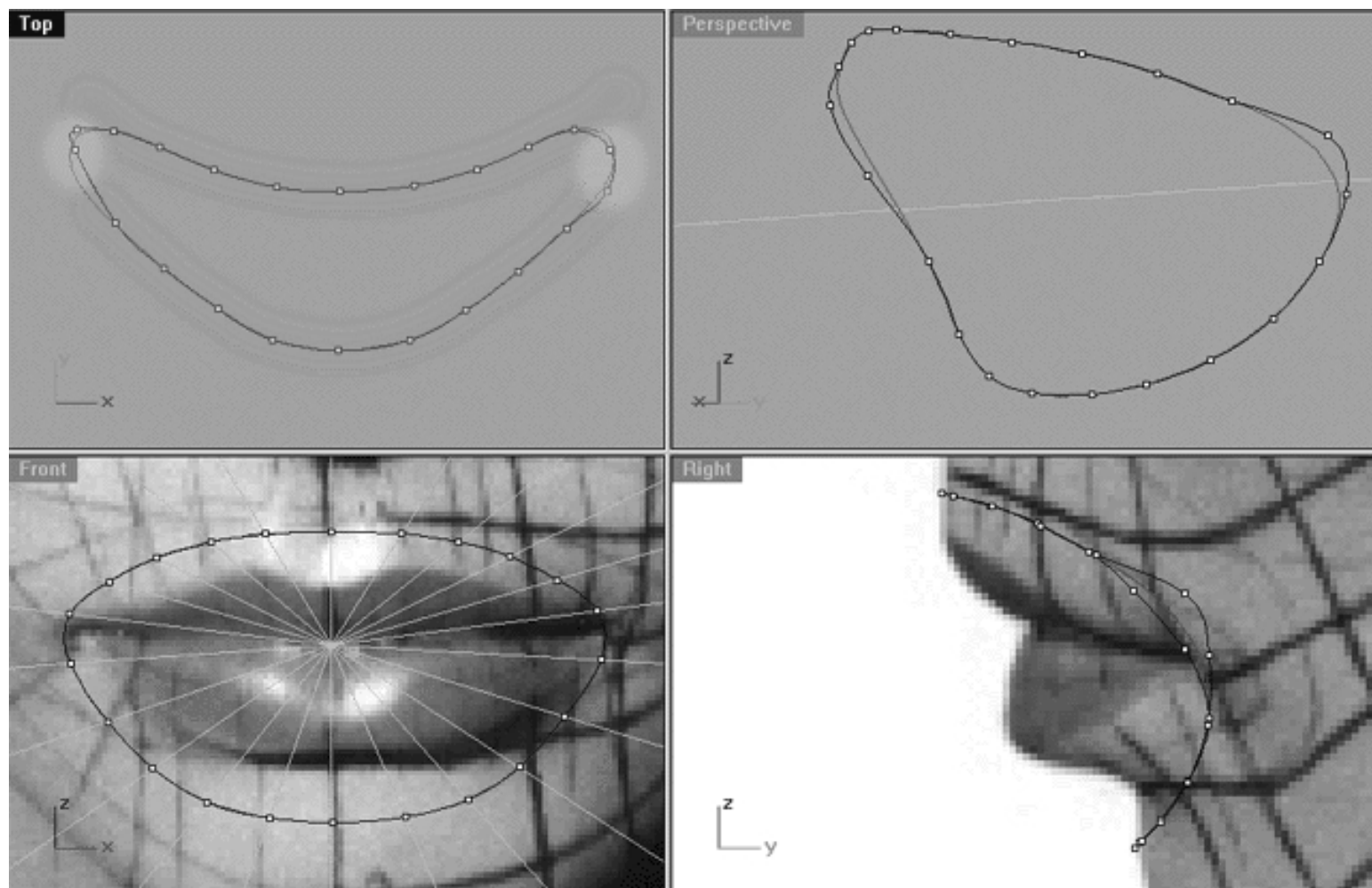




This **All Viewport** Screenshot shows the result of moving each of the edit points on the new mouth curve (*Nu\_Mouth\_Curve\_01*) in the **FRONT VIEWPORT** to now lie on top of the red guide curve (*Mouth\_Curve\_Guide\_01\_EX*) while remaining aligned at the locations where intersection occurs with the gold guide isoparms.

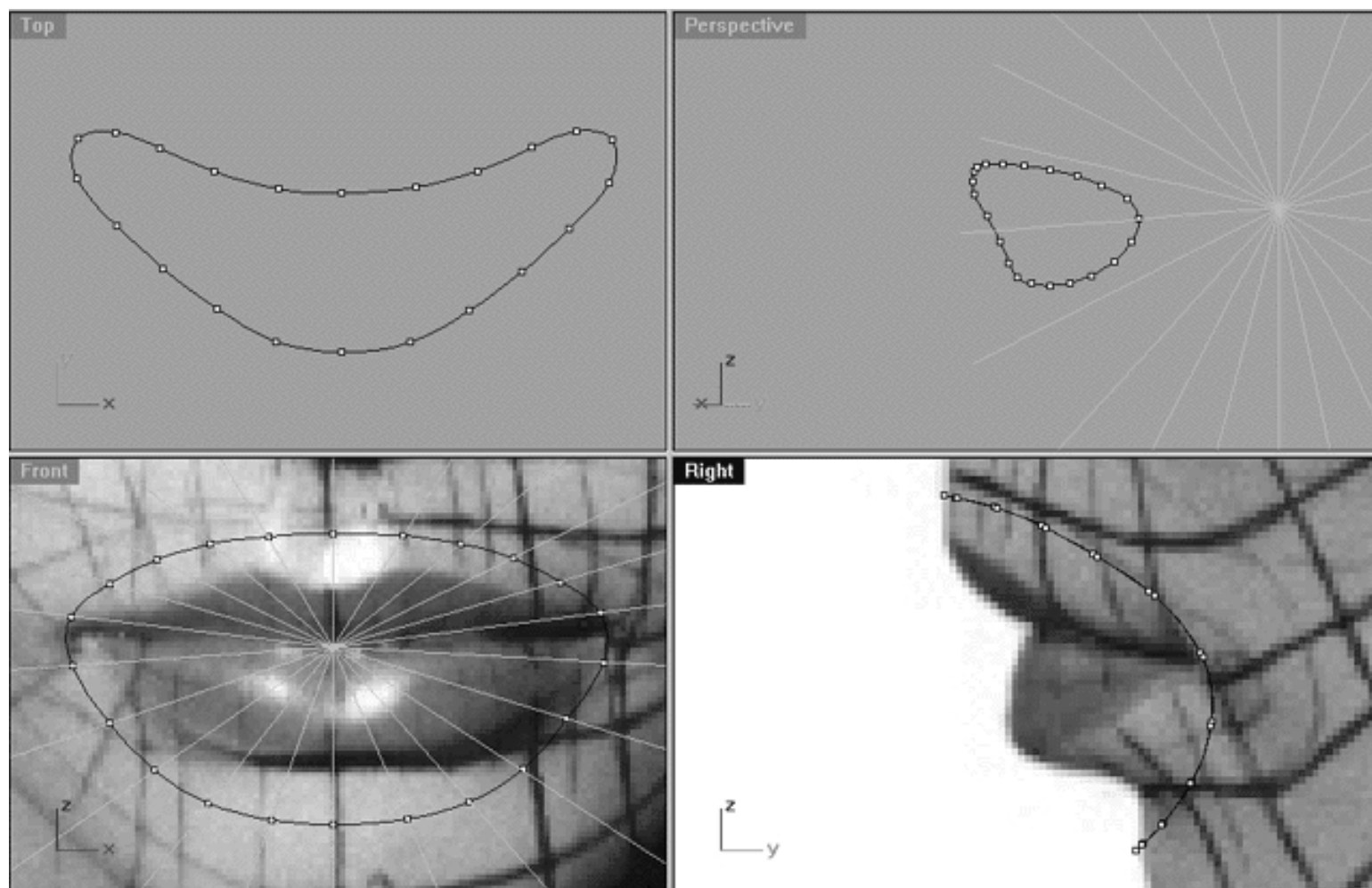
Okay things are looking better in the Front Viewport but the Top, Perspective and Right views tell a different story. You can see quite clearly the curve will need to be further aligned in some of these views as well.

- Leave the viewports as they are, All Views should be visible.
- Now, starting with the point in 12 o'clock position in the TOP VIEWPORT hold down the shift key and drag it along the Y axis until it is in alignment with the red guide curve and monitor your progress in each of the viewports as you do. Continue this alignment procedure for the all the points on the top and bottom of the mouth curve, HOWEVER, disregard the points at the sides as we will deal with those in the next step. Your monitor should now resemble the following screenshot:



This **All Viewport** screenshot shows the result of having moved the edit points on the top and bottom of the curve (highlighted in green) in the TOP VIEWPORT along the Y axis, the points should now conform the red guide pretty well. Do not move the points at the sides of the curve (highlighted in yellow) as we will sort those out in the next few steps.

- Now working in the Right Viewport, hold down the Shift Key and move the last few misaligned points along the Y axis until they lie on top of the red guide curve. Once done your monitor should now resemble the following screenshot:



This **All Viewport** screenshot shows the new control point curve we've just drawn and edited. Notice how each of the points on the new curve have been placed at the location where the radial guides (in gold) intersect with it. Pay particular attention to the shape of the curve in the Right Viewport, note how it looks like a "J" that has been tipped to one side. Look at its placement in relation to the face and notice how the bottom of the curve lies on the upper chin not in the groove between the chin and the lower lip as you might expect. This is an "adjustment" that has to be made because we are modelling the mouth in a semi open pose, not closed. Look closely at the Top Viewport, notice how it looks a bit like a boomerang. Take some time to really LOOK at what you've created and to think about the proportions. Also, you will notice that when looking at the points in the right view they don't all line up perfectly (i.e., they don't lie exactly on top of each other in this view) don't worry about this, it's fine and not an issue that you should be too concerned with. You can tweak them and refine even further if you like, but it is really not necessary at this stage.

## Shutting Down the Scene

If you plan on continuing immediately to the next lesson then you can skip this procedure, however, we do recommend that you save your scene now anyway.

In the event that you wish to take a break and continue working later, than please perform the following procedure:

- Save the file.
- Unhide any objects that may no longer be visible. Type the command: Show at the command line and press Enter.

- Open the Edit Layers dialogue box and...
- Turn ON the layer entitled: SCENE START UP and make it the active layer.
- Turn ON the layer entitled: Photopoints.
- Turn OFF the layer entitled: Mouth\_Curve\_Guide\_01\_EX.
- Turn OFF the layer entitled: Mouth\_Guides\_01.
- Turn OFF the layer entitled: NU\_Mouth\_Curve\_01.
- Turn OFF the layer entitled: Secondary\_Surf.
- Press OK to complete the operation and exit.
- Perform a ZoomExtentsAll.
- SAVE THE FILE.

---

Go to the [NEXT PART](#)

RETURN to the Top of Page -- [Click Here](#)

Written by Joseph R. Saltzman.

Co-produced in association with Steven Ståhlberg

©1998-1999 Cinemagic Productions Limited. All Rights Reserved.

Duplication of this document including images and text by any means is expressly forbidden without prior written consent of Cinemagic Productions Limited.

Web Site: <http://www.cmagic.co.uk> Telephone: +44 (0)1753 733 190 Fax: +44 (0)1753 736 619 email: [cmagic@cmagic.co.uk](mailto:cmagic@cmagic.co.uk)

**RETURN** to previous page -- [Click Here](#)

**GOTO** the [NEXT LESSON](#)




## THE MOUTH PART THREE


### Contents:

- [Scene Setup](#)
  - [From Inside Out, The 6th Mouth Curve -- Planning](#)
  - [Coming Up](#)
- 

## Scene Setup



- If you've not done so already start a Rhinoceros session by **double clicking** on the desktop icon  the application will begin.
- Choose File, Open from the menu bar and double click on **START\_A.3DM** in the file list, it will load and open.
- Confirm at the Lower Status Bar the currently active layer is entitled SCENE START UP. If it is active proceed to the next step, if it's not then make it active by left clicking on the layer box, highlighting the correct layer and clicking on it.
- Again, at the Layers Box on the Lower Status Bar this time right click on the box, the Edit Layers Dialogue box will open. Confirm the following switches have been enabled or disabled:
- The Layer entitled Photopoints should be OFF.
- The Layer entitled SCENE START UP should be ON.
- The Layer entitled Mouth\_Guides\_01 should be LOCKED.

- The Layer entitled Nu\_Mouth\_Curve\_01 should be ON. **\*NOTE** -- If the original interpolated curve that you drew in the previous lesson (i.e. the one used for purposes of projection and to create the curve entitled: Nu\_Mouth\_Curve\_01) becomes visible (check your Top and Perspective views) then do the following: Either hide it by selecting it and typing the command: Hide at the command line or delete it. **WARNING** -- be careful, do not delete the Nu\_Mouth\_Curve\_01 rather only the curve that was used to create it!
- With the exception of those mentioned, ALL other layers should be set to OFF.
- When you've finished making your changes ( if any ) click on OK.
- Confirm that you can see the background image in the Front and Right viewports.
- Confirm that the grid display in the viewports has been disabled, if not turn it off now.
- Confirm that no Osnaps are currently enabled, if any are disable them.
- Confirm that no edit points are currently displayed, if any are hide them.
- Zoom out all the viewports by selecting the Zoom Extents All icon  or by typing the command: **ZoomExtentsAll** at the command line and pressing ENTER.

## From Inside Out

### The 6th Mouth Curve -- Planning

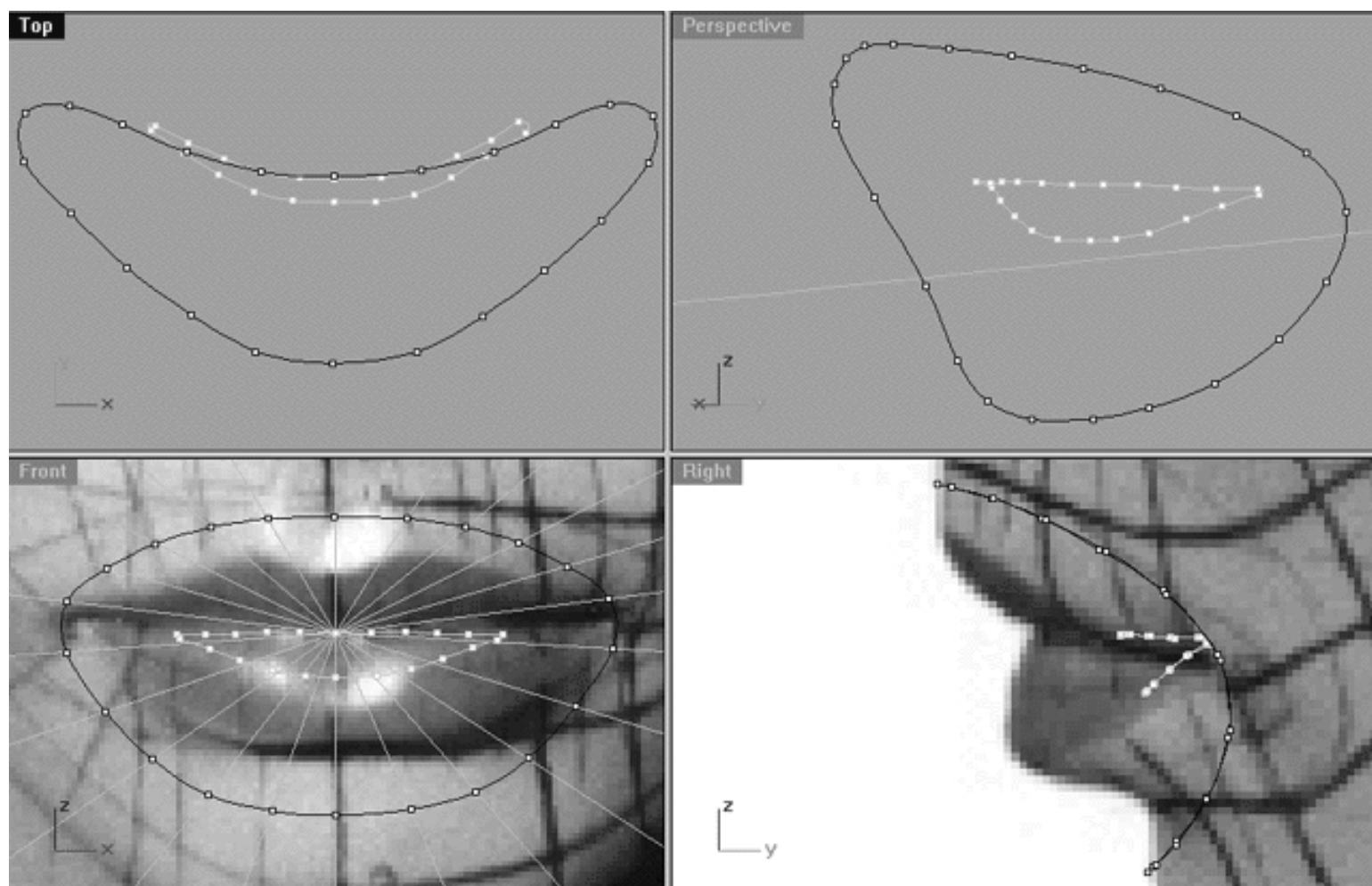
In order to avoid any possible confusion please be aware that we will be now working from the inside of the mouth outward. For our purposes then, the innermost curve will be known as the 6th mouth curve and outermost curve we will call the 1st mouth curve -- the opposite of what some people might expect. Then again, we are British and we like being contrary just for the sake of it sometimes!

Right then, we've now created the curve the will make up the outside ring of the mouth. Now we need to think about how we will actually go about creating the inner part. There are a lot of ways to do this. This will be a rather short section, during which we will discuss the general planning of our two main mouth curves.

- Zoom in all viewports as required.
- Open the Edit Layers dialogue box, locate the layer entitled: Mouth\_Curve\_Guide\_06, and turn it ON, then press OK to exit.
- A small new curve will now appear.
- Hold down the Ctrl key and select the 1st and 6th mouth curves -- they will highlight.
- Display the edit points on each curve.



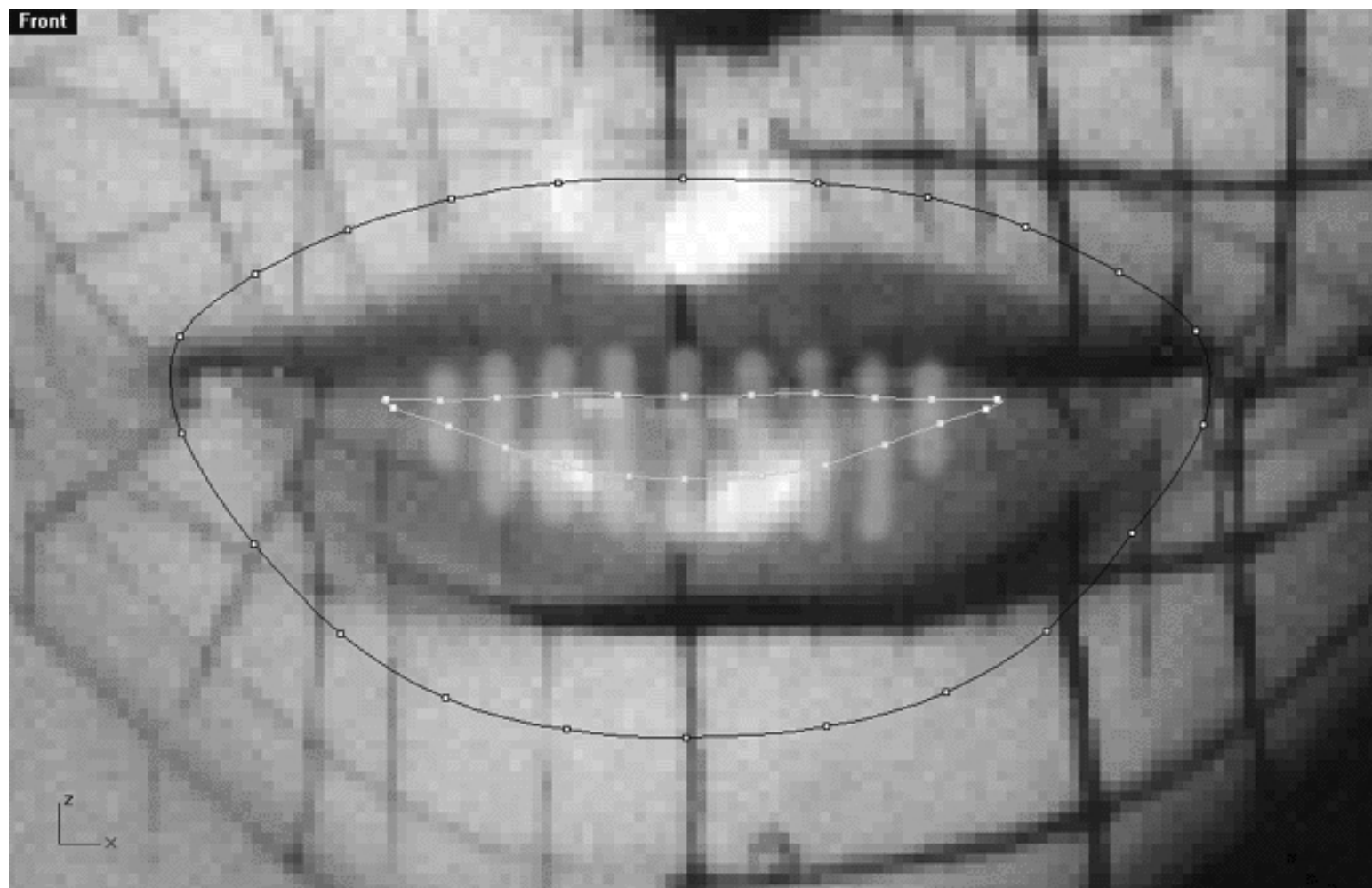
- Your monitor should now resemble the following screenshot:



This **All Viewport** screenshot above shows the 1st outer mouth curve in dark blue (*Nu\_Mouth\_Curve\_01*) and the inner guide curve (*Mouth\_Curve\_Guide\_06* in light cyan).

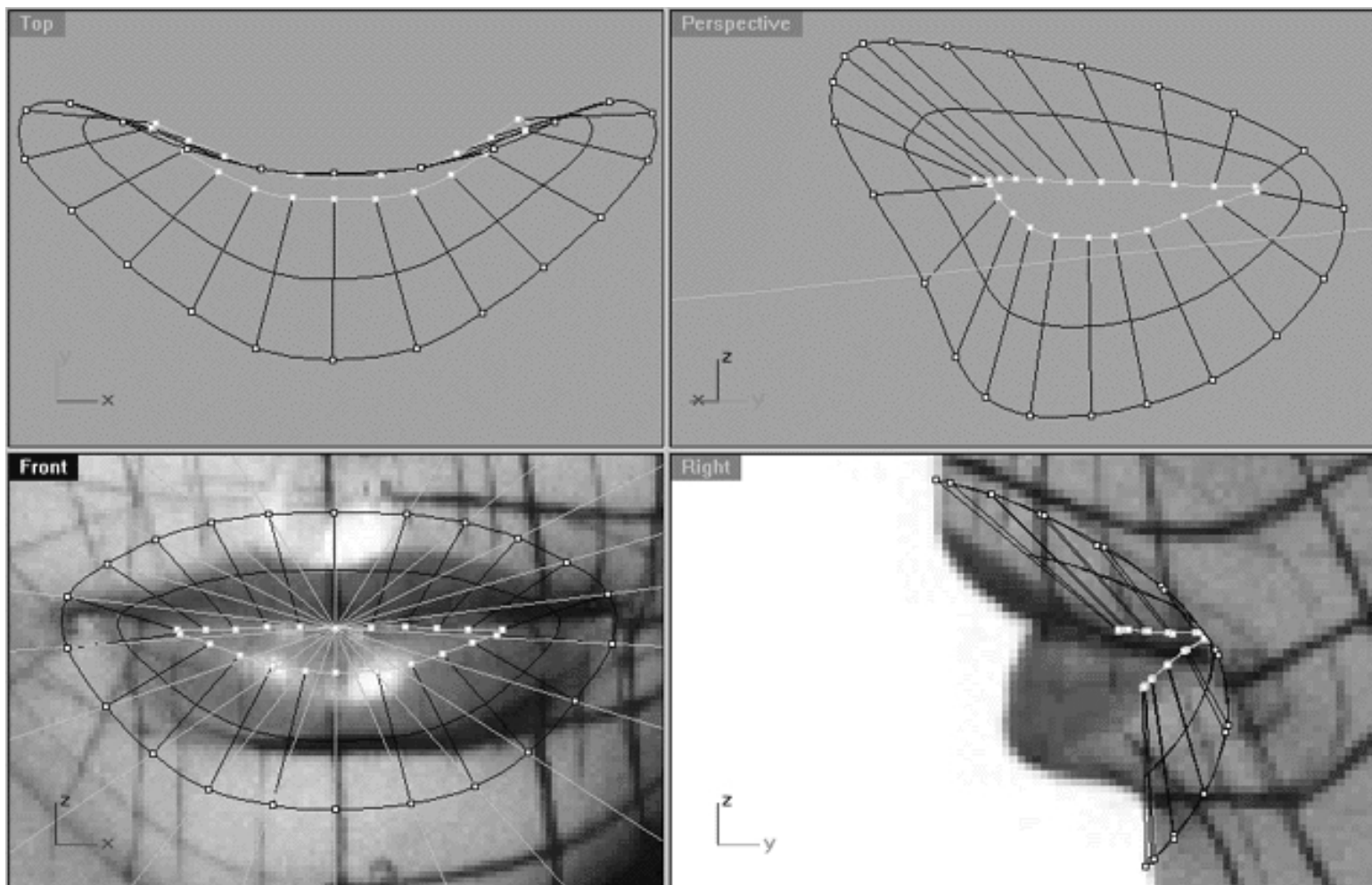
Before we proceed any further, take some time to really study screenshot and investigate the important relationships in each of the views:

1. Study the curves themselves -- notice how *Mouth\_Curve\_Guide\_06* has been scaled down, it is much smaller than *Nu\_Mouth\_Curve\_01*. In addition, *Mouth\_Curve\_Guide\_06* also is located inward along the Y axis in the Top, Perspective and Right views. As you saw earlier the outer curve (*Nu\_Mouth\_Curve\_01*) which when viewed in the Right viewport looks like a "J" tilted on an angle. Notice how the inner mouth guide is also tilted on a similar angle with their vectors running parallel to each other.
2. Study the points -- notice how the points on the inner and outer curves differ. While they are similar they are by no means exact (this is largely due to the scaling). Have a look at how the points are aligned on the inner curve in the Front Viewport, with the exception of the points at each side, notice how they almost line up along the Z axis (highlighted in yellow) as in the following screenshot :



This **Front Viewport** screenshot shows our proposed ideal point configuration for the innermost curve.

Okay, so how did I arrive at this configuration? Well trial and error mainly. It's pretty easy to figure out that both the inner and outer curves will need to be situated in such a fashion. To give you a better idea of what is going on, allow me to perform a quick loft. I'll now create a loose type loft on the outer curve and the inner guide curve just to give you an idea of the type of surface we are attempting to produce. Note -- you don't have to do this, rather, just have a look at the following screenshot:



This **All Viewport** screenshot shows a quick loose loft surface created by lofting the outer curve and the inner guide curve. So what does this tell us then? Well, as you can see with the points configured as they are on each of the curves the isoparms run in a logical and well spaced manner, which is exactly what we want them to do. You can see that unlike the background image that using this configuration of points and placement of curves the mouth will be in a semi-open position, which is again just what we are after. The only real issue to be concerned with here is that with only these two curves the mouth and lips have no real depth or fullness (currently similar to a potato chip).

# Coming Up

Our task is now to create a curve that will be a replica of the small guide curve (Mouth\_Curve\_Guide\_06). Under normal circumstances and if I were working in an application *other* than Rhinoceros my first inclination would be to make a copy of the curve and scale it down into roughly the correct position. While Rhino does contain several different scaling functions/options there are a few problems with using them. Firstly, in our opinion the scale functions to be found within rhino leave a bit to be desired. This is mainly due to the fact that it is difficult, if not near impossible to reproduce your exact actions when using scale, or at least I've not found an easy way of doing it because you can't choose or store an objects centre. So then, let's not bother we will just do it the old fashioned way by simply copying and editing the 1st mouth guide curve.

Go to the [NEXT PART](#)

RETURN to the Top of Page -- [Click Here](#)

Written by Joseph R. Saltzman.

Co-produced in association with Steven Ståhlberg

©1998-1999 Cinemagic Productions Limited. All Rights Reserved.

Duplication of this document including images and text by any means is expressly forbidden without prior written consent of Cinemagic Productions Limited.

Web Site: <http://www.cmagic.co.uk> Telephone: +44 (0)1753 733 190 Fax: +44 (0)1753 736 619 email: [cmagic@cmagic.co.uk](mailto:cmagic@cmagic.co.uk)

# MOVIE CREATING THE 1ST MOUTH CURVE

To **PLAY** the example movie, double click below:

To **RETURN** to the head shape tutorial -- [click here](#).

# MOVIE PROJECTING THE 1ST MOUTH CURVE

To **PLAY** the example movie, double click below:

To **RETURN** to the head shape tutorial -- [click here](#).



# ESTABLISHING THE DIRECTION OF A CURVE

To **PLAY** the example movie, double click below:

To **RETURN** to the head shape tutorial -- [click here](#).

# REBUILDING THE CURVE

To **PLAY** the example movie, double click below:

To **RETURN** to the head shape tutorial -- [click here](#).

**RETURN** to previous page -- [Click Here](#)

**GOTO** the [NEXT LESSON](#)




## THE MOUTH PART FOUR

### Contents:

- [The 6th Mouth Curve -- Execution](#)
- [Editing Points in the Front View](#)
- [Editing Points in the Top View](#)
- [Editing Points in the Right View](#)
- [Example Movie -- How to create the 6th Mouth Curve](#)
- [Summary -- A Few Thoughts](#)
- [Shutting Down the Scene](#)

---

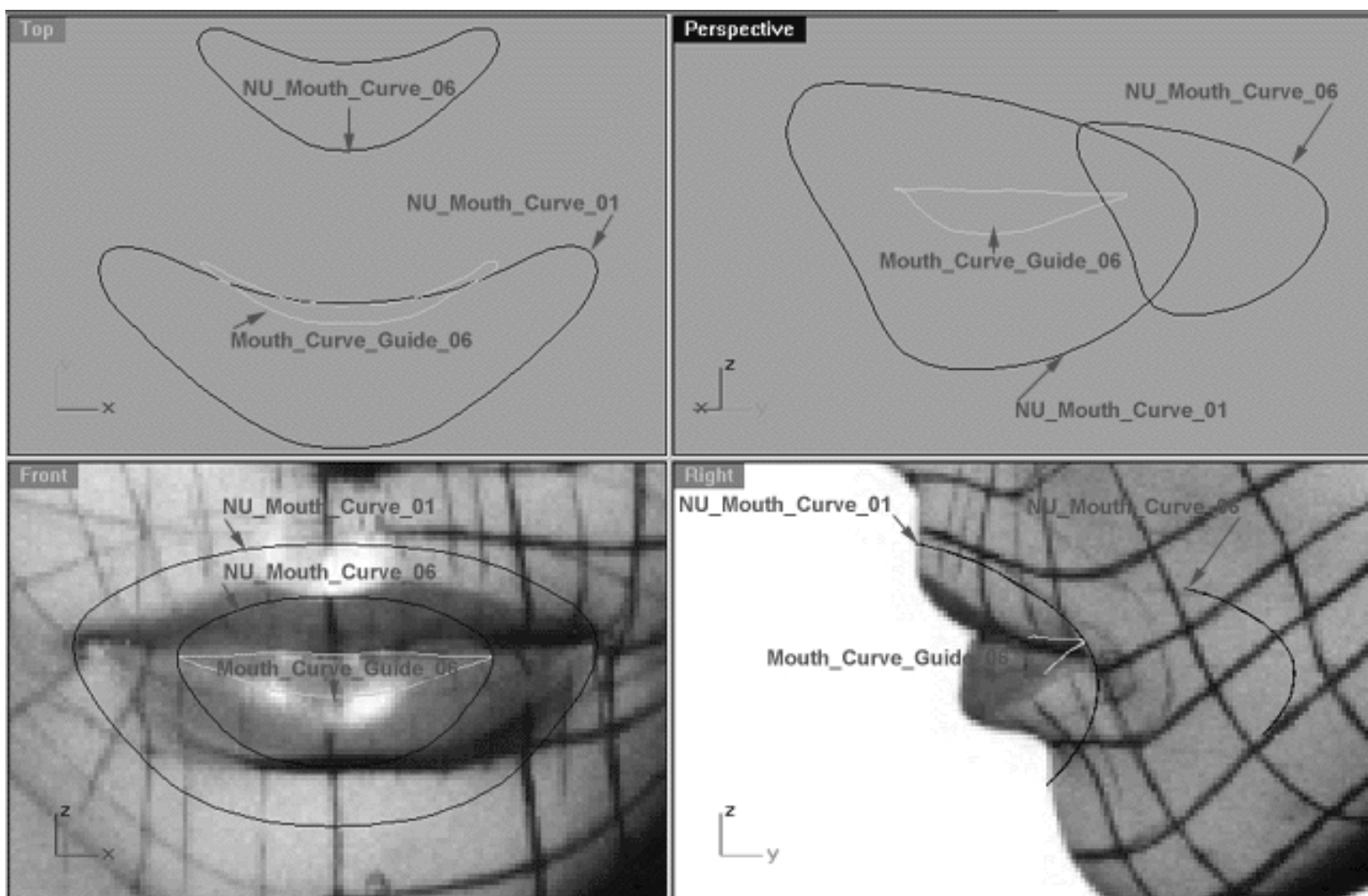
## The 6th Mouth Curve -- Execution

- Turn off any currently displayed edit points.
- Open the Edit Layers dialogue box and create a new layer entitled: Nu\_Mouth\_Curve\_06, leave its colour at the default (black).
- Make the new layer active by left clicking on the Layer Info box, highlight the item in the list and left click again to exit.
- Make a copy of the outer mouth curve (Nu\_Mouth\_Curve\_01). To do this choose the copy icon  from the toolbar and left click, the system will respond with the following prompt at the command line: Select objects to copy:
- In Any Viewport, select the outer mouth curve by left clicking on it (Nu\_Mouth\_Curve\_01) -- it will highlight, then press Enter. The system will respond with the following prompt at the command line: Point to copy from ( Vertical InPlace ):
- Type IN and press Enter to complete the operation.



- The outer curve should still be highlighted. Hint -- In the event that it is not, re-select it. When you do the Choose One Object dialogue box should appear, select curve 2 of 2 and press OK.



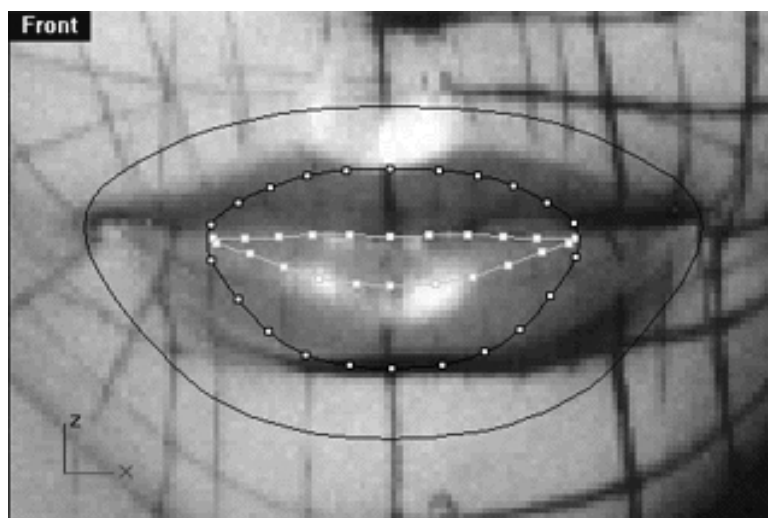
- Now choose the Scale icon by left clicking on it, the system will respond with the following prompt at the command line: Origin point (copy):
- In the Front Viewport move your cursor into roughly the dead centre of the curve and left click (you will have to guess where this is, Hint -- the place where all the gold guide curves originate is a good bet).
- The system will respond with the following prompt at the command line: Scale factor or first reference point ( copy ):
- Hold down the Shift key and move your cursor outward along the X axis until you reach the side of the curve, when you do left click.
- Now while still holding down the Shift key move your cursor in the opposite direction (inward) along the X axis until you reach the side of the inner guide curve (Mouth\_Curve\_Guide\_06), when you do left click again to complete the operation. Your monitor should now resemble the following screenshot:



*This **All Viewport** screenshot describes and shows the current locations of all the curves we will be working with during this lesson.*

- Select the Nu\_Mouth\_Curve\_06 by left clicking on it -- it will highlight.
- Assign the curve to the currently active layer by right clicking on the Layer icon  and choosing the Change Layer icon from the flyout and then left clicking on it. Select the Nu\_Mouth\_Curve\_06 layer from the list by highlighting it with the mouse. When you've done so, click OK to complete the operation.
- Hold down the Ctrl key and in Any Viewport select Mouth\_Curve\_Guide\_06 and NU\_Mouth\_Curve\_06 by left clicking on them with your mouse -- they will highlight.
- Display their edit points by choosing the Edit Points On icon  from the toolbar and left clicking on it -- the points will become visible.
- Right click on the Layer Info box at the lower status bar -- the Edit Layers dialogue box will appear. In the list find the layer entitled: Mouth\_Curve\_Guide\_06 and LOCK it -- then click OK to exit.
- Maximise the Front Viewport -- double left click on its label to do so.

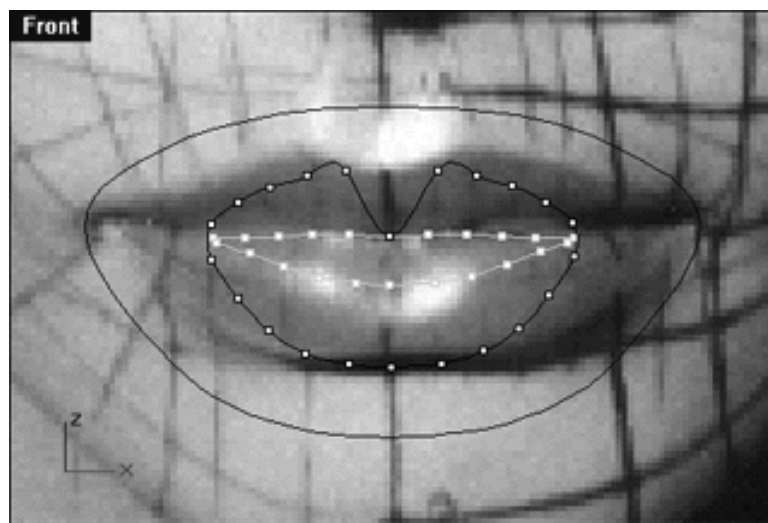
Your monitor should now resemble the following screenshot :



This **Front Viewport** screenshot shows the points being displayed on (Mouth\_Curve\_Guide\_06) and NU\_Mouth\_Curve\_06.

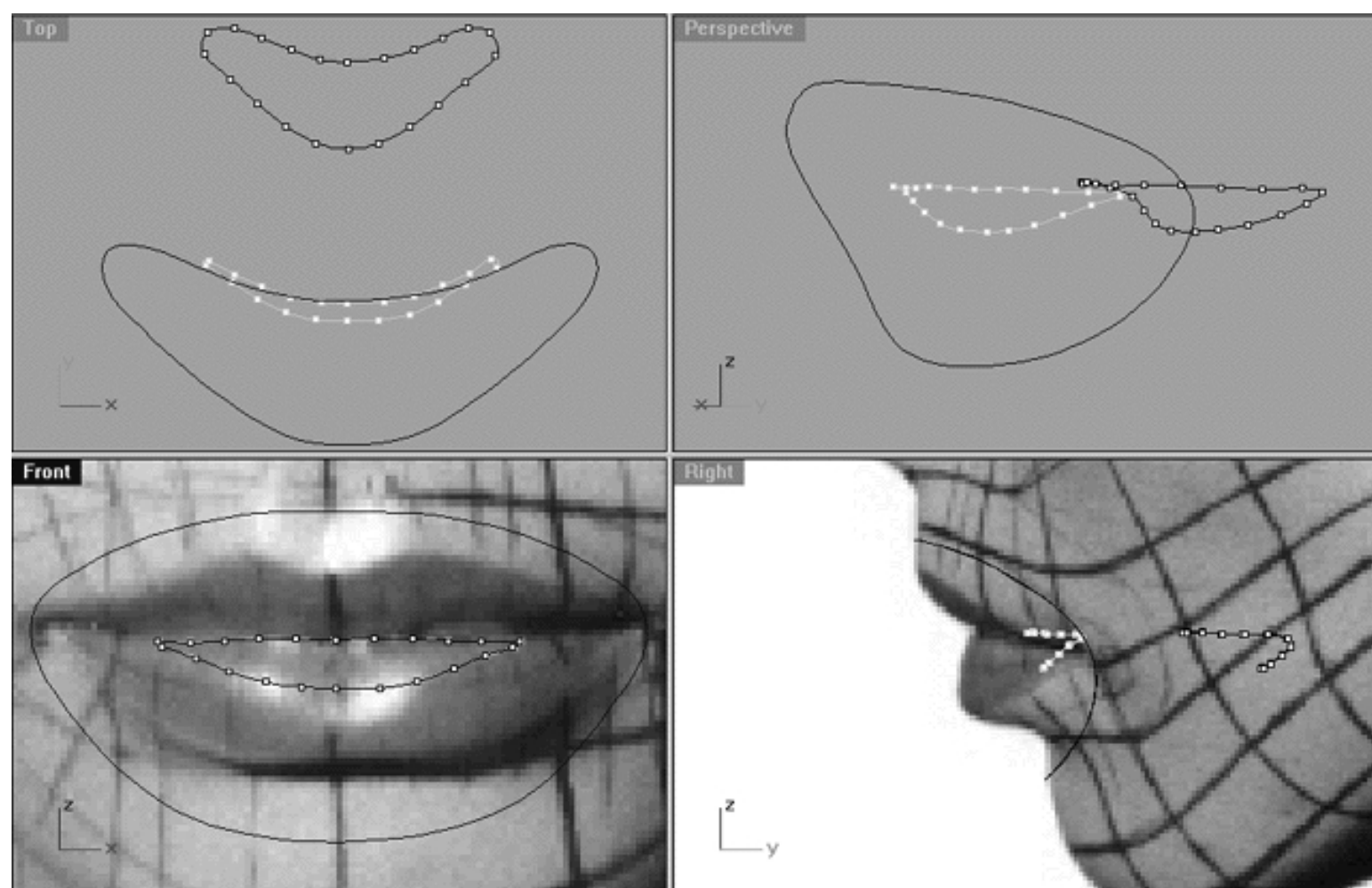
## Editing Points in Front View

- In the Front Viewport, starting with the point at the 12 o'clock position on the (NU\_Mouth\_Curve\_06), move it so that it lies on top of its sister point on the (Mouth\_Curve\_Guide\_06), zoom as required -- once done, your monitor should now look like the following screenshot:



This **Front Viewport** screenshot shows the point at the 12 o'clock position on the (NU\_Mouth\_Curve\_06) has now been moved on top of its sister point on (Mouth\_Curve\_Guide\_06).

- In the Front Viewport continue working in a clockwise fashion and repeat this procedure for each remaining point until they all lie directly on top of their sisters, zoom and pan as required. Once done, your monitor should now resemble the following screenshot:

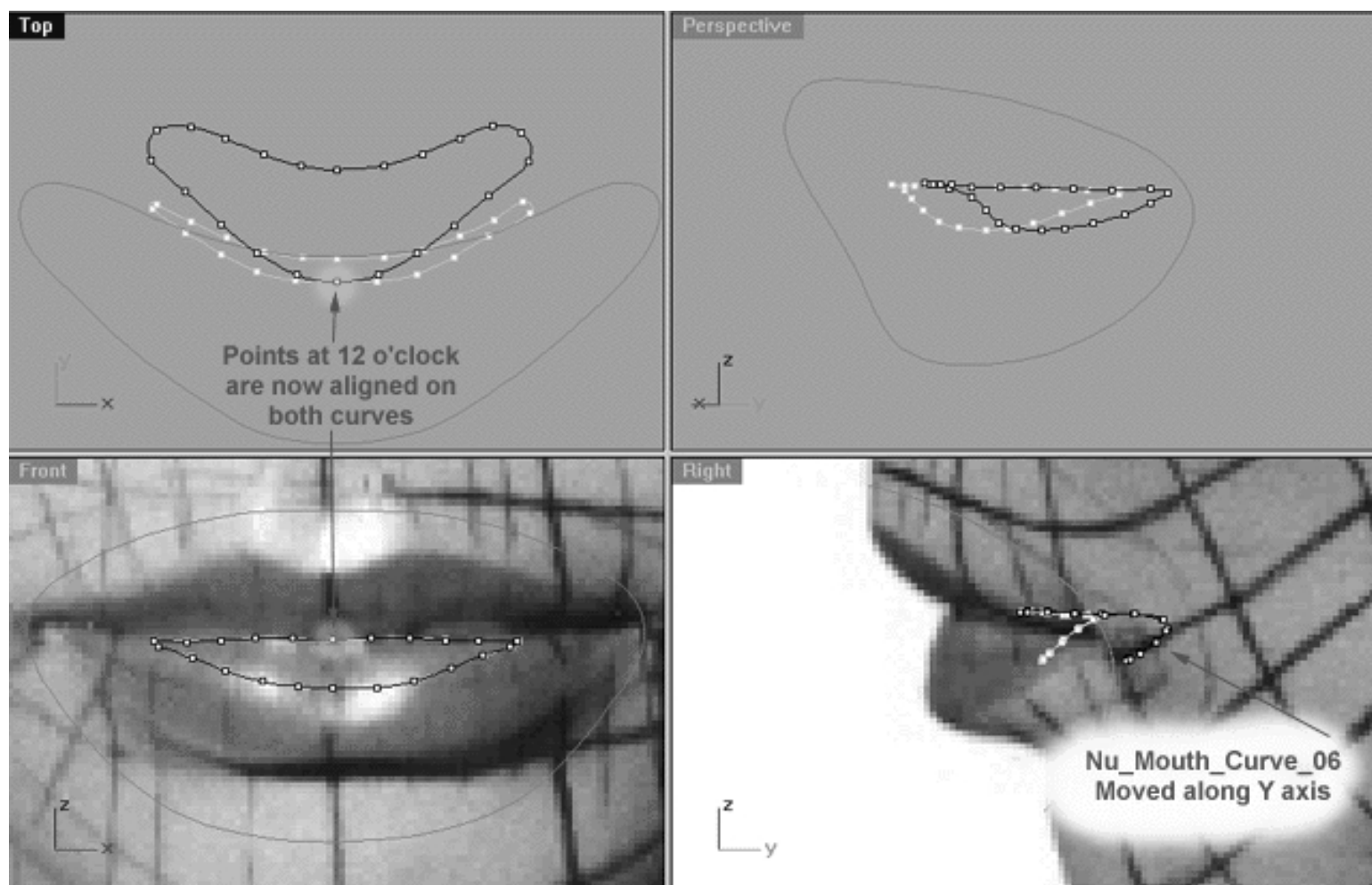


This **All Viewport** screenshot shows that the edit points on (NU\_Mouth\_Curve\_06) have now been moved so that they all lie directly on top of their sister points on the guide curve (as seen from the Front View).

- Select the outer mouth curve (Nu\_Mouth\_Curve\_01) by left clicking on it with your mouse -- it will highlight.



- Lock the curve by typing the command: Lock at the command line and press Enter to complete the operation.
- In the Right Viewport select (NU\_Mouth\_Curve\_06) by holding down the left mouse button and dragging a frame around the entire curve -- all the points on the curve should highlight.
- Hold down the Shift Key and move the curve along the Y axis until the points at the 12 o'clock position are roughly aligned on both curves as in the following screenshot:

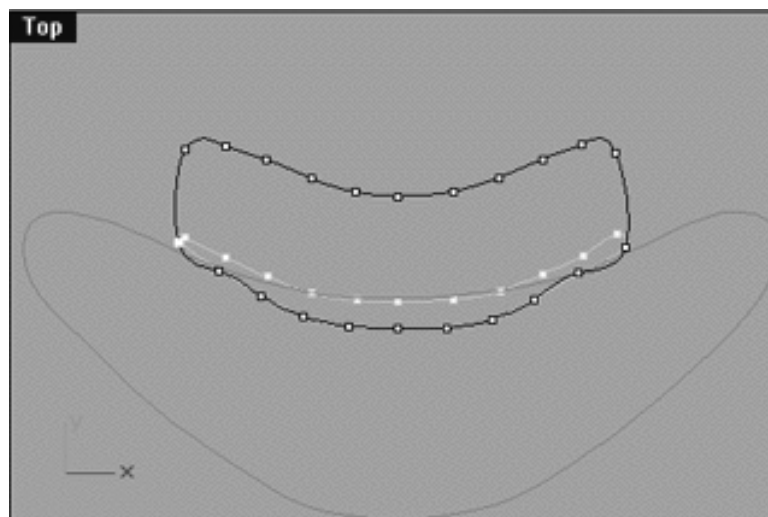


*This **All Viewport** screenshot shows that the curve entitled: (NU\_Mouth\_Curve\_06) has now been moved so that the points located at roughly the 12 o'clock position on both curves (i.e., NU\_Mouth\_Curve\_06 and the guide curve) are aligned (as seen from the Top view). Hint -- watch the 12 o'clock point in the Top Viewport as you move the object/points along the Y axis.*

## Editing Points in the Top View

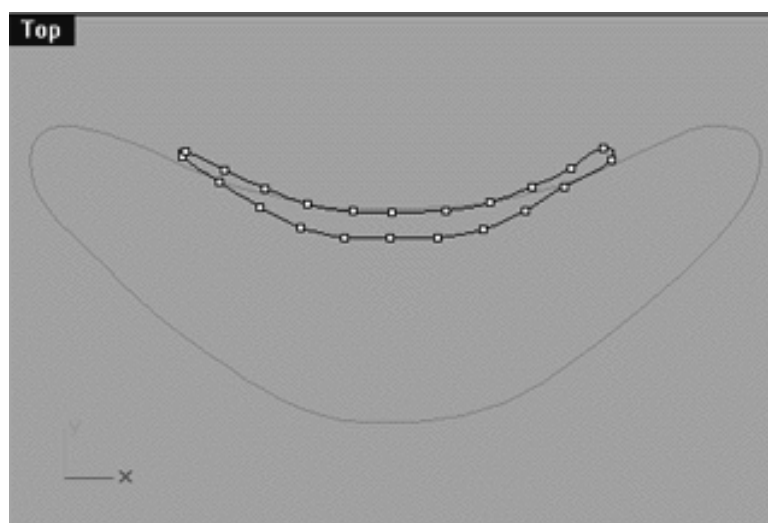
- Maximise the Top Viewport by double left clicking on its label.
- Make sure the points are visible but not currently selected, (i.e., no points should be currently highlighted).
- Next, whilst holding down the Shift key begin to move each of the points on the top of (NU\_Mouth\_Curve\_06) downward along the Y axis and into alignment with their sister points on (Mouth\_Curve\_Guide\_06), zoom and pan as required.

- Once done your monitor should resemble the following screenshot:



*This **Top Viewport** screenshot shows that the edit points along the top of (NU\_Mouth\_Curve\_06) have now been moved downward along the Y axis and into alignment with their sister points on the guide curve.*

- Now once again, whilst holding down the Shift key move each of the points on the bottom row of (NU\_Mouth\_Curve\_06) along the Y axis and into alignment with their sister points on (Mouth\_Curve\_Guide\_06) as in the screenshot below. HINT -- It is strongly advised that you zoom in tightly on the points so that you can be sure that your alignment is as accurate as possible.



*This **Top Viewport** screenshot shows that the edit points along the bottom row of (NU\_Mouth\_Curve\_06) have now been moved along the Y axis and into alignment with their sister points on the guide curve.*

## Editing Points in the Right View

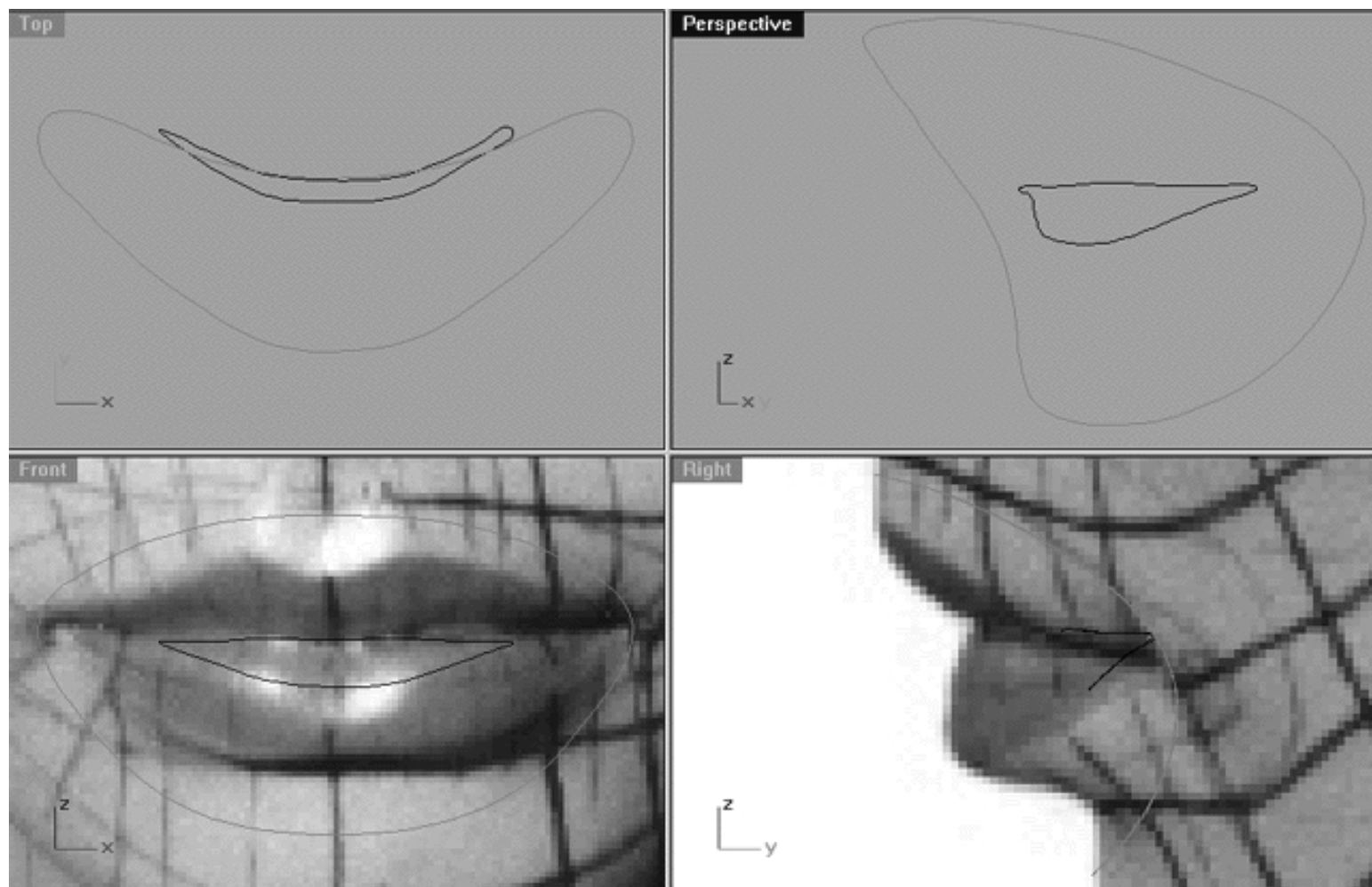
- Minimise the Top Viewport by double left clicking on its label.
- Maximise the Right Viewport by double left clicking on its label.

- Temporarily hide the background reference image by typing the command: **HideBackgroundBitmap** at the command line and pressing Enter to complete.
- Zoom in very tightly on the curve and correct all misalignments that you find, panning the view as you work from point to point. Take your time when refining these points as there will be quite a few corrections that will need to be made.
- Once done, check your work in all the other views making sure that all the points still seem to be on target, correct any that are not.
- When you've finished your monitor should resemble the following screenshot:



*This **Right Viewport** screenshot shows that any misalignments with guide curve have now been corrected.*

- Make sure that the Right Viewport is active and then restore the background image by typing the command: **ShowBackgroundBitmap** at the command line and pressing Enter to complete.
- Minimise the Right Viewport by double left clicking on its label.
- Turn off (Mouth\_Curve\_Guide\_06) to do so, right click on the Layer Info box at the lower status bar -- the Edit Layers dialogue box will appear. In the list find the layer entitled: Mouth\_Curve\_Guide\_06 and select the OFF radio button.
- Turn off (Mouth\_Guides\_01) and select the OFF radio button, then press OK to exit.
- Zoom Extents All to reset the viewports.
- This would be a good time to **SAVE YOUR WORK** if you've not already done so.
- Your monitor should now resemble the following screenshot:



*This **All Viewport** screenshot shows the now completed 6th Mouth Curve.*



**Example Movie**

**How To Create the 6th Mouth Curve [Click Here](#)**

## Summary -- A few thoughts

By this stage you might be thinking, "Hey wait a minute, wouldn't it have been easier just to snap all the points rather than to align and move them in multiple views..?" The answer is, of course it would have been! So why didn't we do that then? The reason is that you would not have learned anything by doing so, and after all next time you go to create a mouth you're not going to have the luxury of having any guide curves to work from, so you need how to manipulate the new curves and get the basic point alignment setup and correct without them.

Again, I must stress that there are many ways to create a mouth and this is only one of many possible methods. You could have created the mouth by drawing a cross sectional curve and then creating a revolved surface which then you could have edited into its final shape. This is a perfectly valid method and the one that I frequently used until quite recently adopting this technique. The main problem with building from a revolve is that you have to contend with a few hundred points all of which have to be pulled into place and it's a bit of an editing nightmare in my view.

The method that I am now showing you of creating a mouth by using a series of closed curves and then lofting them is a little unusual, fair enough. That said, it is quite easy to work with as you are only dealing with a few curves at a time with a limited number of points on each curve. If you take a little time to study each of the curves, how they are placed and their relationships to one another you will soon see that this is a very logical way of constructing a mouth which can be easily altered to suit a wide variety of head types and poses.

So now we've created the outer mouth curve and the inner mouth curve our next task will be to create the lips.

---

## Shutting Down the Scene

If you plan on continuing immediately to the next lesson then you can skip this procedure, however, we do recommend that you save your scene now anyway.

In the event that you wish to take a break and continue working later, than please perform the following procedure:

- Save the file.
- Unhide any objects that may no longer be visible. Type the command: Show at the command line and press Enter.
- Unlock any currently locked curves by typing the command: Unlock at the command line and pressing Enter.
- Open the Edit Layers dialogue box and...
- Turn ON the layer entitled: SCENE START UP and make it the active layer.
- Turn ON the layer entitled: Photopoints.

- Turn OFF the layer entitled: NU\_Mouth\_Curve\_01.
- Turn OFF the layer entitled: Nu\_Mouth\_Curve\_06.
- With the exception of those mentioned, all other layers should be set to OFF.
- Press OK to complete the operation and exit.
- Perform a ZoomExtentsAll.
- SAVE THE FILE.

Go to the [NEXT PART](#)

RETURN to the Top of Page -- [Click Here](#)

Written by Joseph R. Saltzman.

Co-produced in association with Steven Ståhlberg

©1998-1999 Cinemagic Productions Limited. All Rights Reserved.

Duplication of this document including images and text by any means is expressly forbidden without prior written consent of Cinemagic Productions Limited.

Web Site: <http://www.cmagic.co.uk> Telephone: +44 (0)1753 733 190 Fax: +44 (0)1753 736 619 email: [cmagic@cmagic.co.uk](mailto:cmagic@cmagic.co.uk)



**RETURN** to previous page -- [Click Here](#)

**GOTO** the [NEXT LESSON](#)




## THE MOUTH PART FIVE


### Contents:

- [Scene Setup](#)
- [Get Lippy -- The Inner Lips \(The 5th Mouth Curve\)](#)
- [Shutting Down the Scene](#)

---

## Scene Setup


- If you've not done so already start a Rhinoceros session by **double clicking** on the desktop icon  the application will begin.
- Choose File, Open from the menu bar and double click on **START\_A.3DM** in the file list, it will load and open.
- Confirm at the Lower Status Bar the currently active layer is entitled SCENE START UP. If it is active proceed to the next step, if it's not then make it active by left clicking on the layer box, highlighting the correct layer and clicking on it.
- Again, at the Layers Box on the Lower Status Bar this time right click on the box, the Edit Layers Dialogue box will open. Confirm the following switches have been enabled or disabled:
- The Layer entitled Photopoints should be OFF.
- The Layer entitled SCENE START UP should be ON.
- The Layer entitled Nu\_Mouth\_Curve\_01 should be ON.
- The Layer entitled Nu\_Mouth\_Curve\_06 should be ON.
- The Layer entitled Mouth\_Curve\_Guide\_05 should be ON.

- The Layer entitled Mouth\_Guides\_01 should be LOCKED.
- With the exception of those mentioned, ALL other layers should be set to OFF.
- When you've finished making your changes ( if any ) click on OK.
- Confirm that you can see the background image in the Front and Right viewports.
- Confirm that the grid display in the viewports has been disabled, if not turn it off now.
- Confirm that no Osnaps are currently enabled, if any are disable them.
- Confirm that no edit points are currently displayed, if any are hide them.
- Reset all the viewports by selecting the Zoom Extents All icon  or by typing the command: **ZoomExtentsAll** at the command line and pressing ENTER.

---

## Get Lippy -- The Inner Lips

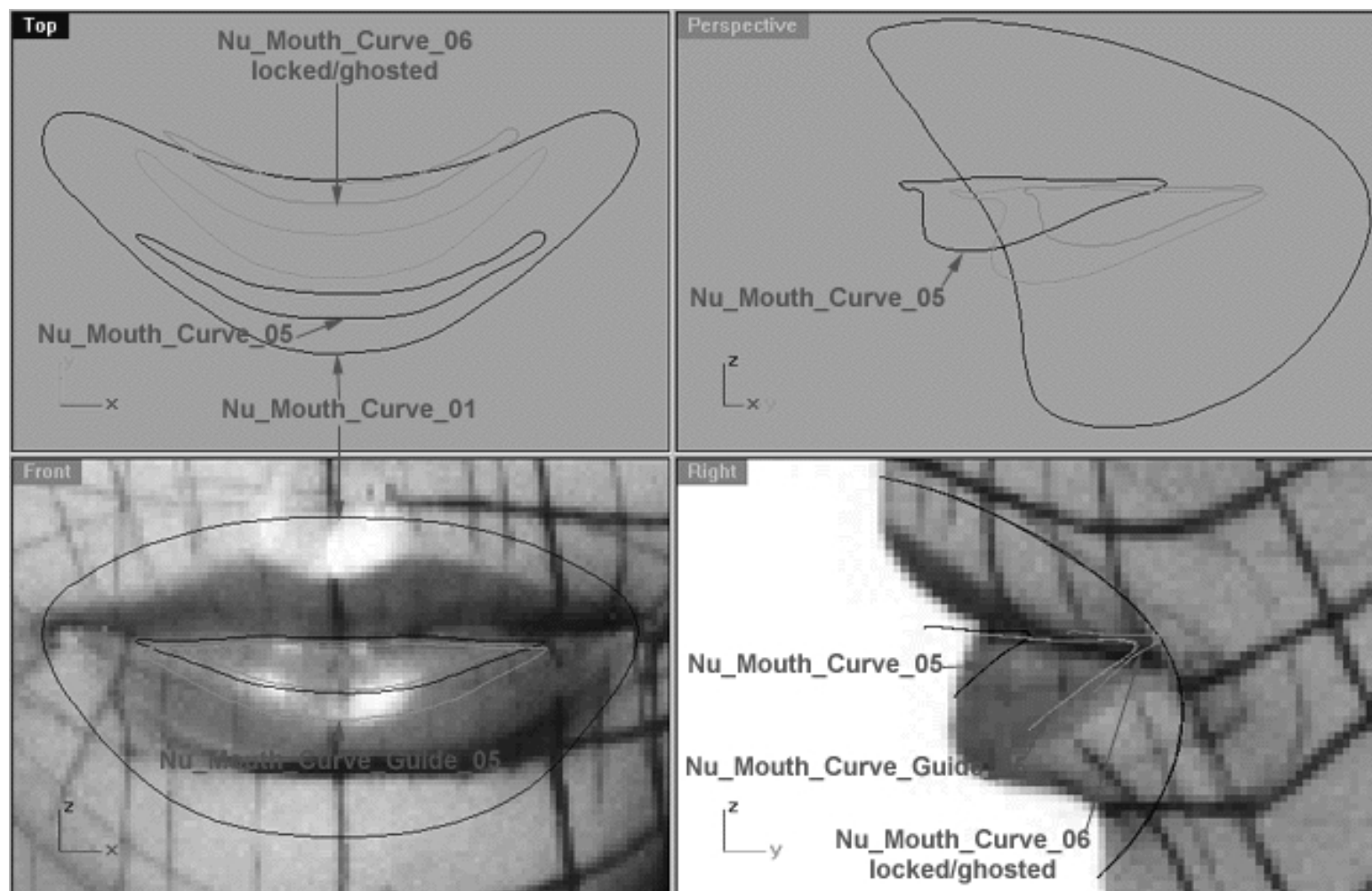
### The 5th Mouth Curve

- Right click on the Layer Info box at the lower status bar -- the Edit Layers dialogue will appear.
- Now, create a new layer entitled: Nu\_Mouth\_Curve\_05, click on the New button and type: Nu\_Mouth\_Curve\_05 in the field, then click OK to complete the operation.
- Make the new layer active by left clicking on the Layer Info box, highlight the item in the list and left click again to exit.
- Make a copy of the inner mouth curve (Nu\_Mouth\_Curve\_06). To do this choose the copy icon  from the toolbar and left click, the system will respond with the following prompt at the command line: Select objects to copy:
- In Any Viewport, select the inner mouth curve by left clicking on it (Nu\_Mouth\_Curve\_06) -- it will highlight, then press Enter. The system will respond with the following prompt at the command line: Point to copy from ( Vertical InPlace ):
- Type IN and press Enter to complete the operation.
- The inner curve should still be highlighted. If not, select the curve again by clicking on it -- the Choose One Object dialogue box should appear. Choose object #2 of 2 and press OK.


- Maximise the Right Viewport.

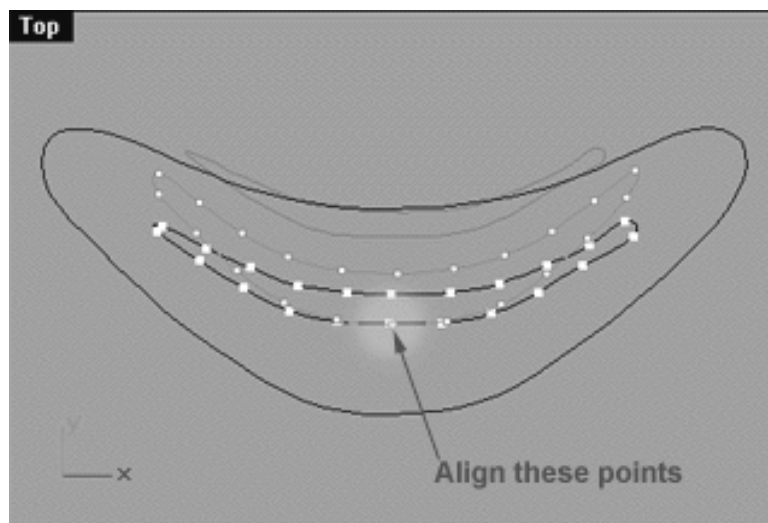


- Now choose the Scale icon by left clicking on it, the system will respond with the following prompt at the command line: Origin point (copy):
- In the Front Viewport move your cursor into roughly the dead centre of the curve (this is about the point where the gold guide isoparms Mouth\_Guides\_01 originate from) and left click.
- The system will respond with the following prompt at the command line: Scale factor or first reference point ( copy ):
- Hold down the Shift key and move your cursor outward along the X axis until you reach the side of the curve, when you do left click.
- Now while still holding down the Shift key move your cursor in the same direction (outward) along the X axis until the curve has grown to about the same size as the guide (Mouth\_Curve\_Guide\_05), when you've done this, left click again to complete the operation.
- Select the inner mouth curve (Nu\_Mouth\_Curve\_06) by left clicking on it -- it will highlight. Then type the command: **Lock** at the command line.
- Confirm that the new mouth curve (Nu\_Mouth\_Curve\_05) has been associated with its layer, if not then be sure to do so.
- Minimise the Right Viewport.
- Your monitor should now resemble the following screenshot:



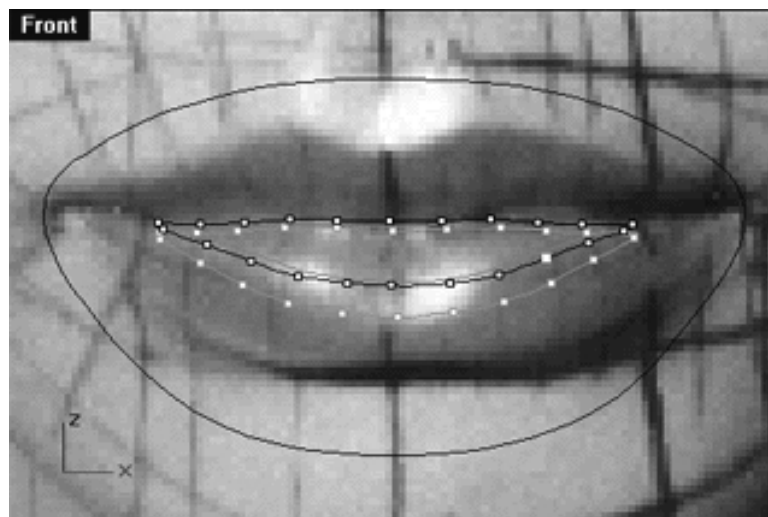
This **All Viewport** screenshot shows all the curves that we are currently working with and their current locations.

- Hold down the Ctrl key and left click on (Mouth\_Curve\_Guide\_05) and (Nu\_Mouth\_Curve\_05) -- they will both highlight.
- Display the edit points for both curves by choosing the Edit Points On icon  and left clicking.
- Type the command: Lasso at the command line, the system will respond with the following prompt: click or drag left mouse button to lasso - press Enter to select points:
- In the Top Viewport carefully draw a circle around (Nu\_Mouth\_Curve\_05) and all of its displayed points (WARNING -- don't include any of the points on the guide curve by mistake) closing the circle at the ends, when you've done so press Enter to complete the operation -- all of the points on the curve should highlight.
- Hold down the Shift key and in the Top Viewport move (Nu\_Mouth\_Curve\_05) and all its displayed points along the Y axis until the point at the 12 o'clock position is roughly aligned with its sister on the guide curve. Your monitor should now resemble the following screenshot:

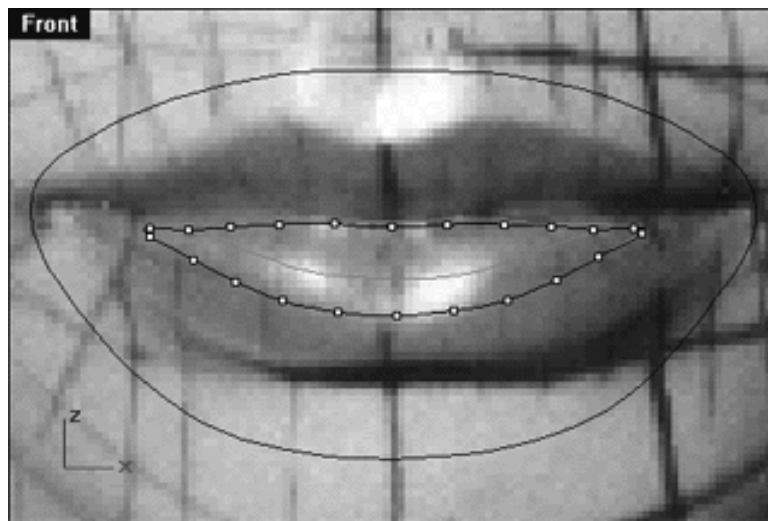


*This **Top View** screenshot shows that all the points have been selected (using the lasso) on (Nu\_Mouth\_Curve\_05). Then whilst holding down the shift key all the points were moved along the Y axis until the points located at roughly 12 o'clock on 5th mouth curve and the guide were in alignment with each other.*

- Right click on the Layer Info box at the lower status bar -- the Edit Layers dialogue will appear.
- LOCK the layer entitled: Mouth\_Curve\_Guide\_05, press OK to exit.
- Maximise the Front Viewport by double left clicking on its label.
- Now move each of the points on (Nu\_Mouth\_Curve\_05) into alignment with their sister points on Mouth\_Curve\_Guide\_05, zoom and pan the view as required.
- See the following screenshots:

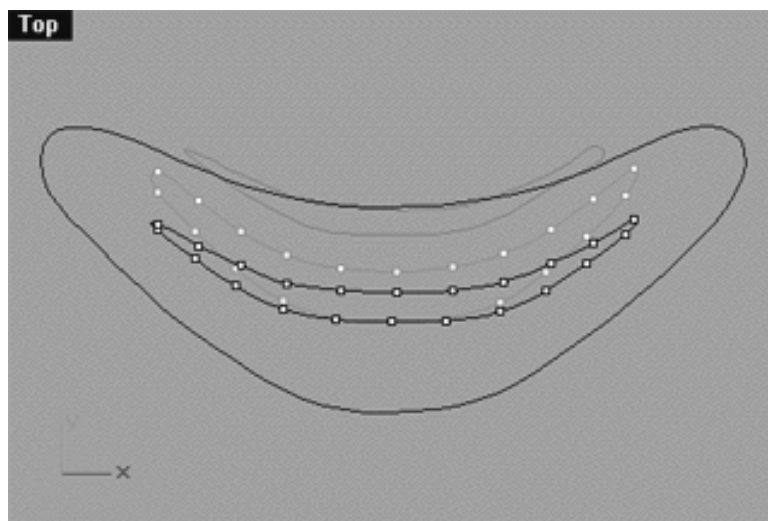


*This **Front Viewport** screenshot shows how your monitor should look before moving the points.*



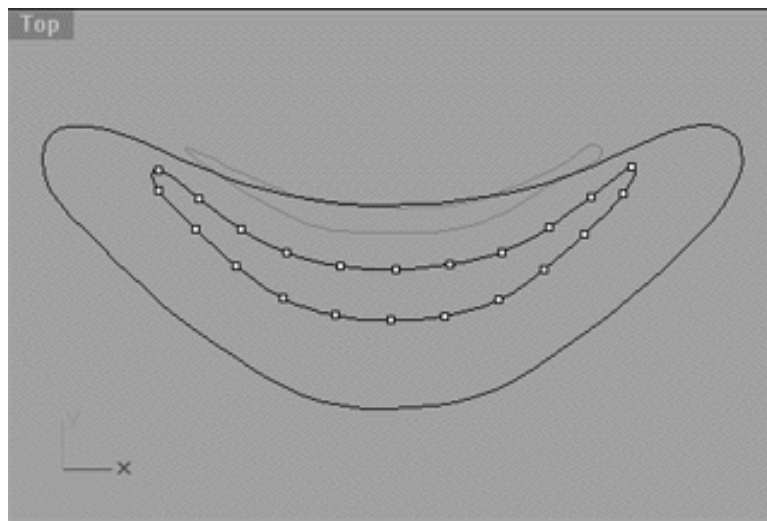
And this **Front Viewport** screenshot is how your monitor should look after moving the points.

- Switch to the Top Viewport and maximise it by double left clicking on its label, zoom the view as required.
- Now whilst holding down the Shift key, one by one move the points on the top and bottom of the curve along the Y axis, until each have been aligned with their sister points on the guide.
- See the following screenshots:



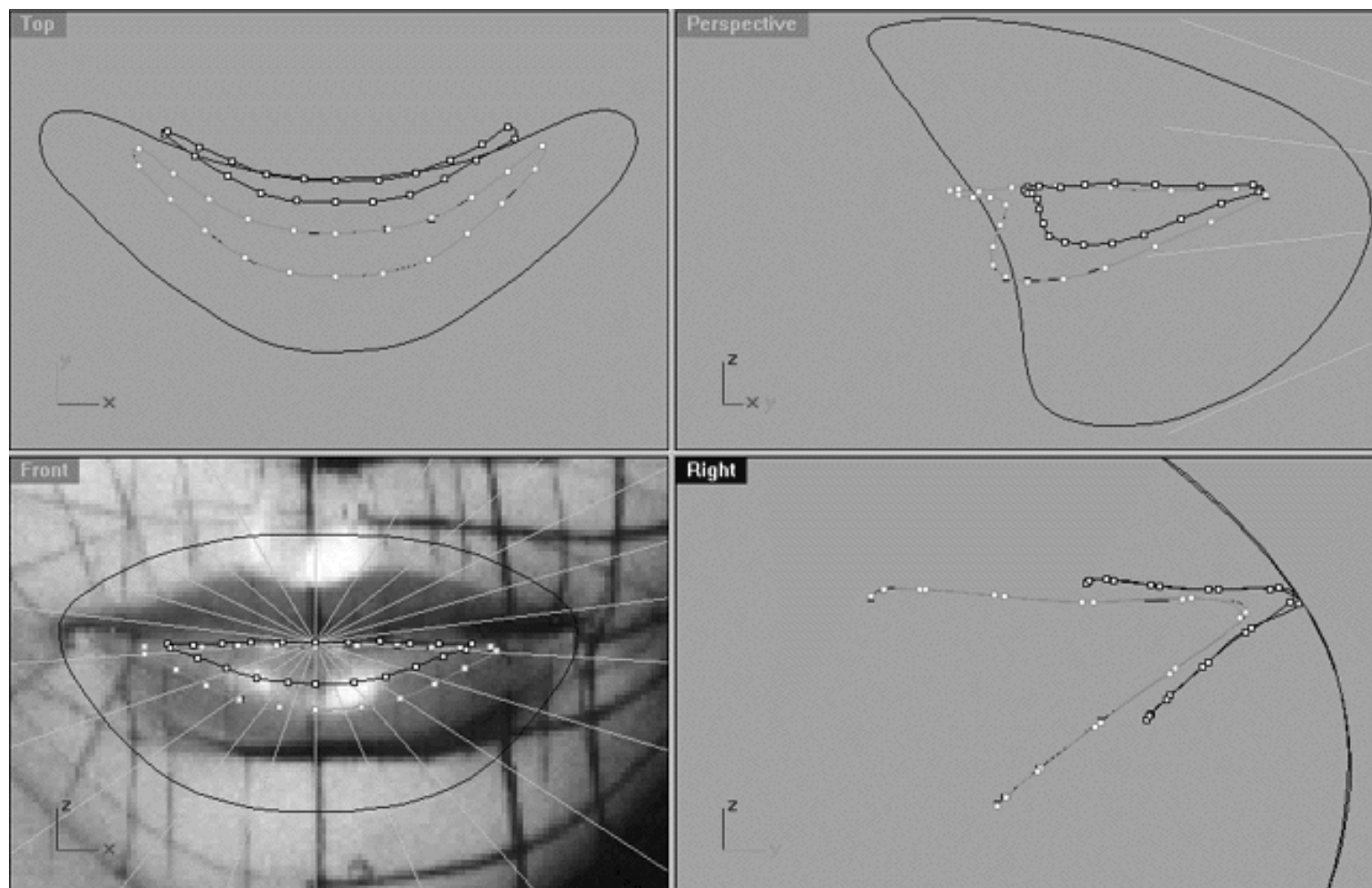
This **Top Viewport** screenshot is how your monitor should look before moving the points.





*This **Top Viewport** screenshot is how your monitor should look after moving the points.*

- Switch to the Right Viewport and Maximise it by double left clicking on its label, zoom and pan as required.
- Carefully check the points and refine any misalignment you might find in this view.
- Once done, minimise the Right Viewport.
- At the command line type: Unlock -- (Nu\_Mouth\_Curve\_06) should become visible once again.
- Select (Nu\_Mouth\_Curve\_06) and display its edit points.
- Your monitor should now resemble the following screenshot:



This **All Viewport** screenshot above shows the outer mouth curve (Nu\_Mouth\_Curve\_01), the inner lip curve (Nu\_Mouth\_Curve\_05) now edited so that its points lie directly on top of sisters on (Mouth\_Curve\_Guide\_05) and the inner mouth curve (Nu\_Mouth\_Curve\_06). **\*Note** the background image in the Right viewport has been temporarily turned off for purposes of clarity. In addition, the gold guide isoparms (as seen in the Front viewport) have been turned on in order to better illustrate the relationships between the points on (Nu\_Mouth\_Curve\_05) and (Nu\_Mouth\_Curve\_06).

Take some time to study the relationships between the points, especially in the Top and Front viewports. Also, notice how the curves have been placed in relationship each other in the Right viewport.

## Shutting Down the Scene

If you plan on continuing immediately to the next lesson then you can skip this procedure, however, we do recommend that you save your scene now anyway.

In the event that you wish to take a break and continue working later, than please perform the following procedure:

- Save the file.
- Unhide any objects that may no longer be visible. Type the command: Show at the command line and press Enter.

- Unlock any currently locked curves by typing the command: Unlock at the command line and pressing Enter.
- Open the Edit Layers dialogue box and...
- Turn ON the layer entitled: SCENE START UP and make it the active layer.
- Turn ON the layer entitled: Photopoints.
- Turn OFF the layer entitled: NU\_Mouth\_Curve\_01.
- Turn OFF the layer entitled: Nu\_Mouth\_Curve\_06.
- Turn OFF the layer entitled: Nu\_Mouth\_Curve\_05.
- Turn OFF the layer entitled: Mouth\_Curve\_Guide\_05.
- Turn OFF the layer entitled: Mouth\_Guides\_01.
- With the exception of those mentioned, all other layers should be set to OFF.
- Press OK to complete the operation and exit.
- Perform a ZoomExtentsAll.
- SAVE THE FILE.

---

Go to the [NEXT PART](#)

RETURN to the Top of Page -- [Click Here](#)

Written by Joseph R. Saltzman.

Co-produced in association with Steven Ståhlberg

©1998-1999 Cinemagic Productions Limited. All Rights Reserved.

Duplication of this document including images and text by any means is expressly forbidden without prior written consent of Cinemagic Productions Limited.

Web Site: <http://www.cmagic.co.uk> Telephone: +44 (0)1753 733 190 Fax: +44 (0)1753 736 619 email: [cmagic@cmagic.co.uk](mailto:cmagic@cmagic.co.uk)

# CREATING & EDITING THE 6TH MOUTH CURVE PART ONE

To **PLAY** the example movie, double click below:

To **RETURN** to the mouth shape tutorial -- [click here](#).

To watch **PART TWO** of this movie -- [click here](#).

# CREATING & EDITING THE 6TH MOUTH CURVE PART TWO

To **PLAY** the example movie, double click below:

To **RETURN** to the mouth shape tutorial -- [click here](#).

To watch **PART THREE** of this movie -- [click here](#).

# CREATING & EDITING THE 6TH MOUTH CURVE PART THREE

To **PLAY** the example movie, double click below:

To **RETURN** to the mouth shape tutorial -- [click here](#).

To watch **PART FOUR** of this movie -- [click here](#).



# CREATING & EDITING THE 6TH MOUTH CURVE PART FOUR

To **PLAY** the example movie, double click below:

To **RETURN** to the mouth shape tutorial -- [click here](#).

To watch **PART FIVE** of this movie -- [click here](#).

# CREATING & EDITING THE 6TH MOUTH CURVE PART FIVE

To **PLAY** the example movie, double click below:

To **RETURN** to the mouth shape tutorial -- [click here](#).

**RETURN** to previous page -- [Click Here](#)

**GOTO** the [NEXT LESSON](#)



## THE MOUTH PART SIX


### Contents:


- [Scene Setup](#)
- [The 4th Mouth Curve](#)
- [Shutting Down the Scene](#)

---



## Scene Setup





- If you've not done so already start a Rhinoceros session by **double clicking** on the desktop icon  the application will begin.
- Choose File, Open from the menu bar and double click on **START\_A.3DM** in the file list, it will load and open.
- Confirm at the Lower Status Bar the currently active layer is entitled SCENE START UP. If it is active proceed to the next step, if it's not then make it active by left clicking on the layer box, highlighting the correct layer and clicking on it.
- Again, at the Layers Box on the Lower Status Bar this time right click on the box, the Edit Layers Dialogue box will open. Confirm the following switches have been enabled or disabled:
- The Layer entitled Photopoints should be OFF.
- The Layer entitled SCENE START UP should be ON.
- The Layer entitled Nu\_Mouth\_Curve\_01 should be ON.
- The Layer entitled Nu\_Mouth\_Curve\_06 should be ON.
- The Layer entitled Nu\_Mouth\_Curve\_05 should be ON.

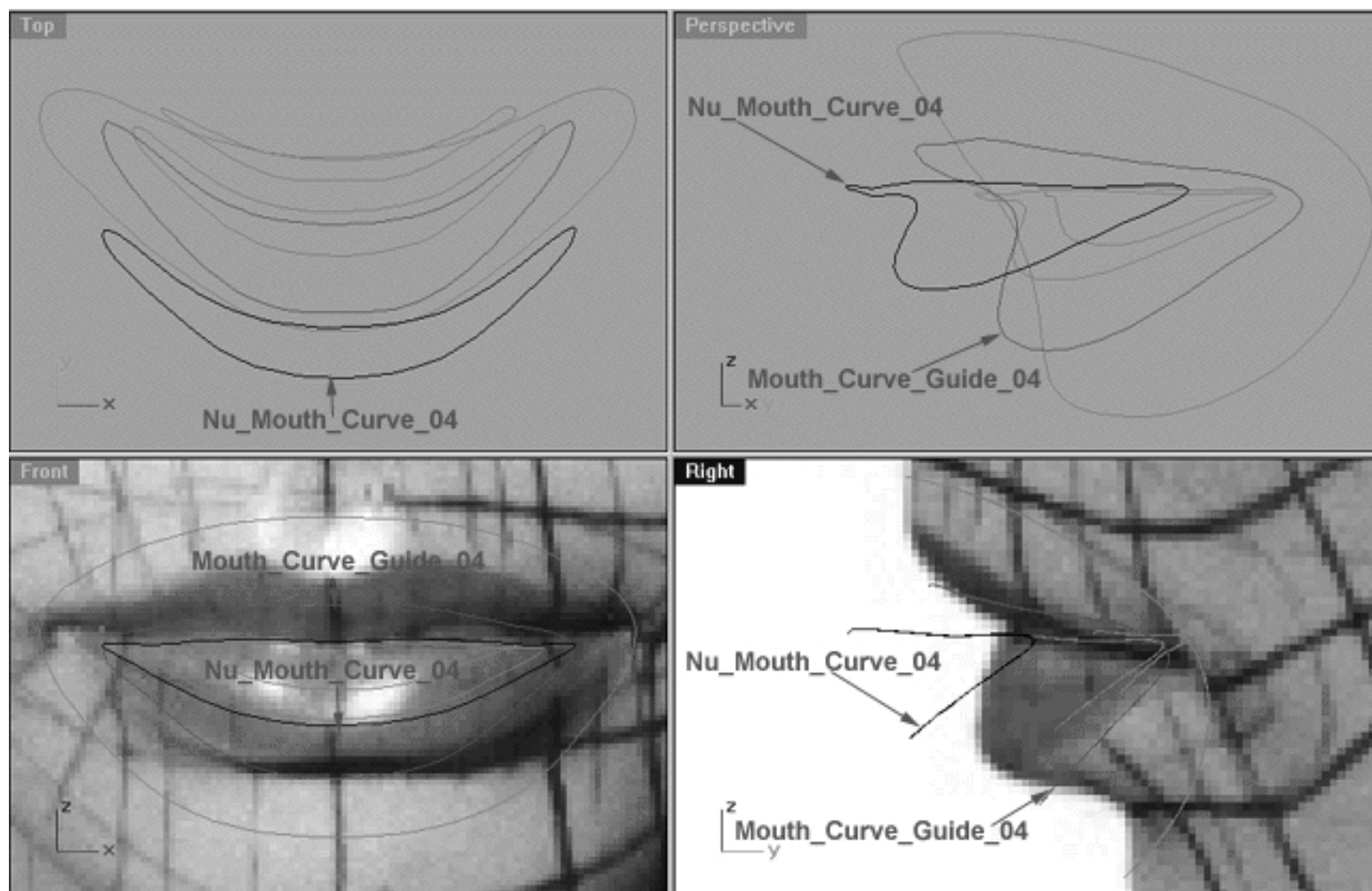
- The Layer entitled Mouth\_Curve\_Guide\_04 should be ON.
- The Layer entitled Mouth\_Guides\_01 should be LOCKED.
- With the exception of those mentioned, ALL other layers should be set to OFF.
- When you've finished making your changes ( if any ) click on OK.
- Confirm that you can see the background image in the Front and Right viewports.
- Confirm that the grid display in the viewports has been disabled, if not turn it off now.
- Confirm that no Osnaps are currently enabled, if any are disable them.
- Confirm that no edit points are currently displayed, if any are hide them.
- Reset all the viewports by selecting the Zoom Extents All icon  or by typing the command: **ZoomExtentsAll** at the command line and pressing ENTER.
- Zoom each view as required.

## The 4th Mouth Curve


- Right click on the Layer Info box at the lower status bar -- the Edit Layers dialogue will appear.
- Create a new layer entitled: Nu\_Mouth\_Curve\_04, click on the New button and type: Nu\_Mouth\_Curve\_04 in the field, then click OK to complete the operation.
- Make the new layer active by left clicking on the Layer Info box, highlight the item in the list and left click again to exit.
- If you've not done so already, click in the Right Viewport to make it active, then type the command: ShowBackgroundBitmap at the command line to restore the background image.
- Turn off all edit points, choose the Edit Points Off icon  from the toolbar and right click.
- Select Mouth\_Curve\_Guide\_04 by left clicking on it.
- Display its edit points by choosing the Edit Points On icon  from the toolbar and left clicking.
- Hold down the Ctrl key and select the outer mouth curve (Nu\_Mouth\_Curve\_01) and the inner mouth curve (Nu\_Mouth\_Curve\_06) -- they will highlight. Then type the command: **Lock** at the command line and press Enter.



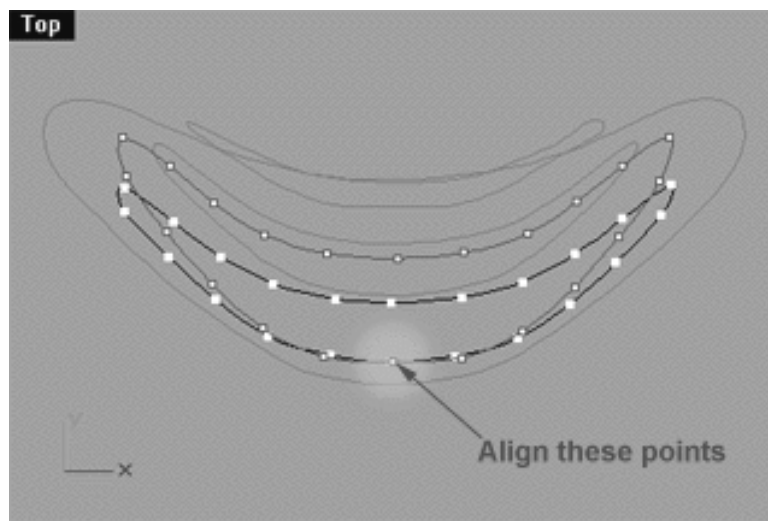
- Make a copy of the inner lip curve (Nu\_Mouth\_Curve\_05). To do this choose the copy icon  from the toolbar and left click, the system will respond with the following prompt at the command line: Select objects to copy:
- In Any Viewport, select the inner lip curve by left clicking on it (Nu\_Mouth\_Curve\_05) -- it will highlight, then press Enter. The system will respond with the following prompt at the command line: Point to copy from ( Vertical InPlace ):
- Type IN and press Enter to complete the operation.
- If you've not done so already, maximise the Front Viewport and zoom as required.
- The inner lip curve should still be highlighted, if not select the correct object (curve #2 of 2) as you did in the previous lesson.
- Now choose the Scale icon  by left clicking on it, the system will respond with the following prompt at the command line: Origin point (copy):
- In the Front Viewport move your cursor into roughly the dead centre of the curve and left click.
- The system will respond with the following prompt at the command line: Scale factor or first reference point ( copy ):
- Hold down the Shift key and move your cursor outward along the X axis until you reach the side of the curve, when you do left click.
- Now while still holding down the Shift key move your cursor in the same direction (outward) along the X axis until the curve has grown to about the same size as the guide (Mouth\_Curve\_Guide\_04), when you've done this, left click again to complete the operation.
- Select the inner mouth curve (Nu\_Mouth\_Curve\_05) by left clicking on it -- it will highlight. Then type the command: **Lock** at the command line and press Enter.
- Confirm that the new mouth curve (Nu\_Mouth\_Curve\_04) has been associated with its layer.
- Minimise the Right Viewport and turn off any currently displayed points.
- Your monitor should now resemble the following screenshot:



This **All Viewport** screenshot shows some of the main curves that we will be working with during this lesson.

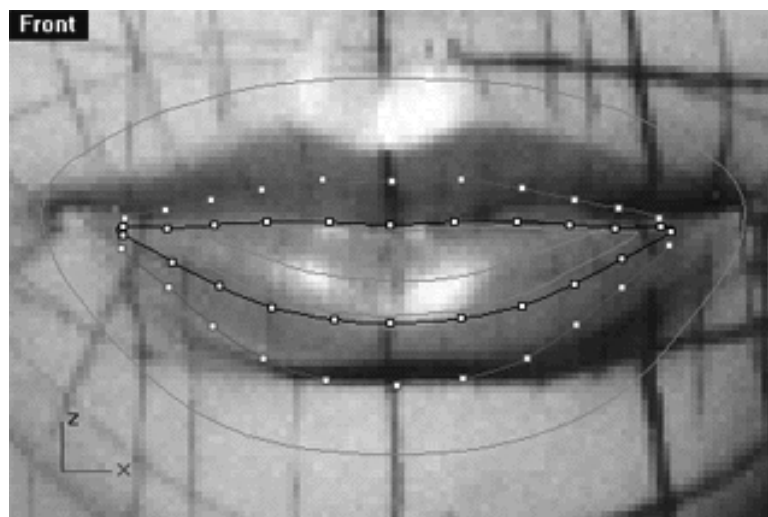
- Hold down the Ctrl key and left click on (Mouth\_Curve\_Guide\_04) and (Nu\_Mouth\_Curve\_04) -- they will both highlight.
- Display the edit points for both curves by choosing the Edit Points On icon  and left clicking.
- Maximise the Top Viewport.
- Type: Lasso at the command line, the system will respond with the following prompt: click or drag left mouse button to lasso - press Enter to select points:
- In the Top Viewport carefully draw a circle around (Nu\_Mouth\_Curve\_04) and all of its displayed points (WARNING -- don't include any of the points on the guide curve by mistake) closing the circle at the ends, when you've done so press Enter to complete the operation -- all of the points on the curve should highlight.
- Hold down the Shift key and in the Top Viewport move (Nu\_Mouth\_Curve\_04) and all its displayed points along the Y axis until the point at the 12 o'clock position is roughly aligned with its sister on the guide curve. Your monitor should now resemble the following screenshot:



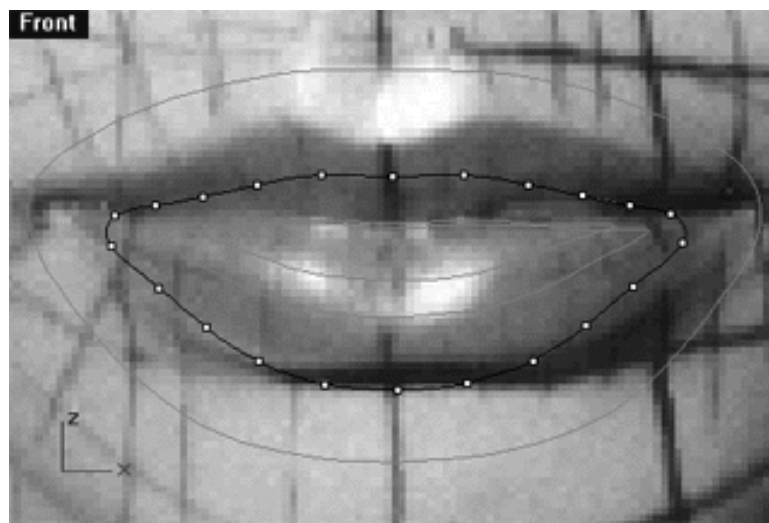


This **Top Viewport** screenshot shows the points at the 12 o'clock position on (Nu\_Mouth\_Curve\_04) and the guide have now been aligned.

- Right click on the Layer Info box at the lower status bar -- the Edit Layers dialogue will appear.
- LOCK the layer entitled: Mouth\_Curve\_Guide\_04, press OK to exit.
- Minimise the Top Viewport.
- Maximise the Front Viewport by double left clicking on its label.
- Now move each of the points on (Nu\_Mouth\_Curve\_04) into alignment with their sister points on Mouth\_Curve\_Guide\_04.
- See the following screenshots:

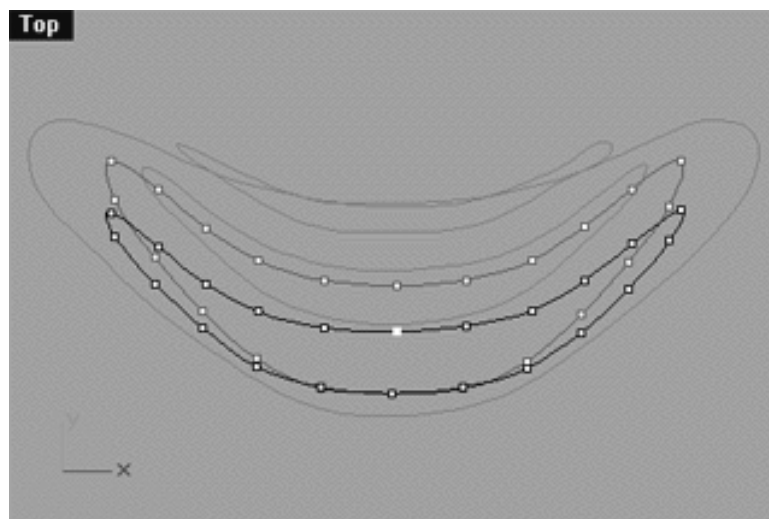


This **Front Viewport** screenshot shows how your monitor should look before moving the points.

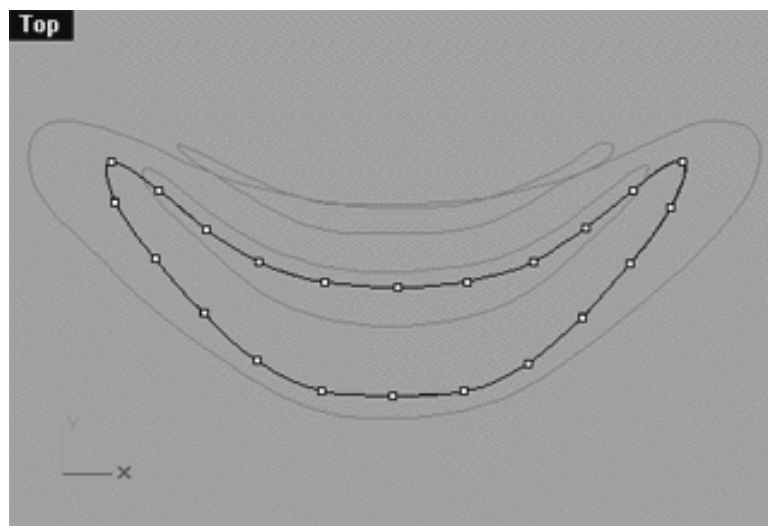


And this **Front Viewport** screenshot is how your monitor should look after moving the points.

- Switch to the Top Viewport and Maximise it by double left clicking on its label.
- Zoom the view as required.
- Now whilst holding down the Shift key, one by one, align each of the points along the top and bottom of the curve with their sister points on the guide.
- See the following screenshots:

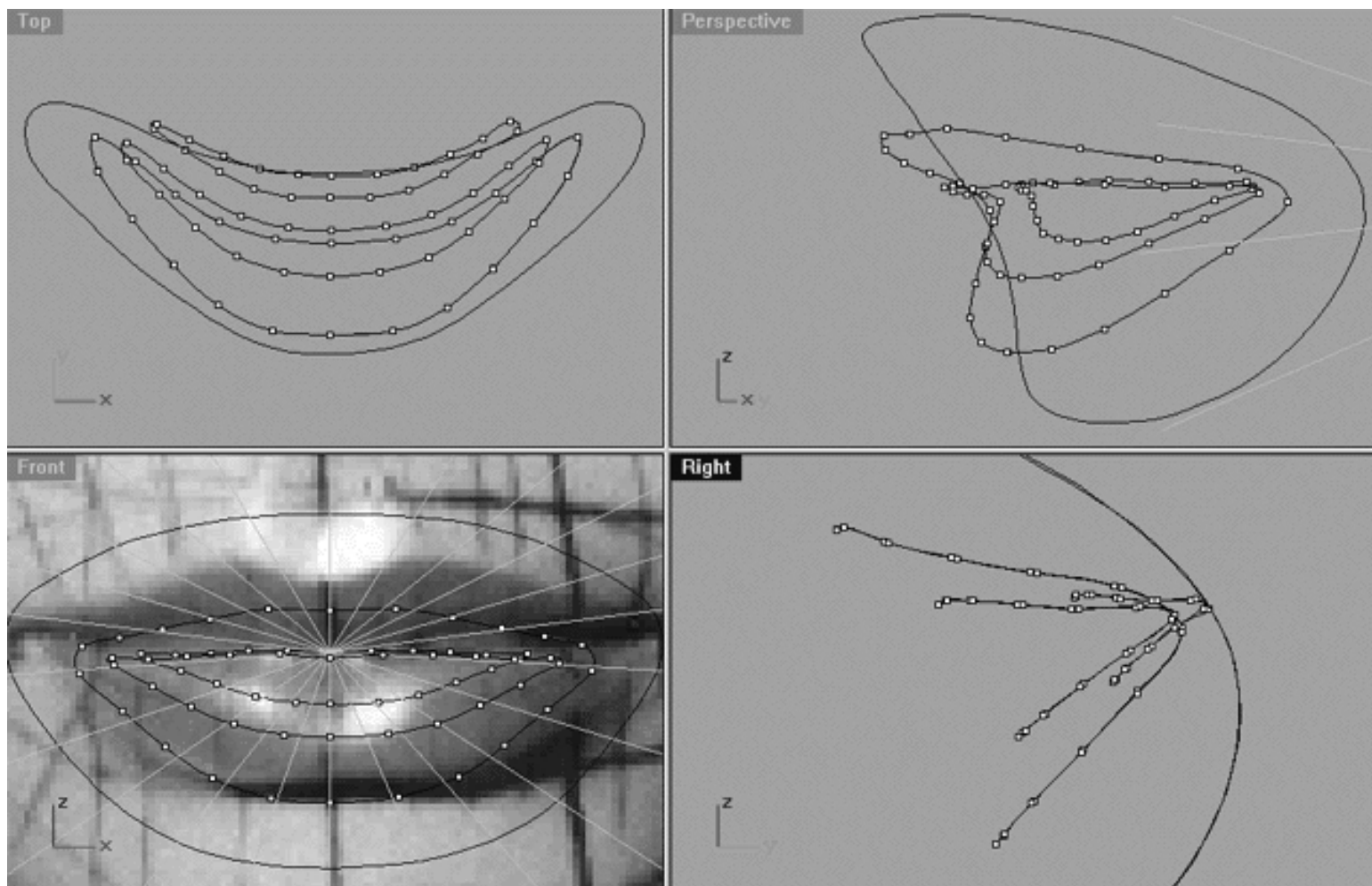


This **Top Viewport** screenshot is how your monitor should look before moving the points.



*This **Top Viewport** screenshot is how your monitor should look after moving the points.*

- Switch to the Right Viewport and Maximise it by double left clicking on its label.
- Zoom the view as required.
- Carefully check the points and refine any misalignment you might find in this view.
- Once done, minimise the Right Viewport.
- Turn off any currently displayed edit points.
- At the command line type: Unlock --(Nu\_Mouth\_Curve\_01), (Nu\_Mouth\_Curve\_05), (Nu\_Mouth\_Curve\_06) should become visible once again.
- Hold down the Ctrl key and select (Nu\_Mouth\_Curve\_04), (Nu\_Mouth\_Curve\_05) and (Nu\_Mouth\_Curve\_06) then display their edit points.
- Your monitor should now resemble the following screenshot:



This **All Viewport** screenshot shows (as viewed from the outside in) the outer mouth curve (Nu\_Mouth\_Curve\_01), the lip curve (Nu\_Mouth\_Curve\_04) which has now edited so that its points lie directly on top of its sister points on (Mouth\_Curve\_Guide\_04), the inner lip curve (Nu\_Mouth\_Curve\_05) and the inner mouth curve (Nu\_Mouth\_Curve\_06). NOTE: The background image in the Right viewport has been temporarily turned off for purposes of clarity.

Take some time to study the relationships between the points, especially in the Top and Front viewports. Also, notice how the curves have been placed in relationship each other in the Right viewport.

## Shutting Down the Scene

If you plan on continuing immediately to the next lesson then you can skip this procedure, however, we do recommend that you save your scene now anyway.

In the event that you wish to take a break and continue working later, than please perform the following procedure:

- Save the file.
- Unhide any objects that may no longer be visible. Type the command: Show at the command line and press Enter.
- Unlock any currently locked curves by typing the command: Unlock at the command line and pressing Enter.

- Turn off any edit points that may currently be displayed.
- Open the Edit Layers dialogue box and...
- Turn ON the layer entitled: SCENE START UP and make it the active layer.
- Turn ON the layer entitled: Photopoints.
- Turn OFF the layer entitled: Nu\_Mouth\_Curve\_01.
- Turn OFF the layer entitled: Nu\_Mouth\_Curve\_06.
- Turn OFF the layer entitled: Nu\_Mouth\_Curve\_05.
- Turn OFF the layer entitled: Nu\_Mouth\_Curve\_04.
- Turn OFF the layer entitled: Mouth\_Curve\_Guide\_04.
- Turn OFF the layer entitled: Mouth\_Guides\_01.
- With the exception of those mentioned, all other layers should be set to OFF.
- Press OK to complete the operation and exit.
- Perform a ZoomExtentsAll.
- SAVE THE FILE.

---

Go to the [NEXT PART](#)

RETURN to the Top of Page -- [Click Here](#)

Written by Joseph R. Saltzman.

Co-produced in association with Steven Ståhlberg

©1998-1999 Cinemagic Productions Limited. All Rights Reserved.

Duplication of this document including images and text by any means is expressly forbidden without prior written consent of Cinemagic Productions Limited.

Web Site: <http://www.cmagic.co.uk> Telephone: +44 (0)1753 733 190 Fax: +44 (0)1753 736 619 email: [cmagic@cmagic.co.uk](mailto:cmagic@cmagic.co.uk)

**RETURN** to previous page -- [Click Here](#)

**GOTO** the [NEXT LESSON](#)



## THE MOUTH PART SEVEN


### Contents:

- [Scene Setup](#)
- [The 3rd Mouth Curve](#)
- [Shutting Down the Scene](#)


---

## Scene Setup





- If you've not done so already start a Rhinoceros session by **double clicking** on the desktop icon  the application will begin.
- Choose File, Open from the menu bar and double click on **START\_A.3DM** in the file list, it will load and open.
- Confirm at the Lower Status Bar the currently active layer is entitled SCENE START UP. If it is active proceed to the next step, if it's not then make it active by left clicking on the layer box, highlighting the correct layer and clicking on it.
- Again, at the Layers Box on the Lower Status Bar this time right click on the box, the Edit Layers Dialogue box will open. Confirm the following switches have been enabled or disabled:
- The Layer entitled Photopoints should be OFF.
- The Layer entitled SCENE START UP should be ON.
- The Layer entitled Nu\_Mouth\_Curve\_01 should be ON.
- The Layer entitled Nu\_Mouth\_Curve\_06 should be ON.
- The Layer entitled Nu\_Mouth\_Curve\_05 should be ON.




- The Layer entitled Nu\_Mouth\_Curve\_04 should be ON.
  - The Layer entitled Mouth\_Curve\_Guide\_03 should be ON.
  - The Layer entitled Mouth\_Guides\_01 should be LOCKED.
  - With the exception of those mentioned, ALL other layers should be set to OFF.
  - When you've finished making your changes ( if any ) click on OK.
  - Confirm that you can see the background image in the Front and Right viewports.
  - Confirm that the grid display in the viewports has been disabled, if not turn it off now.
  - Confirm that no Osnaps are currently enabled, if any are disable them.
  - Confirm that no edit points are currently displayed, if any are hide them.
  - Reset all the viewports by selecting the Zoom Extents All icon  or by typing the command: **ZoomExtentsAll** at the command line and pressing ENTER.
  - Zoom each view as required.
- 

## The 3rd Mouth Curve

- Right click on the Layer Info box at the lower status bar -- the Edit Layers dialogue will appear.
- Create a new layer entitled: Nu\_Mouth\_Curve\_03, click on the New button and type: Nu\_Mouth\_Curve\_03 in the field, then click OK to complete the operation.
- Make the new layer active by left clicking on the Layer Info box, highlight the item in the list and left click again to exit.
- If you've not done so already, turn off all edit points, choose the Edit Points Off icon  from the toolbar and right click.
- Select Mouth\_Curve\_Guide\_03 by left clicking on it.
- Display its edit points by choosing the Edit Points On icon  from the toolbar and left clicking.
- Hold down the Ctrl key and select the outer mouth curve (Nu\_Mouth\_Curve\_01) and the inner mouth curve (Nu\_Mouth\_Curve\_06) and the inner lip curve (Nu\_Mouth\_Curve\_05) -- they will highlight. Then type the command: **Lock** at the command line and press Enter.


- Maximise the Front Viewport.

- Make a copy of the lip curve (Nu\_Mouth\_Curve\_04). To do this choose the copy icon  from the toolbar and left click, the system will respond with the following prompt at the command line: Select objects to copy:

- In the Front Viewport, select the lip curve by left clicking on it (Nu\_Mouth\_Curve\_04) -- it will highlight, then press Enter. The system will respond with the following prompt at the command line: Point to copy from ( Vertical InPlace ):

- Type IN and press Enter to complete the operation.

- The lip curve should still be highlighted, if not, select the correct curve when presented with the Choose One Object dialogue, (which in this case is #2 of 2).

- Now choose the Scale icon  by left clicking on it, the system will respond with the following prompt at the command line: Origin point (copy):

- In the Front Viewport move your cursor into roughly the dead centre of the curve and left click.

- The system will respond with the following prompt at the command line: Scale factor or first reference point ( copy ):

- Hold down the Shift key and move your cursor outward along the X axis until you reach the side of the curve, when you do left click.

- Now while still holding down the Shift key move your cursor in the same direction (outward) along the X axis until the curve has grown to about the same size as the guide (Mouth\_Curve\_Guide\_03), when you've done this, left click again to complete the operation.

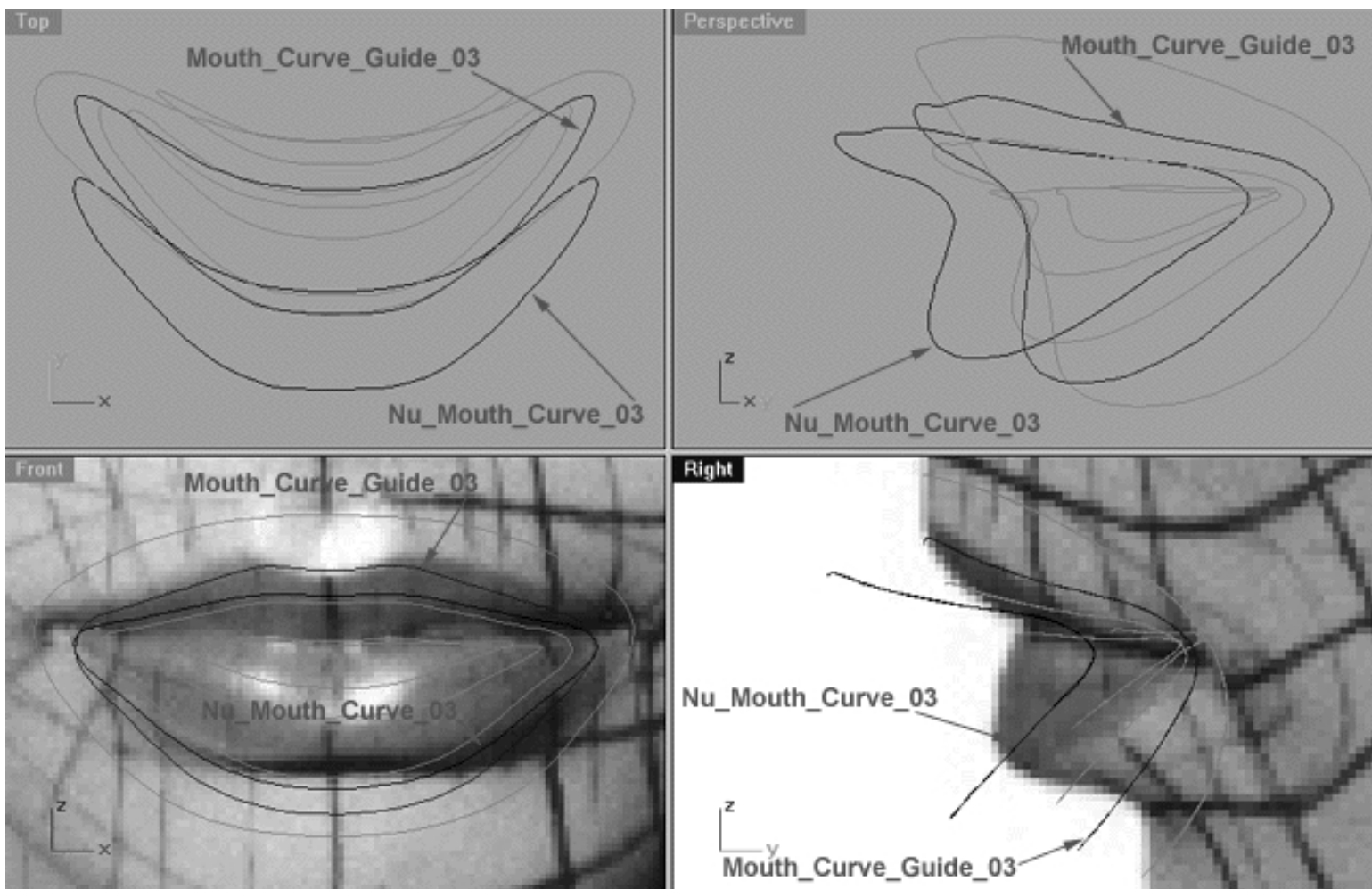
- Select the inner mouth curve (Nu\_Mouth\_Curve\_04) by left clicking on it -- it will highlight. Then type the command: **Lock** at the command line.

- Confirm that the new mouth curve (Nu\_Mouth\_Curve\_03) has been associated with its layer.


- Minimise the Front Viewport.

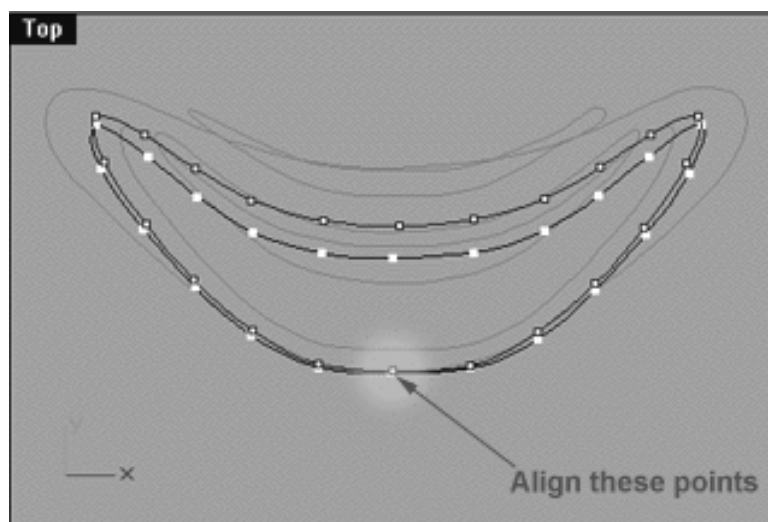
- Turn off any currently displayed edit points.

- Your monitor should now resemble the following screenshot:



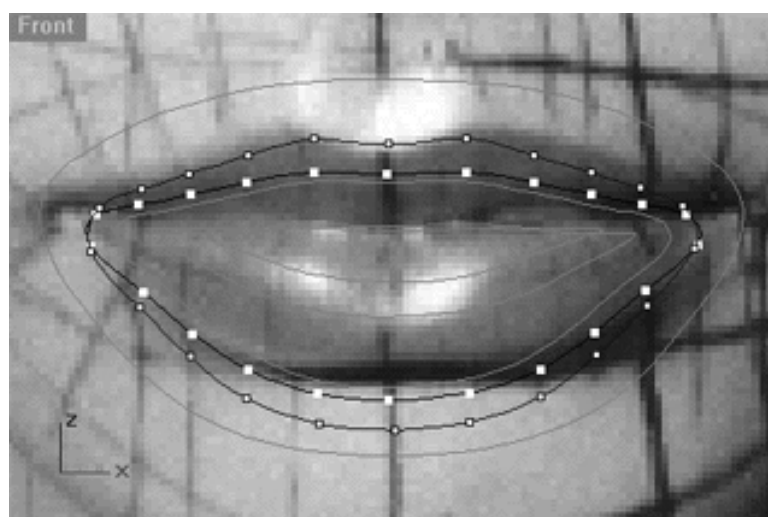
This **All Viewport** screenshot shows some of the main curves we will be working with during this lesson.

- Hold down the Ctrl key and left click on (Mouth\_Curve\_Guide\_03) and (Nu\_Mouth\_Curve\_03) -- they will both highlight.
- Display the edit points for both curves by choosing the Edit Points On icon  and left clicking.
- Maximise the Right Viewport.
- Type: Lasso at the command line, the system will respond with the following prompt: click or drag left mouse button to lasso - press Enter to select points:
- In the Right Viewport carefully draw a circle around (Nu\_Mouth\_Curve\_03) and all of its displayed points (WARNING -- don't include any of the points on the guide curve by mistake) closing the circle at the ends, when you've done so press Enter to complete the operation -- all of the points on the curve should highlight.
- Minimise the Right Viewport.
- Maximise the Top Viewport.
- Hold down the Shift key and in the Top Viewport move (Nu\_Mouth\_Curve\_03) and all its displayed points along the Y axis until the point at the 12 o'clock position is roughly aligned with its sister on the guide curve. Your monitor should now resemble the following screenshot:

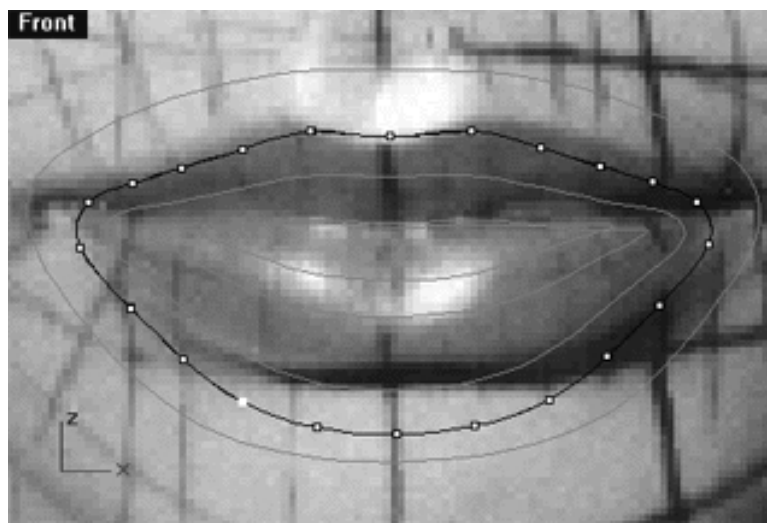


This **Top Viewport** screenshot shows that all the points along the curve entitled (Nu\_Mouth\_Curve\_03) have now been moved along the Y axis. Observe how the points at roughly the 12 o'clock position on (Nu\_Mouth\_Curve\_03) and on the guide (Mouth\_Curve\_Guide\_03) are now in alignment with each other.

- Right click on the Layer Info box at the lower status bar -- the Edit Layers dialogue will appear.
- LOCK the layer entitled: Mouth\_Curve\_Guide\_03, press OK to exit.
- Minimise the Top Viewport.
- Maximise the Front Viewport by double left clicking on its label.
- Now move each of the points on (Nu\_Mouth\_Curve\_03) into alignment with their sister points on (Mouth\_Curve\_Guide\_03), zoom and pan the view as required.
- See the following screenshots:

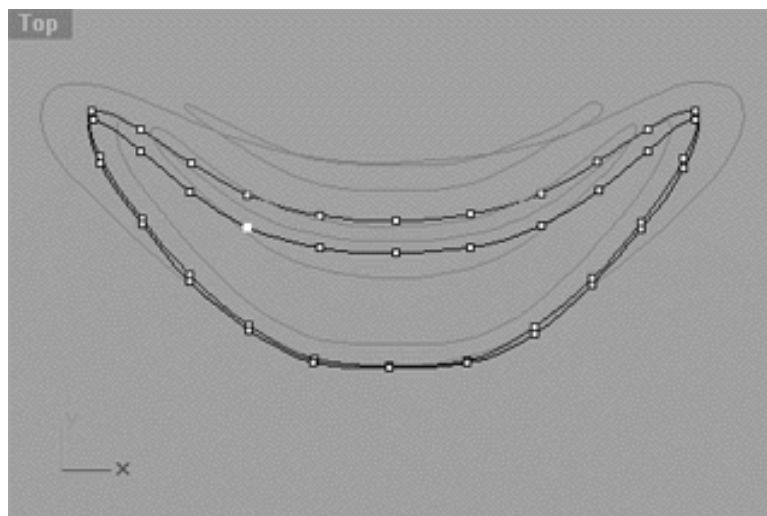


This **Front Viewport** screenshot shows how your monitor should look before moving the points.

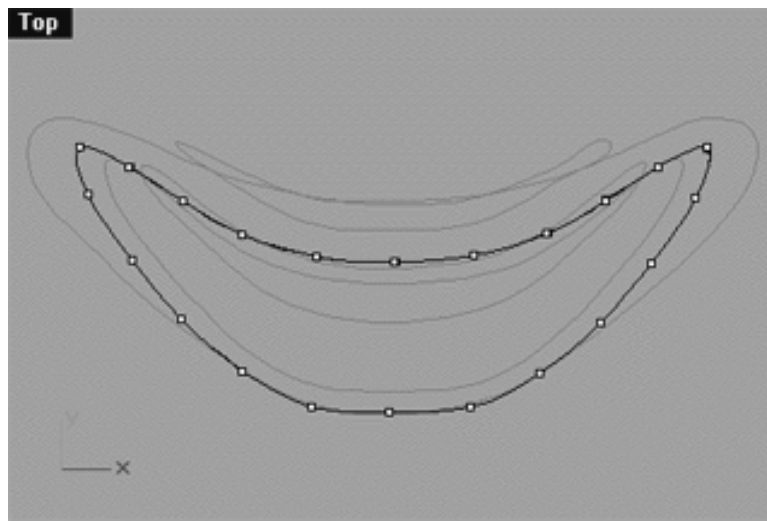


*This **Front Viewport** screenshot shows how your monitor should look after moving the points.*

- Switch to the Top Viewport and maximise it by double left clicking on its label.
- Now whilst holding down the Shift key, one by one, move each of the points on the top and bottom of the curve along the Y axis until they have been aligned with their sister points on the guide. Zoom and pan the view as required.
- See the following screenshots:



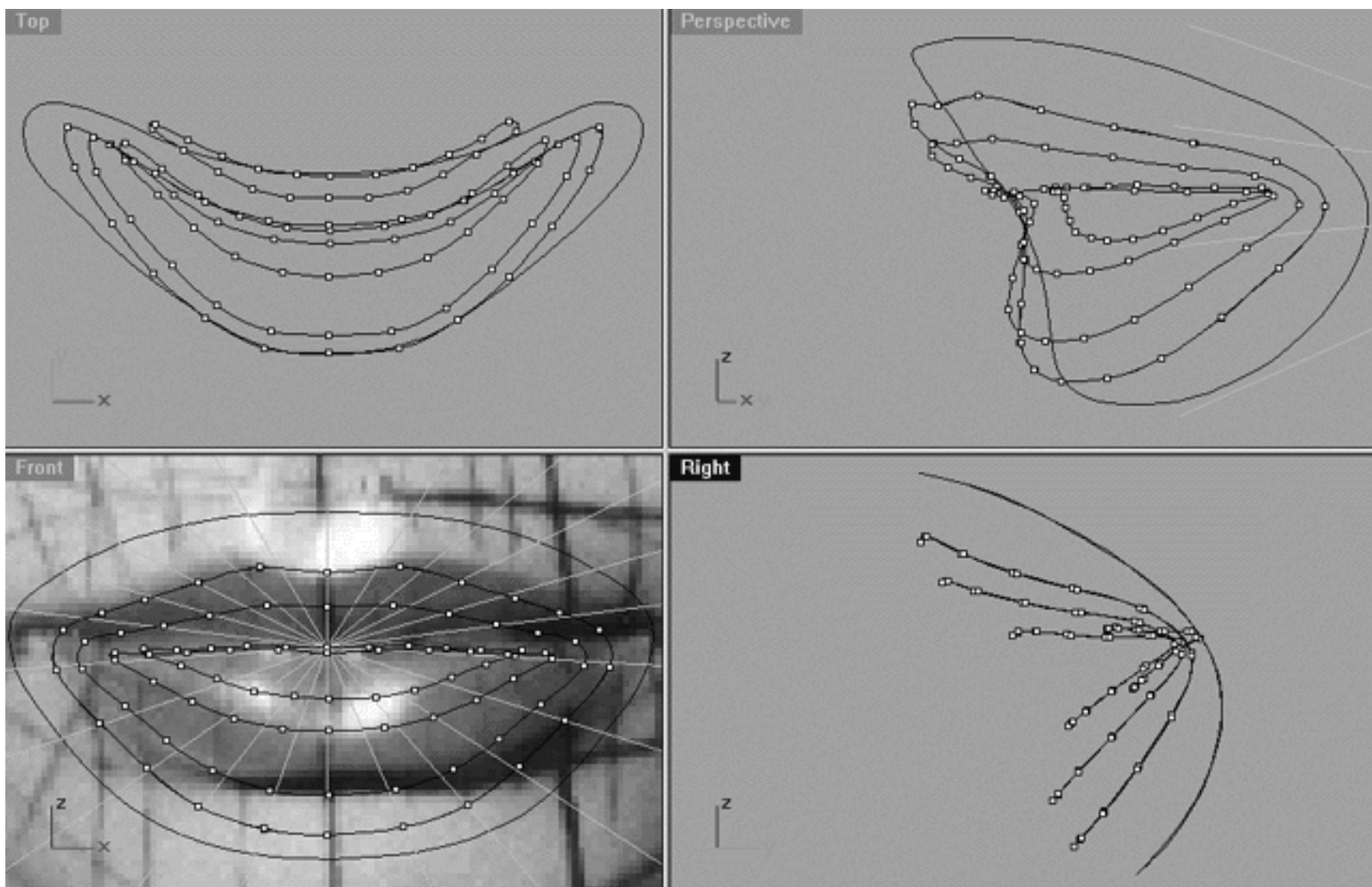
*This **Top Viewport** screenshot shows how your monitor should look before moving the points.*



*This **Top Viewport** screenshot shows how your monitor should look after moving the points.*

- Switch to the Right Viewport and maximise it by double left clicking on its label, then zoom in very tightly.
- Carefully check the points and refine any misalignment you might find in this view.
- Once done, minimise the Right Viewport.
- At the command line type: Unlock -- all currently locked curves should become visible once again.
- Carefully select all the curves with the exception of (Nu\_Mouth\_Curve\_01) and display their edit points.
- Your monitor should now resemble the following screenshot:





This **All Viewport** screenshot shows (as viewed from the outside in) the outer mouth curve (Nu\_Mouth\_Curve\_01), the lip curve (Nu\_Mouth\_Curve\_03) now edited so that its points lie directly on top of sisters on (Mouth\_Curve\_Guide\_03), the lip curve (Nu\_Mouth\_Curve\_04), the inner lip curve (Nu\_Mouth\_Curve\_05) and the inner mouth curve (Nu\_Mouth\_Curve\_06). **\*Note** the background image in the Right viewport has been temporarily turned off for purposes of clarity. In addition, the gold guide isoparms (as seen in the Front viewport) have been turned on in order to better depict the relationships between the points on the curves. Don't worry if some of the points don't quite seem to be lining up with these curves, they're not supposed to. These curves only a guide to help you visualise point placement, so don't panic.

Take some time to study the relationships between the points, especially in the Top and Front viewports. Also, notice how the curve have been placed in relationship each other in the Right viewport.

## Shutting Down the Scene

If you plan on continuing immediately to the next lesson then you can skip this procedure, however, we do recommend that you save your scene now anyway. In the event that you wish to take a break and continue working later, than please perform the following procedure:

- Save the file.
- Unhide any objects that may no longer be visible. Type the command: Show at the command line and press Enter.

- Unlock any currently locked curves by typing the command: Unlock at the command line and pressing Enter.
- Turn off any edit points that may currently be displayed.
- Open the Edit Layers dialogue box and...
- Turn ON the layer entitled: SCENE START UP and make it the active layer.
- Turn ON the layer entitled: Photopoints.
- Turn OFF the layer entitled: Nu\_Mouth\_Curve\_01.
- Turn OFF the layer entitled: Nu\_Mouth\_Curve\_06.
- Turn OFF the layer entitled: Nu\_Mouth\_Curve\_05.
- Turn OFF the layer entitled: Nu\_Mouth\_Curve\_04.
- Turn OFF the layer entitled: Nu\_Mouth\_Curve\_03.
- Turn OFF the layer entitled: Mouth\_Curve\_Guide\_03.
- Turn OFF the layer entitled: Mouth\_Guides\_01.
- With the exception of those mentioned, all other layers should be set to OFF.
- Press OK to complete the operation and exit.
- Perform a ZoomExtentsAll.
- SAVE THE FILE.

---

Go to the [NEXT PART](#)

RETURN to the Top of Page -- [Click Here](#)

Written by Joseph R. Saltzman.

Co-produced in association with Steven Ståhlberg  
©1998-1999 Cinemagic Productions Limited. All Rights Reserved.

Duplication of this document including images and text by any means is expressly forbidden without prior written consent of Cinemagic Productions Limited.  
Web Site: <http://www.cmagic.co.uk> Telephone: +44 (0)1753 733 190 Fax: +44 (0)1753 736 619 email: [cmagic@cmagic.co.uk](mailto:cmagic@cmagic.co.uk)

**RETURN** to previous page -- [Click Here](#)




## THE MOUTH PART EIGHT


### Contents:

- [Scene Setup](#)
- [The 2nd Mouth Curve -- The Lip Crest](#)
- [Loft Them Lips](#)
- [Summary](#)
- [Shutting Down the Scene](#)

---



## Scene Setup



- If you've not done so already start a Rhinoceros session by **double clicking** on the desktop icon  the application will begin.
- Choose File, Open from the menu bar and double click on **START\_A.3DM** in the file list, it will load and open.
- Confirm at the Lower Status Bar the currently active layer is entitled SCENE START UP. If it is active proceed to the next step, if it's not then make it active by left clicking on the layer box, highlighting the correct layer and clicking on it.
- Again, at the Layers Box on the Lower Status Bar this time right click on the box, the Edit Layers Dialogue box will open. Confirm the following switches have been enabled or disabled:
  - The Layer entitled Photopoints should be OFF.
  - The Layer entitled SCENE START UP should be ON.
  - The Layer entitled Nu\_Mouth\_Curve\_01 should be ON.
  - The Layer entitled Nu\_Mouth\_Curve\_06 should be ON.
  - The Layer entitled Nu\_Mouth\_Curve\_05 should be ON.

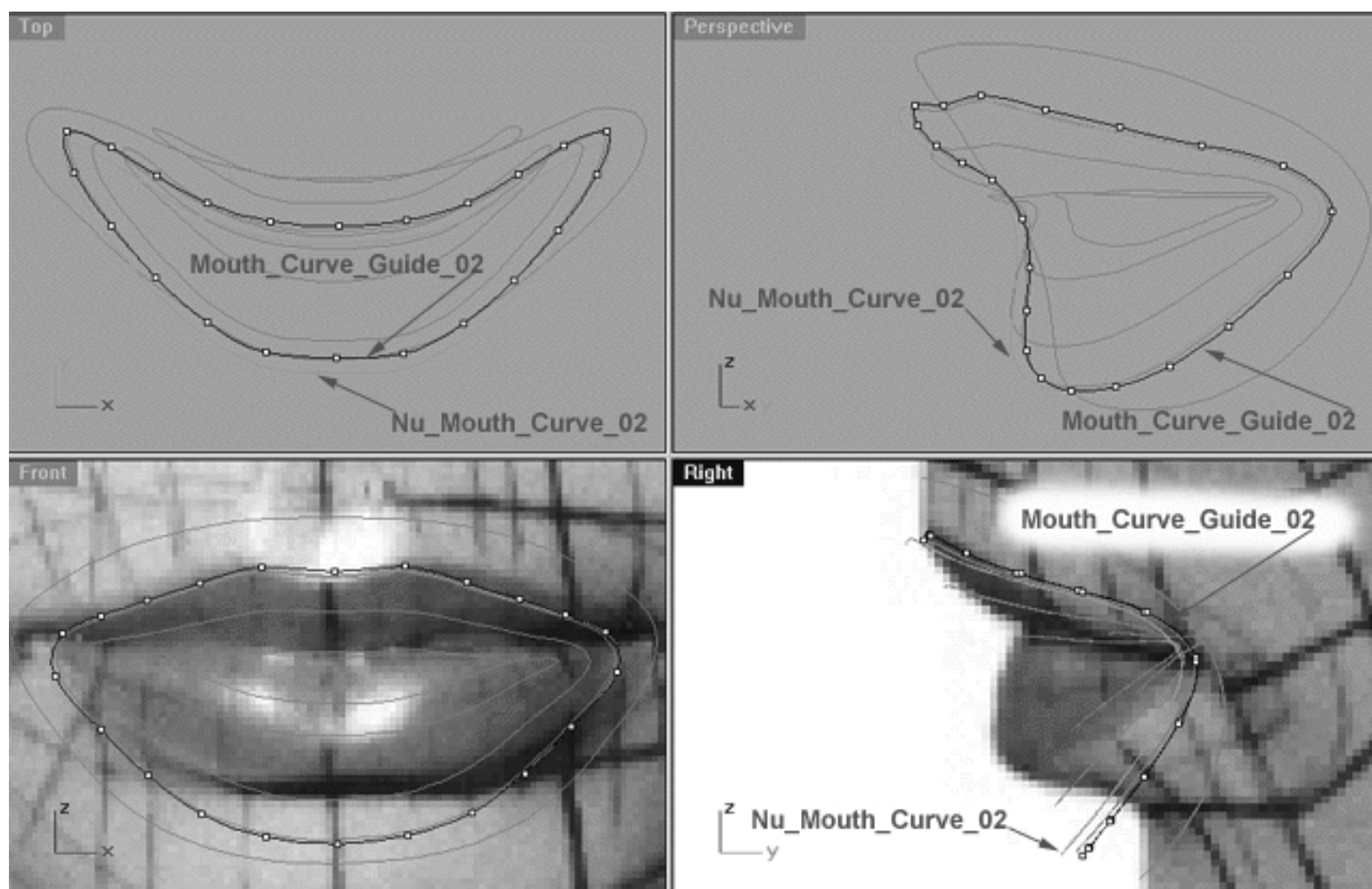
- The Layer entitled Nu\_Mouth\_Curve\_04 should be ON.
- The Layer entitled Nu\_Mouth\_Curve\_03 should be ON.
- The Layer entitled Mouth\_Curve\_Guide\_02 should be ON.
- The Layer entitled Mouth\_Guides\_01 should be LOCKED.
- With the exception of those mentioned, ALL other layers should be set to OFF.
- When you've finished making your changes ( if any ) click on OK.
- Confirm that you can see the background image in the Front and Right viewports.
- Confirm that the grid display in the viewports has been disabled, if not turn it off now.
- Confirm that no Osnaps are currently enabled, if any are disable them.
- Confirm that no edit points are currently displayed, if any are hide them.
- Reset all the viewports by selecting the Zoom Extents All icon  or by typing the command: **ZoomExtentsAll** at the command line and pressing ENTER.
- Zoom each view as required.

---



## The 2nd Mouth Curve -- The Lip Crest

- Right click on the Layer Info box at the lower status bar -- the Edit Layers dialogue will appear.
- Create a new layer entitled: (Nu\_Mouth\_Curve\_02), click on the New button and type: (Nu\_Mouth\_Curve\_02) in the field, make the colour Orange and then click OK to complete the operation.
- Make the new layer active by left clicking on the Layer Info box, highlight the item in the list and left click again to exit.
- If you've not done so already, turn off all edit points, choose the Edit Points Off icon  from the toolbar and right click.
- Maximise the Front Viewport.
- Select (Mouth\_Curve\_Guide\_02) by left clicking on it.
- Display its edit points by choosing the Edit Points On icon  from the toolbar and left clicking.

- Hold down the Ctrl key and select all the mouth curves with the exception of (Nu\_Mouth\_Curve\_03) -- they will highlight. Then type: **Lock** at the command line and press Enter to complete the operation.
- Make a copy of the lip curve (Nu\_Mouth\_Curve\_03). To do this choose the copy icon  from the toolbar, left click and then press Enter. The system will respond with the following prompt at the command line: Select objects to copy:
- In the Front Viewport, select the lip curve by left clicking on it (Nu\_Mouth\_Curve\_03) -- it will highlight. The system will respond with the following prompt at the command line: Point to copy from ( Vertical InPlace ):
- Type IN and press Enter to complete the operation.
- The lip curve should still be highlighted, if not, select the correct curve when presented with the Choose One Object dialogue, (which in this case is #2 of 2).
- Now choose the Scale icon  by left clicking on it, the system will respond with the following prompt at the command line: **Origin point (copy):**
- In the **Front Viewport** move your cursor into roughly the dead centre of the curve and left click.
- The system will respond with the following prompt at the command line: **Scale factor or first reference point ( copy ):**
- Hold down the Shift key and move your cursor outward along the X axis until you reach the side of the curve, when you do left click.
- Now while still holding down the Shift key move your cursor in the same direction (outward) along the X axis until the curve has grown to about the same size as the guide (Mouth\_Curve\_Guide\_02), when you've done this, left click again to complete the operation.
- Select the mouth curve (Nu\_Mouth\_Curve\_03) by left clicking on it -- it will highlight. Then type: **Lock** at the command line.
- Confirm that the new mouth curve (Nu\_Mouth\_Curve\_02) has been associated with its layer and if not, do so now.
- Minimise the Front Viewport.
- Your monitor should now resemble the following screenshot:

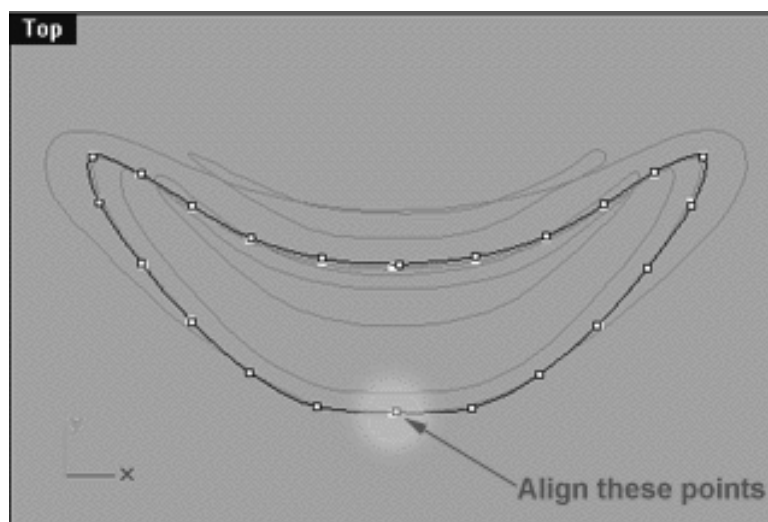


*This **All Viewport** screenshot shows the main curves that we will be working with during this lesson.*

- Select (Nu\_Mouth\_Curve\_02) by left clicking on it -- it will highlight.
- Hold down the Shift key and in the **Right Viewport** move the curve along the Y axis and well away from (Mouth\_Curve\_Guide\_02).
- Temporarily turn off the background image in the **Right Viewport** by typing the command: **HideBackgroundBitmap** at the command line, this will make it easier to see what you're doing.
- Turn off all edit points by choosing the Edit Points Off icon  and right clicking.
- Hold down the Ctrl key and in the Right Viewport left click on (Mouth\_Curve\_Guide\_02) and (Nu\_Mouth\_Curve\_02) -- they will both highlight.
- Display the edit points for both curves by choosing the Edit Points On icon  and left clicking.
- Type: Lasso at the command line, the system will respond with the following prompt: **click or drag left mouse button to lasso - press Enter to select points:**

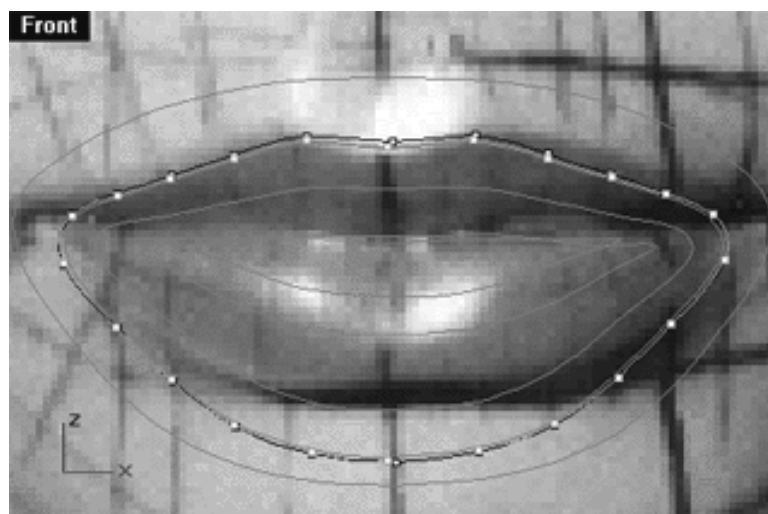


- In the Right Viewport carefully draw a circle around (Nu\_Mouth\_Curve\_02) and all of its displayed points (WARNING -- don't include any of the points on the guide curve by mistake) closing the circle at the ends, when you've done so press Enter to complete the operation -- all of the points on the curve should highlight.
- Hold down the Shift key and in the **Top Viewport** move (Nu\_Mouth\_Curve\_02) and all its displayed points along the Y axis until the point at the 12 o'clock position is roughly aligned with its sister on the guide curve. Your monitor should now resemble the following screenshot:

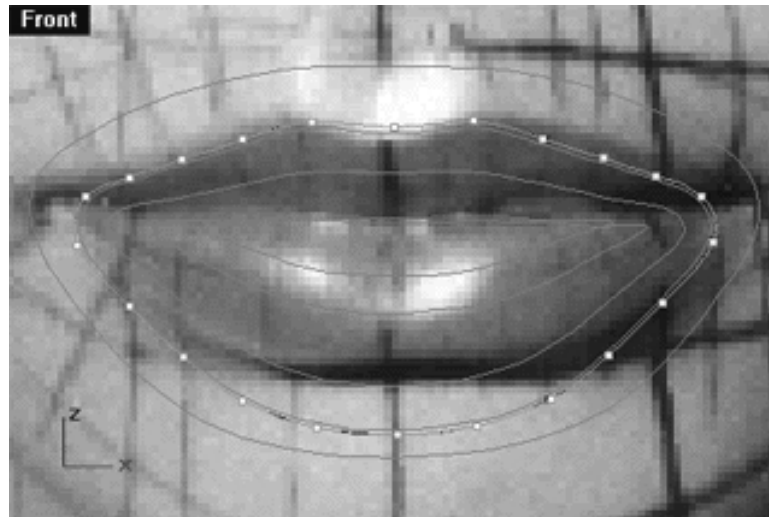


*This **Top Viewport** screenshot shows that all the points along the curve entitled (Nu\_Mouth\_Curve\_02) have now been moved along the Y axis. Observe how the points at roughly the 12 o'clock position on (Nu\_Mouth\_Curve\_02) and on the guide (Mouth\_Curve\_Guide\_02) are now in alignment with each other.*

- Right click on the Layer Info box at the lower status bar -- the Edit Layers dialogue will appear.
- LOCK the layer entitled: Mouth\_Curve\_Guide\_02, press OK to exit.
- Maximise the **Front Viewport** by double left clicking on its label.
- Now move each of the points on (Nu\_Mouth\_Curve\_02) into alignment with their sister points on (Mouth\_Curve\_Guide\_02), zoom and pan as required.
- See the following screenshots:



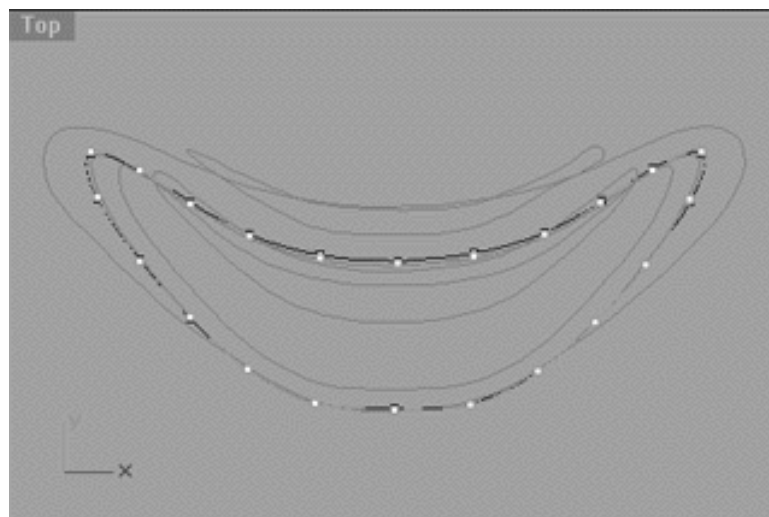
This **Front Viewport** screenshot shows how your monitor should look before moving the points.



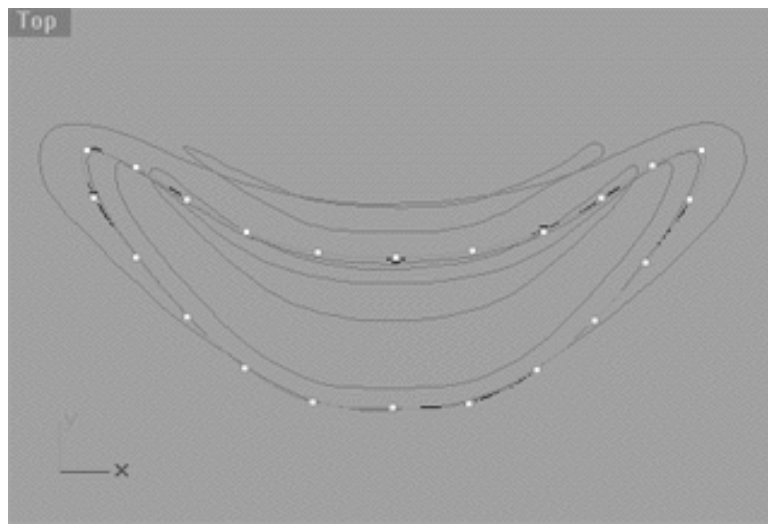
This **Front Viewport** screenshot shows how your monitor should look after moving the points.

**NOTE** -- Since all the points are in very close proximity to each other to begin with, you should only have to move each point a minor amount.

- Switch to the **Top Viewport** and maximise it by double left clicking on its label.
- Now whilst holding down the Shift key, one by one, move each of the points along the top and bottom row of the curve into alignment with their sister points on the guide. Zoom and pan the view as required.
- See the following screenshots:

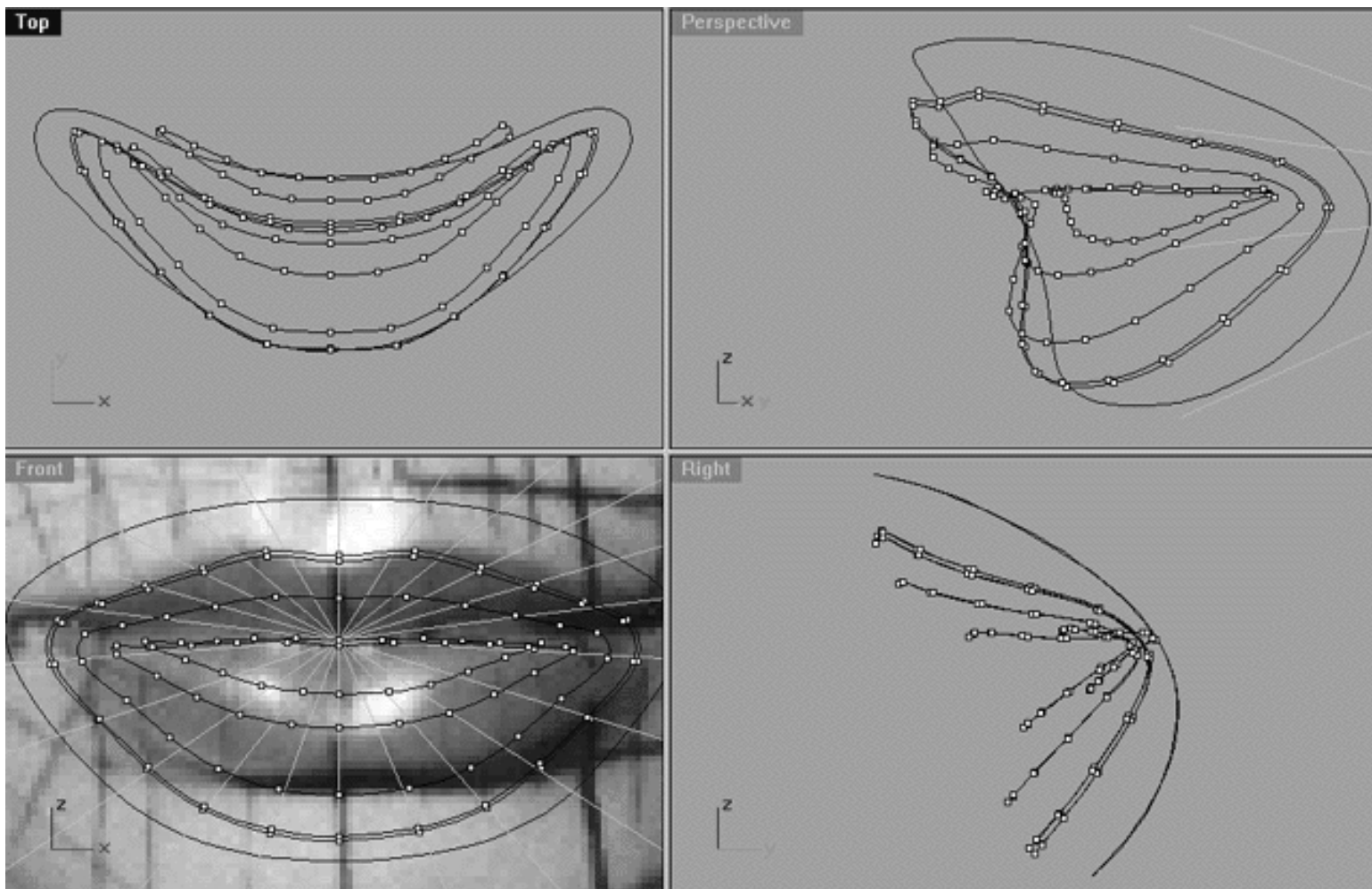


This **Top Viewport** screenshot shows how your monitor should look before moving the points.



*This **Top Viewport** screenshot shows how your monitor should look after moving the points.*

- Switch to the **Right Viewport** and maximise it by double left clicking on its label.
- Zoom in tightly and carefully check the points, refining any misalignment you might find in this view.
- Once done, minimise the Right Viewport.
- At the command line type: Unlock -- all currently locked curves should become visible once again.
- Select all the curves with the exception of (Nu\_Mouth\_Curve\_01) and display their edit points.
- Your monitor should now resemble the following screenshot:




This **All Viewport** screenshot above shows (as viewed from the outside in) the outer mouth curve (Nu\_Mouth\_Curve\_01), the lip curve crest (Nu\_Mouth\_Curve\_02) now edited so that its points lie directly on top of sisters on (Mouth\_Curve\_Guide\_02), the lip curve (Nu\_Mouth\_Curve\_03), (Nu\_Mouth\_Curve\_04), the inner lip curve (Nu\_Mouth\_Curve\_05) and the inner mouth curve (Nu\_Mouth\_Curve\_06). \*Note the background image in the Right viewport has been temporarily turned off for purposes of clarity.

Again, take some time to study the relationships between the points, especially in the Top and Front viewports. Also, notice how the curve have been placed in relationship each other in the Right viewport.

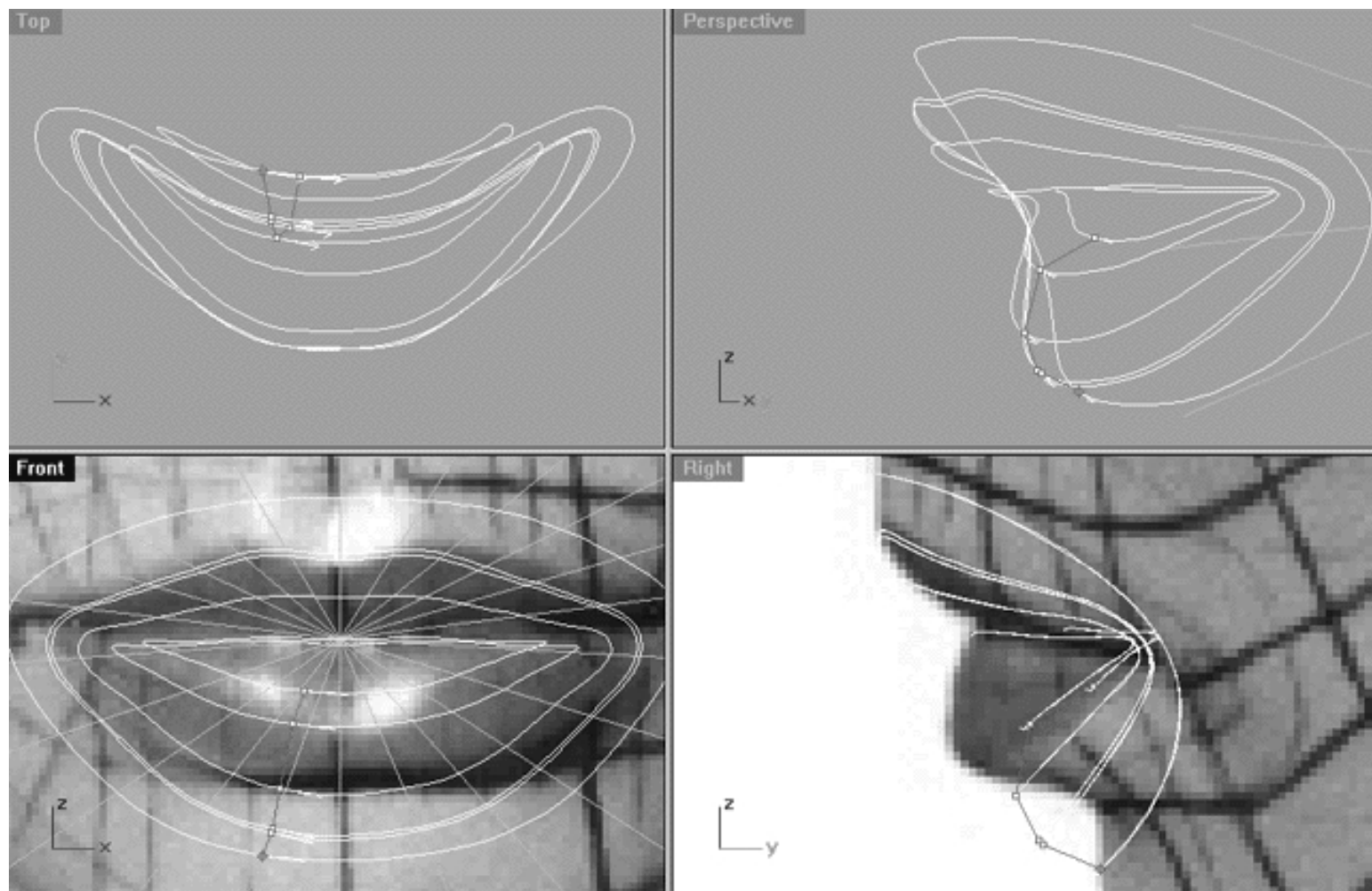
## Loft Them Lips

All that remains now for us to do is to create a surface by lofting up all the curves for the mouth / lips that we've just created.

- Confirm that the background images can be seen in the **Front and Right Viewports**. In the event that either have been hidden, click in the applicable viewport to make it active, then type the command: ShowBackgroundBitmap at the command line and press Enter -- this will restore the background image.
- Confirm that none of the mouth curves are currently ghosted / locked.
- Confirm that the gold guide isoparms (Mouth\_Guides\_01) have been LOCKED.
- Confirm that (Mouth\_Curve\_Guide\_02) has been turned OFF, if not, turn it off now.

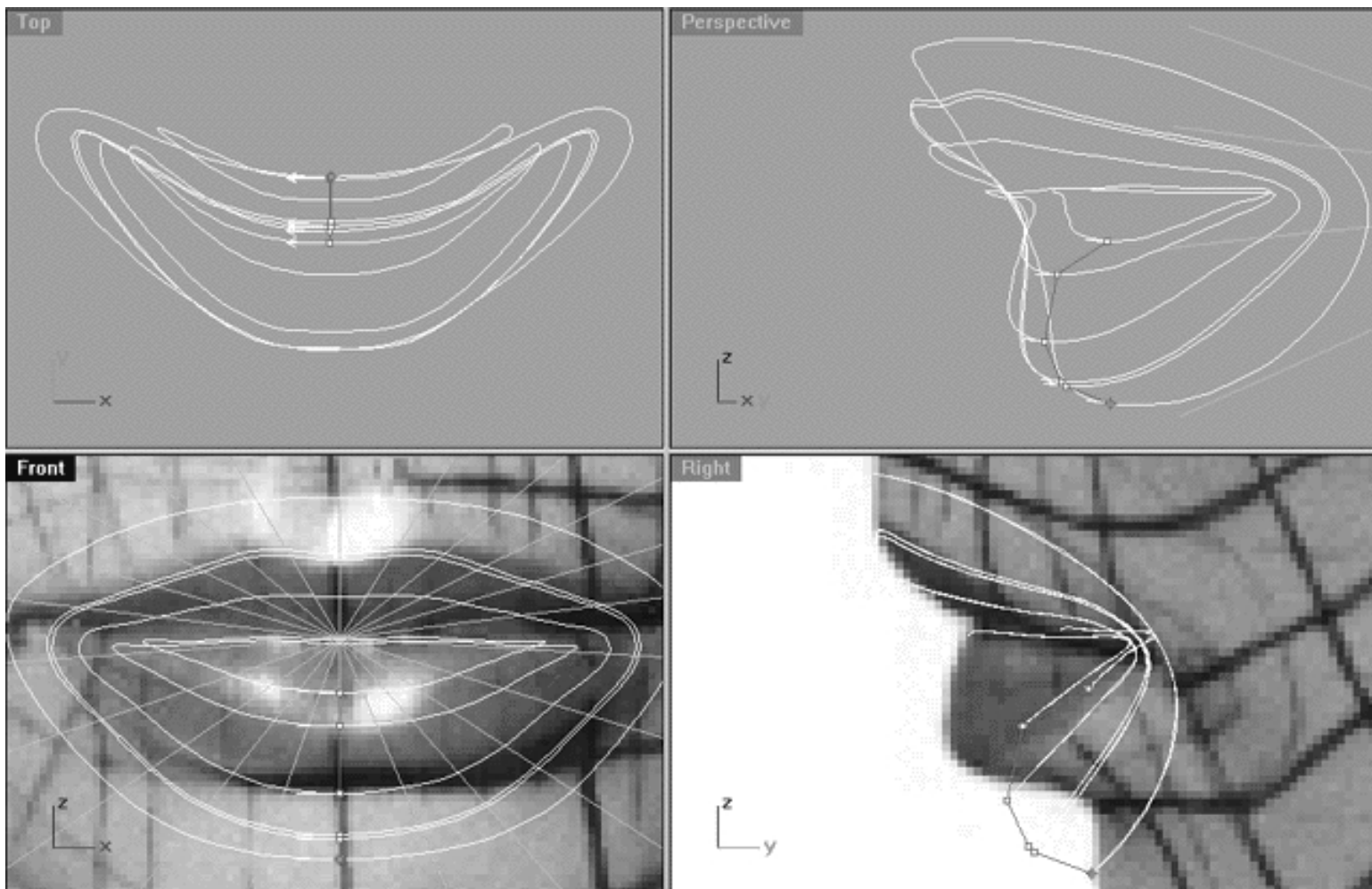
- Double check that each of the mouth curves have in fact been associated with the correct layer. It's a good idea to select each curve and reassign them one by one to their correct respective layers.
- Open the Edit Layers dialogue box and create a new layer entitled: Mouth\_Surface\_EX, set the colour to a nice bright magenta and press OK to exit.
- Make the new layer Mouth\_Surface\_EX active.
- Select the loft icon  from the toolbar or type the command: Loft at the command line and press Enter.
- The system will respond with the following prompt at the command line: **Select curves to loft ( point ):**
- Now begin in the Front Viewport by clicking on innermost mouth curve at the 6 o'clock position. When you do the curve will highlight and the system will respond with the following prompt at the command line: **Select curves to loft ( point ):**
- Proceed to the next curve and click again at the 6 o'clock position -- continue this procedure for all the remaining mouth curves.
- When you've finished selecting the last curve, press Enter.
- A loft sync indicator will appear that will connect each of the curves with arrows at each node showing the seam and direction of the curve. All of the arrows should be pointing in the same direction. If they are not, select the node with the offending arrow and left click, then type the command: **Flip** and press Enter. Once all the arrows are pointing in the right direction you must next "align" the sync indicator. See the following screenshot:





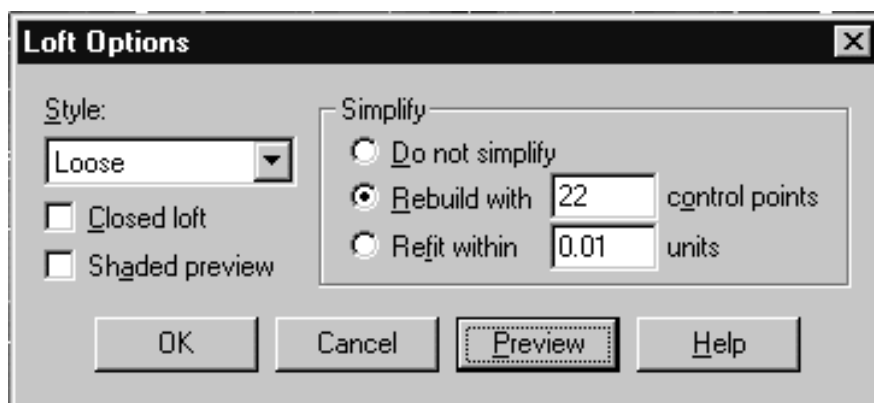
*This **All Viewport** screenshot shows the loft sync indicator prior to alignment.*





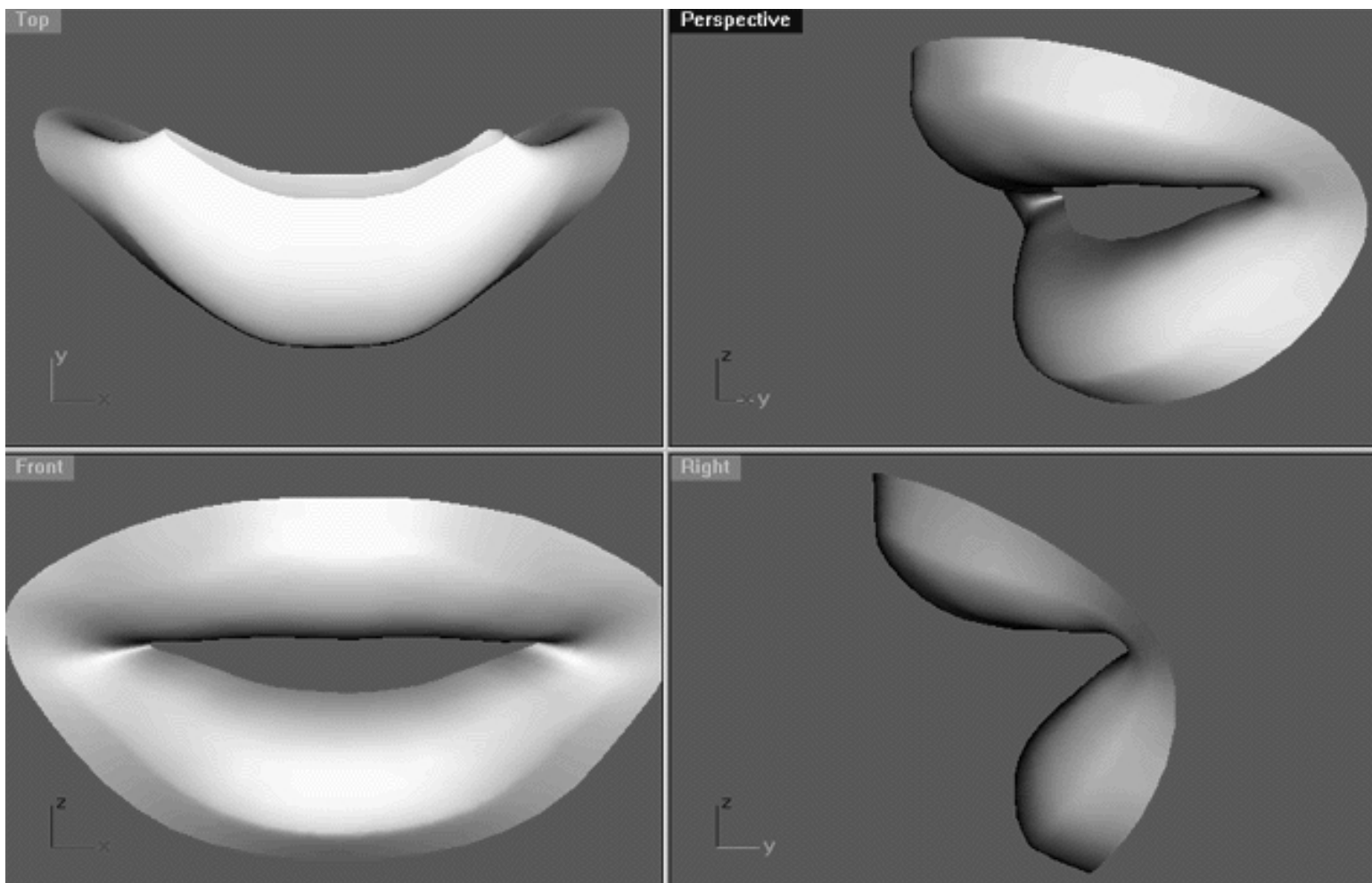
This **All Viewport** screenshot shows the loft sync indicator after alignment. Notice how all the arrows are now headed in a clockwise direction and the indicator is now straight.

- To change the alignment of the loft sync indicator just click on the node you wish to adjust and slide it into position along the curve, when you reach the correct location just click again to set.
- When all the curves are headed in the same direction and the sync indicator has been aligned correctly press ENTER to complete the loft operation.
- The Loft Options dialogue box will appear, set the options as in the following screenshot:



This screenshot shows the parameters that should be set within the Loft Options dialogue box.

Your monitor should resemble the following screenshot:



*This **All Viewport** screenshot shows the final result of lofting all 6 mouth curves and the surface that has been created by doing so.*

After lofting you may notice that the surface is not exactly perfect and may contain some minor ripples or skewing of the isoparms. Don't worry, this situation is quite common and something that you should expect will happen when lofting a series of closed curves. In order to correct any minor imperfections you may find in the surface you will have to further refine edit points on the curves that you've just lofted. In other words, pick a location where the surface is not quite right, then adjust the points on the individual curves (not the surface) in that area. I suggest you do this in the Front Viewport and slide the offending point just a bit to either the right or the left. Then either hide or delete the original surface, perform a test loft and see if any improvement has been made.

---

## Summary

During this lesson you've seen just how easily 6 simple closed curves can be edited to create a visually appealing and geometrically efficient human mouth.

---

# Shutting Down the Scene

If you plan on continuing immediately to the next lesson then you can skip this procedure, however, we do recommend that you save your scene now anyway.

In the event that you wish to take a break and continue working later, than please perform the following procedure:

- Save the file.
- Unhide any objects that may no longer be visible. Type the command: Show at the command line and press Enter.
- Unlock any currently locked curves by typing the command: Unlock at the command line and pressing Enter.
- Turn off any edit points that may currently be displayed.
- Open the Edit Layers dialogue box and...
- Turn ON the layer entitled: SCENE START UP and make it the active layer.
- Turn ON the layer entitled: Photopoints.
- Turn OFF the layer entitled: Nu\_Mouth\_Curve\_01.
- Turn OFF the layer entitled: Nu\_Mouth\_Curve\_06.
- Turn OFF the layer entitled: Nu\_Mouth\_Curve\_05.
- Turn OFF the layer entitled: Nu\_Mouth\_Curve\_04.
- Turn OFF the layer entitled: Nu\_Mouth\_Curve\_03.
- Turn OFF the layer entitled: Nu\_Mouth\_Curve\_02.
- Turn OFF the layer entitled: Mouth\_Curve\_Guide\_02.
- Turn OFF the layer entitled: Mouth\_Guides\_01.
- Turn OFF the layer entitled: Mouth\_Surface\_EX.

- With the exception of those mentioned, all other layers should be set to OFF.
  - Press OK to complete the operation and exit.
  - Perform a ZoomExtentsAll.
  - SAVE THE FILE.
- 

Go to the [NEXT LESSON](#)

RETURN to the Top of Page -- [Click Here](#)

Written by Joseph R. Saltzman.

Co-produced in association with Steven Ståhlberg

©1998-1999 Cinemagic Productions Limited. All Rights Reserved.

Duplication of this document including images and text by any means is expressly forbidden without prior written consent of Cinemagic Productions Limited.

Web Site: <http://www.cmagic.co.uk> Telephone: +44 (0)1753 733 190 Fax: +44 (0)1753 736 619 email: [cmagic@cmagic.co.uk](mailto:cmagic@cmagic.co.uk)

**RETURN** to previous page -- [Click Here](#)

**GOTO** the NEXT LESSON



# REPARAMETERISATION


## Contents:


- [Scene Setup](#)
- [The Urge to Merge](#)
- [Projecting the Right Image](#)
- [There Is Always a Catch](#)
- [Synchronization and Reduction](#)
- [Curve Direction and Alignment](#)
- [Final Rebuild](#)
- [Summary](#)
- [Shutting Down the Scene](#)

## Scene Setup

Before you do anything, please be aware that this is a lengthy section of the tutorial that is both complex and rather confusing. There are quite a few places where things could go very wrong, so to prevent the worst from happening we strongly recommend that you make a backup file of your current Rhino scene. This way if disaster strikes you can always get back to this starting point easily. This will only take a few moments, however, failure to do this could mean having to start ALL over again.



- If you've not done so already start a Rhinoceros session by **double clicking** on the desktop icon  the application will begin.
- Choose File, Open from the menu bar and double click on **START\_A.3DM** in the file list, it will load and open.
- Confirm at the Lower Status Bar the currently active layer is entitled SCENE START UP. If it is active proceed to the next step, if it's not then make it active by left clicking on the layer box, highlighting the correct layer and clicking on it.
- Again, at the Layers Box on the Lower Status Bar this time right click on the box, the Edit Layers Dialogue box will open. Confirm the following switches have been enabled or disabled:

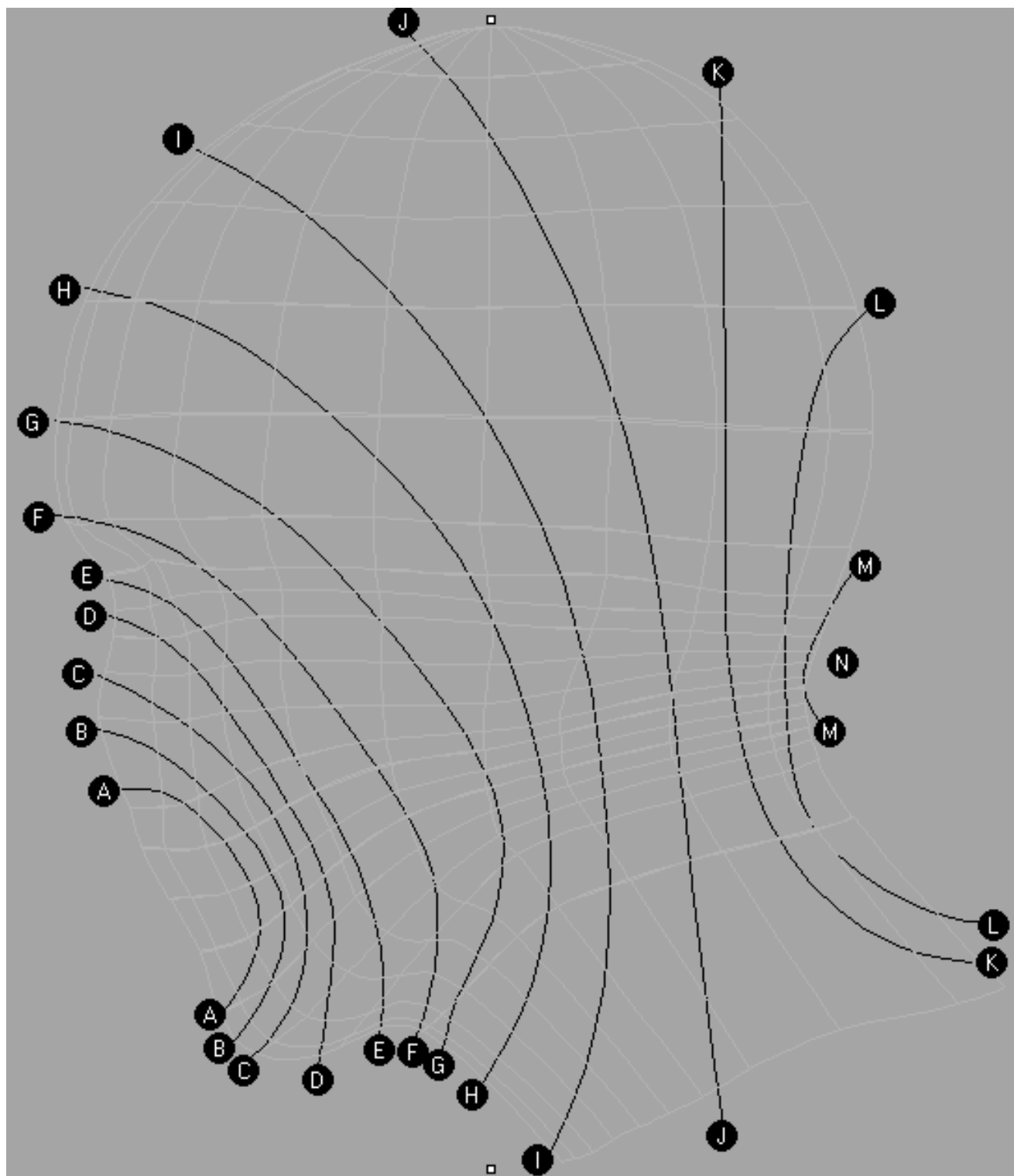
- The Layer entitled Photopoints should be ON.
- The Layer entitled SCENE START UP should be LOCKED.
- The Layer entitled Secondary\_Surf should be ON.
- The Layer entitled COS\_v2\_Guides should be LOCKED.
- With the exception of those mentioned, ALL other layers should be set to OFF.
- When you've finished making your changes ( if any ) click on OK.
- Confirm that you can see the background image in the Front and Right viewports.
- Confirm that the grid display in the viewports has been disabled, if not turn it off now.
- Confirm that no Osnaps are currently enabled, if any are disable them.
- Confirm that no edit points are currently displayed, if any are hide them.
- Reset all the viewports by selecting the Zoom Extents All icon  or by typing the command: **ZoomExtentsAll** at the command line and pressing ENTER.
- Zoom each view as required.

## The Urge to Merge

Now it's time to start converting our north/south pole head model into a new front/back radial one. Of course you could have started off the entire modelling process going immediately to the front/back type, but I think it's much easier to get the basic head shape correct if you start with a north/south pole surface, this way the final surface gets a smoother, more "sophisticated" parameterisation overall.

In the Right Viewport, we will draw curves that we will then project (in the same viewport) onto the existing head surface. To know how many curves to draw, we need to count about how many cv's are needed (minimum) to get the centre (profile) shape we require. Since we're looking for a **minimum**, we need to count on the side that is most complex, and that's obviously the front side of the face (remember we're going for one pole in the mouth, and one in the nape of the neck). At the same time, we're planning about where to put each curve, and how to shape it. The most important thing to concentrate on here is to make certain that curves are as evenly spaced as possible. This can best be done with pencil and paper. Note -- we will close up the back of the head/throat by scaling the last curve we create down to a near singularity (see point "N" in the following screenshot).






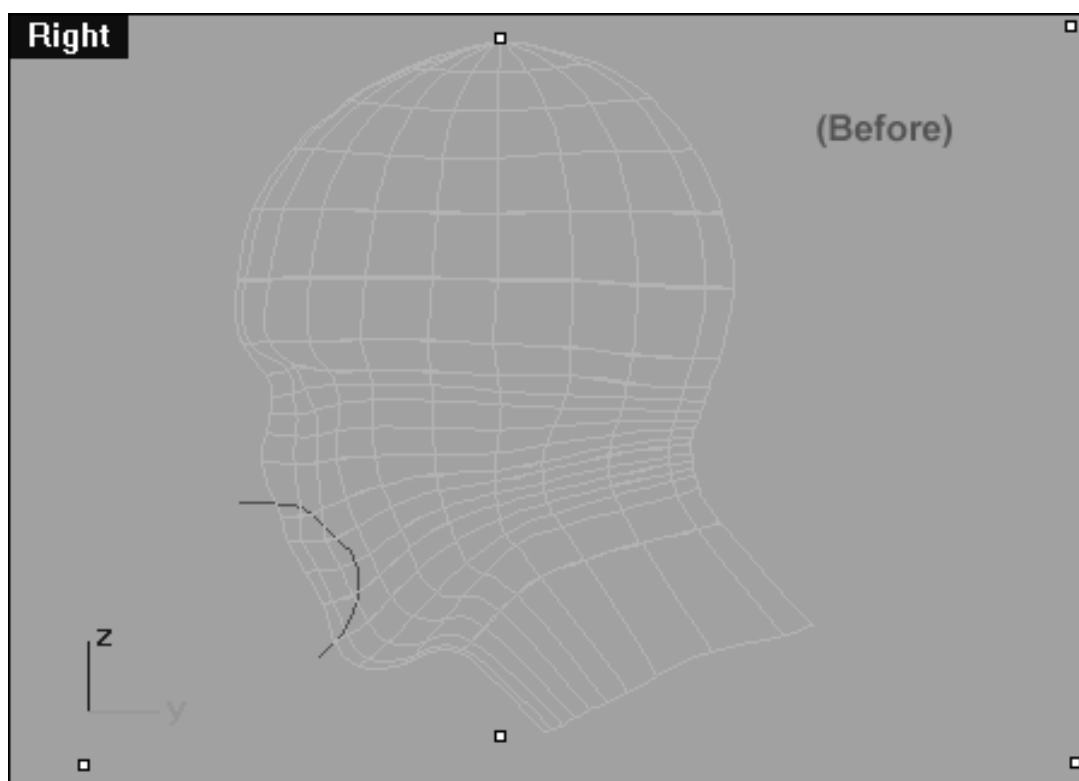
This **Right Viewport** screenshot shows a viable "layout" for converting the surface geometry from a north/south parameterisation head to a front/back type.

Achieving a good workable layout for your new radial curves is much more of an art than it is a science so a fair bit of trial and error can be expected. When you're thinking about your initial layout once again keep in mind the golden rule, that is, use as few curves as possible and keep them spaced as evenly as you can. Now you may look at the screenshot above and think "wait a minute, those curves don't look very evenly spaced to me" and you'd be right -- they are not particularly. That said, it's doubtful that you'll ever get them perfectly even, besides you want the layout of these curves to run in such a way that they transmit the important areas of contour into our new front/back model that you are now creating. For this reason you are naturally going to get areas where slight compression of the curves takes place, such as in the chin and neck area.

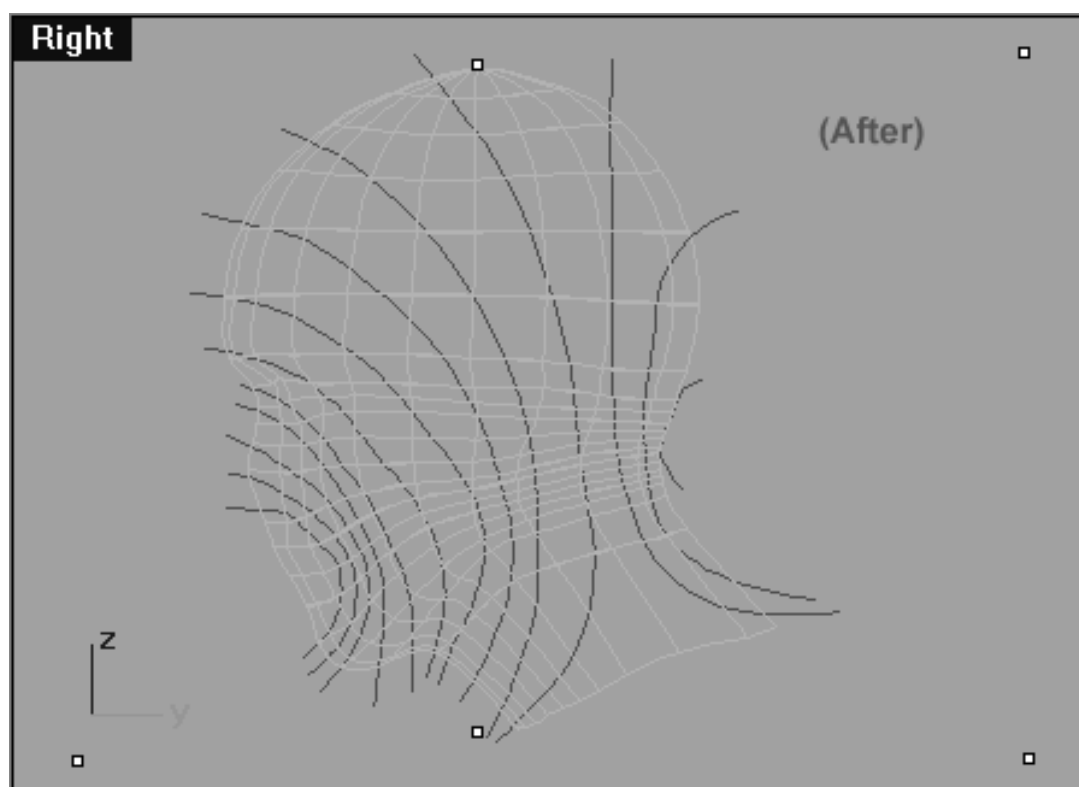
# Projecting the Right Image

Now that we've devised a cunning strategy for the layout of our new curves we must first actually create them and then secondly, project them upon our existing head surface -- so let's crack on...

- Open the Edit Layers dialogue, create a new layer entitled: COS and assign its colour to red.
- Make the new COS layer active.
- Maximize the **Right Viewport** if you've not done so already.
- Zoom and Pan the view as required.
- From the toolbar choose the Curve / Interpolate Points icon  and then in the **Right Viewport** create a new interpolated curve that follows the path "A" shown in the previous screenshot. It's a good idea to draw this curve starting on the nose side of the head and then working your way downward to the chin side. How many points should you use to draw this curve? Don't worry about it, it does not matter. Just use as many points as required to draw a curve so that will follow your layout. In this case drawing your curves is going to be easy because I've done all the work for you by creating guide curves to follow ( COS\_v2\_Guides). All you need do in order to create your new interpolated curve(s) is to "trace" over these guides. Of course this is a bit of a cheat and you will have to learn how to draw and place these curves the next time you create a head from scratch. Still, this should give you a good idea of how to go about doing it. Also, here is a tip -- It is a good idea when drawing the curves to place a point just before the edges of head surface to tack them down. Note -- You should begin to draw the curve well outside of the head surface, leaving a "head" and a "tail" so to speak -- see the following screenshot entitled: (Before).
- Once done, refer back to your layout guide and draw all the remaining interpolated curves (with the exception of the very last) so that they follow their correct paths "B" through "M" (just follow the guides). When you've finished your monitor should resemble the following screenshot entitled: (After).




This **Right Viewport** screenshot shows that an interpolated curve has now been created that follows our proposed layout path ("A") that we devised earlier. Note -- the guide curves have been turned off for reasons of clarity. Observe that a "head" and a "tail" have been left on curve that extend beyond the borders of the head surface.



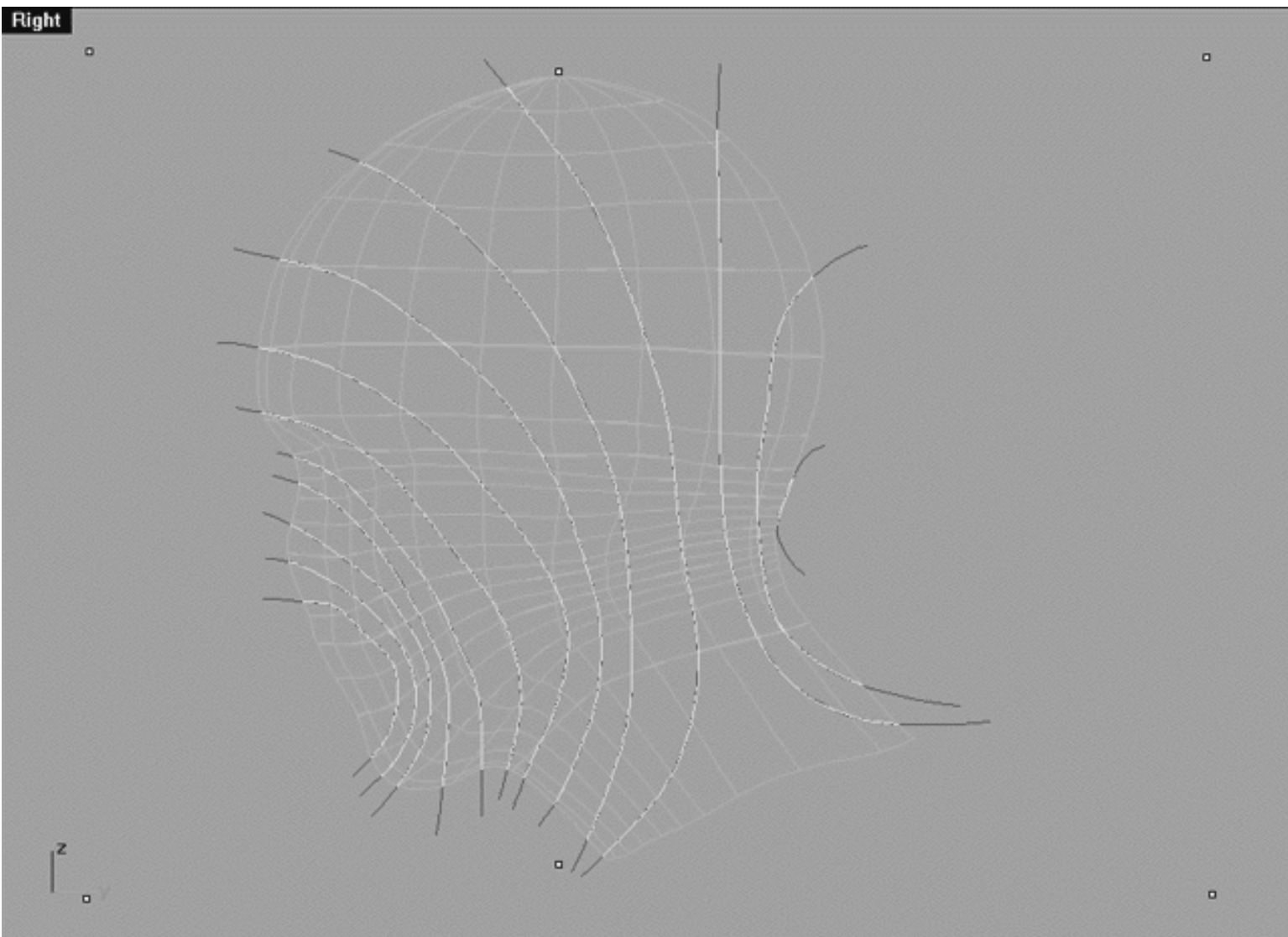
This **Right Viewport** screenshot shows that an interpolated curve has now been created that follows each of our proposed layout path ("A" through "M") that we devised earlier. Observe that a "head" and a "tail" has been left on every curve that extends beyond the borders of the head surface.

**Important:** Did you notice that the curve that should follow the layout path "J" (the curve closest to the north pole) has been drawn and placed differently than in our initial layout plan? The reason for this is simple, we can't place the curve so that it would run down the centre and exit the bottom of the neck because this would cause problems when projecting them. Remember, when projecting the curve needs a surface but the bottom of the neck has no surface it is open. Therefore, when projected the curve would stop at the bottom of the neck and effectively have a big hole in it which is not what we are after. So what we have to do is place the curves to either side, front or back in a logical manner which we've done above. Later on, once we've projected the curves we can move them so that will once again follow the layout plan as we had intended.

Okay now comes the fun and easy part, actually projecting the curves upon the surface -- here is how we do it.

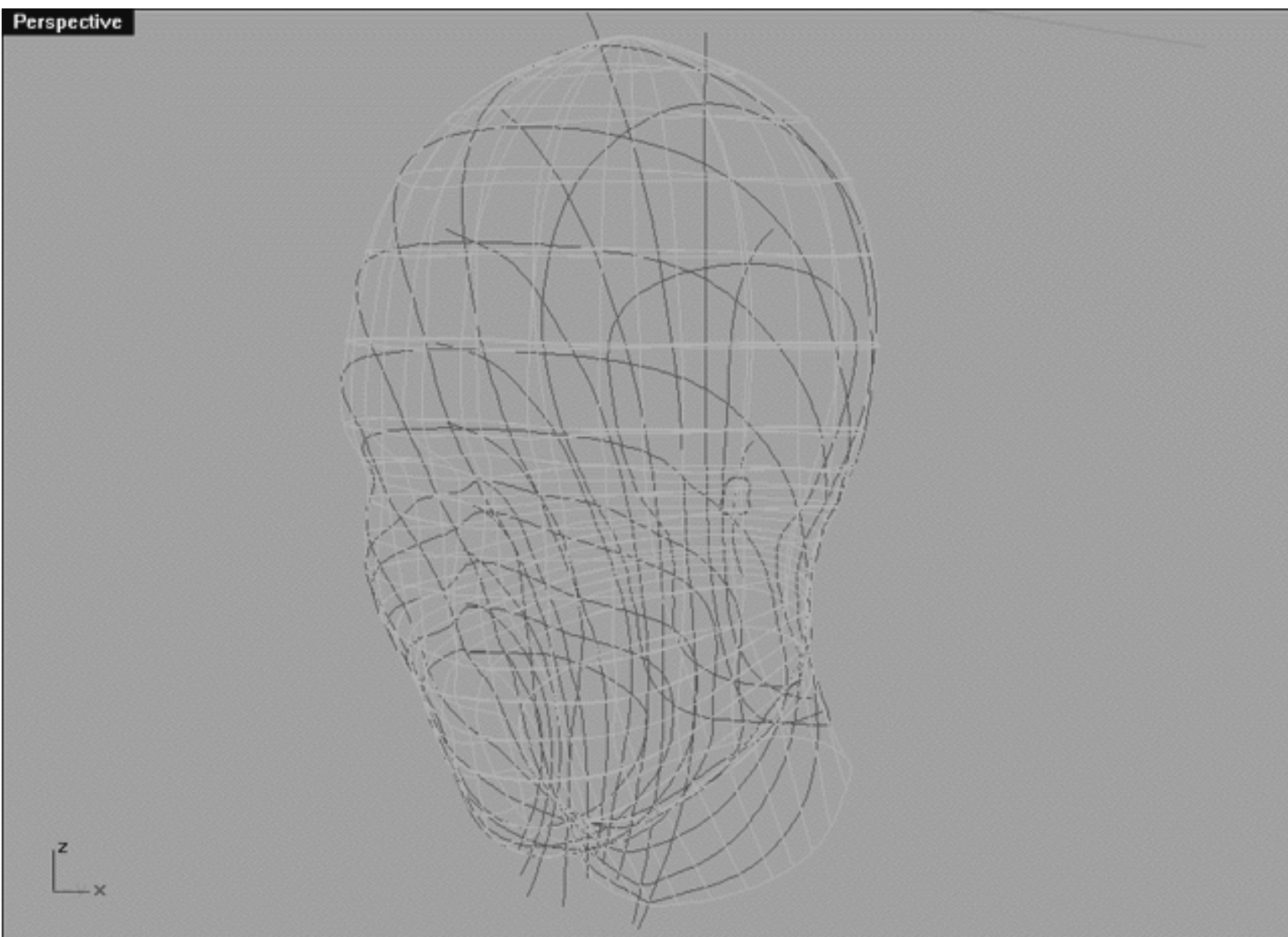
- From the toolbar choose the Project Curve to Surface icon  or type the command: **project** at the command line and press Enter.
- The system will respond with the following prompt at the command line: **Select curves to project:**
- Start by selecting the "head" of the first curve that you drew -- it will highlight. Continue working in a clockwise direction repeating the procedure for all the remaining curves as you select each curve it will highlight. When you've selected all the curves, press Enter.
- The system will respond with the following prompt at the command line: **Select surfaces or polysurface to project onto:**
- With your mouse left click upon the cyan coloured head surface -- it will highlight. Next, press Enter to complete the operation.

Be patient, in a few seconds you should notice that something has happened. Since many curves are being projected at once there are loads of calculations being performed by the application so it may take a little time even on a very fast workstation. Eventually your monitor should look something like the following screenshot:



*This **Right Viewport** screenshot shows the result of projecting the interpolated curves upon the head surface.*

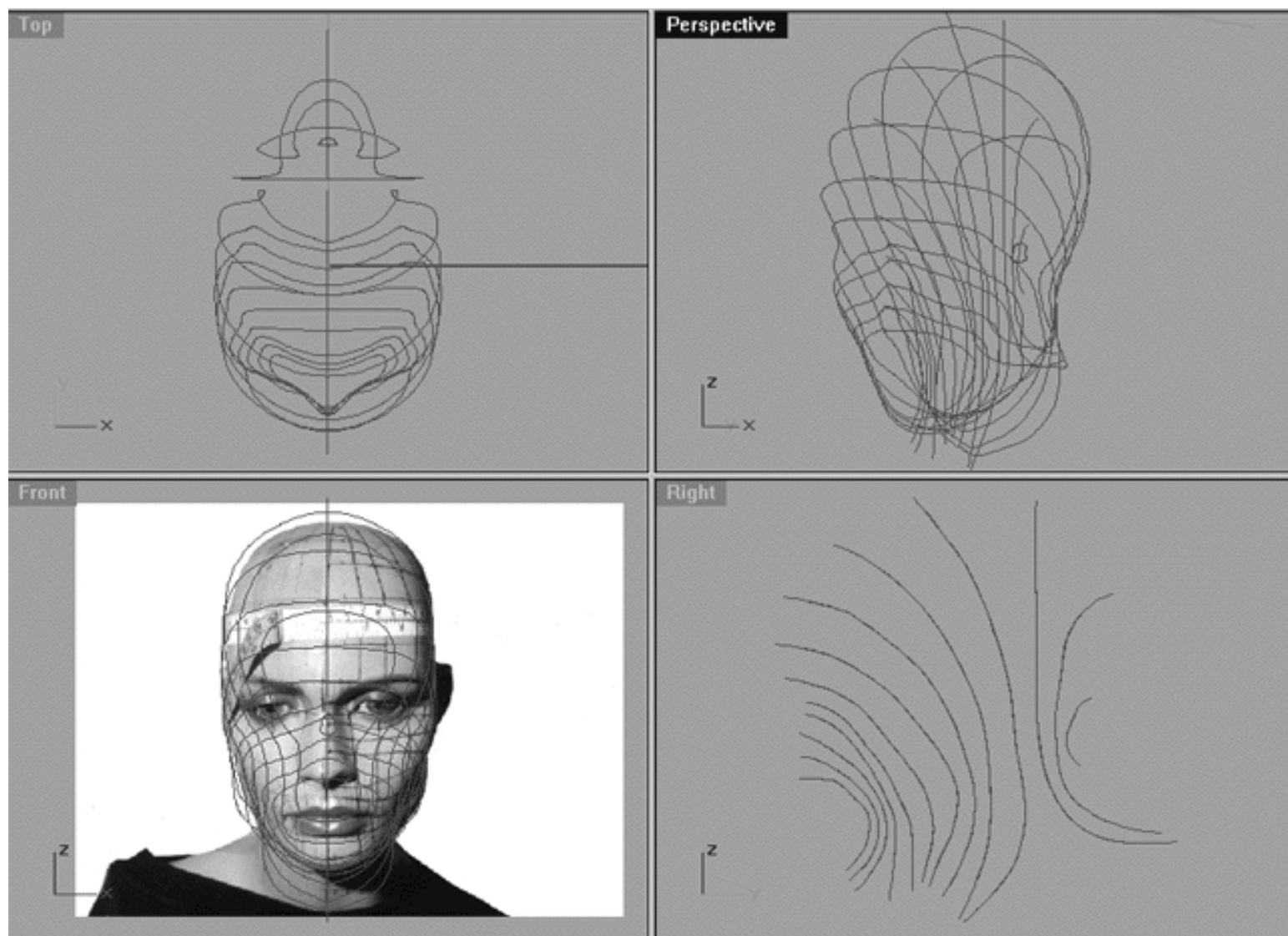
- Minimise the Right Viewport and take a look at what has been produced by this operation in each of the viewports.



This **Perspective Viewport** screenshot shows the result of projecting the interpolated curves upon the head surface. In this view you can clearly see the original head surface with a north/south pole parameterisation (in cyan) and as a result of projection the new front/back radial parameterisation (in red).

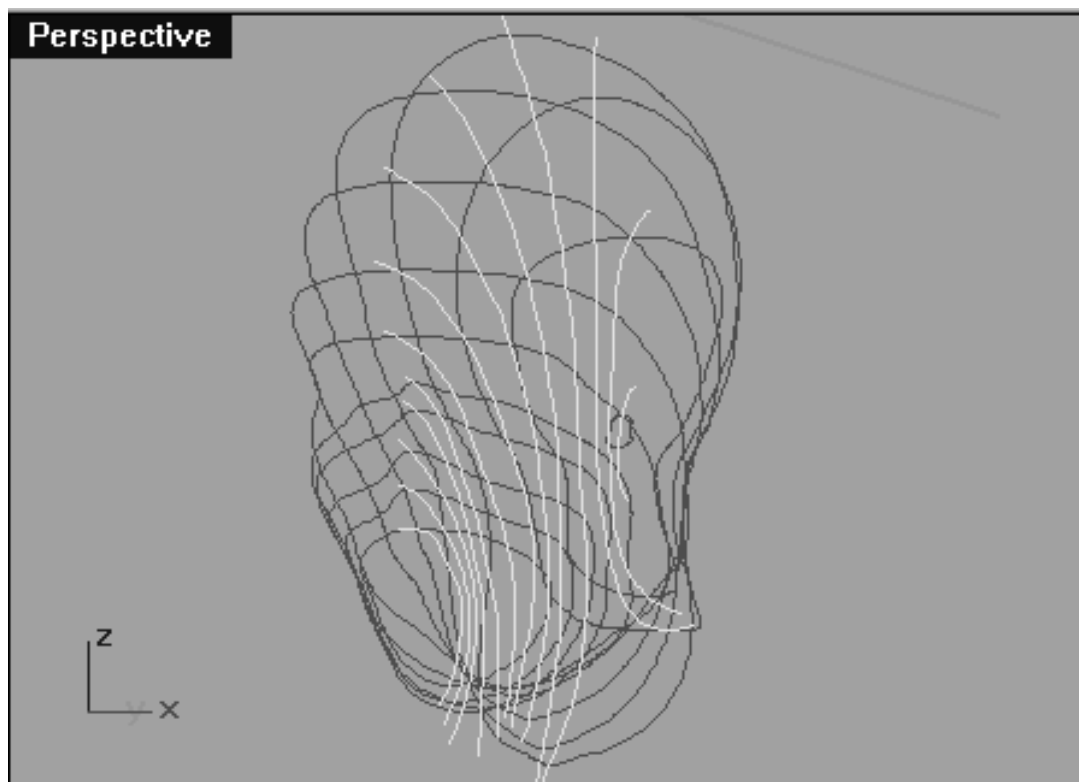
- We have now come to the stage where the original head surface with the north/south parameterisation is no longer required. Do NOT delete it, rather, open the Edit Layers dialogue box and turn off the layer entitled: Secondary\_Surf, then press OK to exit.
- Now, press the Esc key to make certain that no scene objects are currently selected.





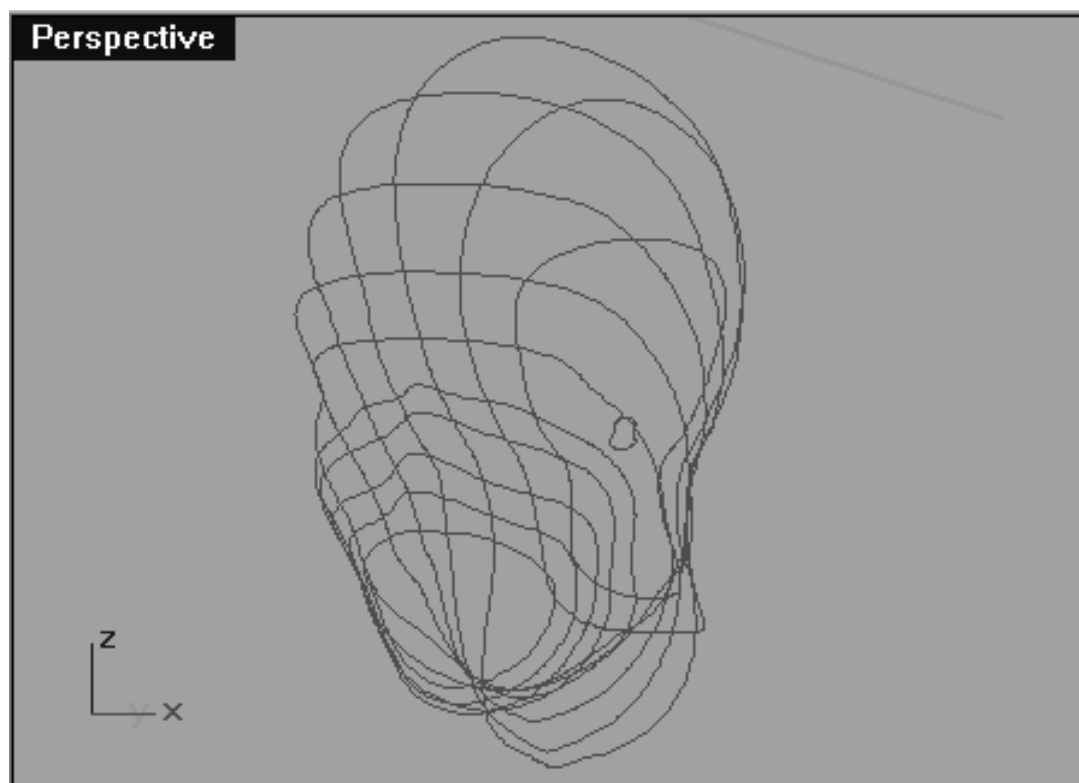
This **All Viewport** screenshot shows the result of projecting the interpolated curves upon the original head surface and the new front/back radial parameterisation (in red) that has been created by doing so. The original head surface with a north/south pole parameterisation has now been hidden as it is no longer needed.

- In the Right Viewport, select each of the original projection curves and hide them. To do this select the "heads" of each of the curves by picking them on the nose side of the head only at the very tips. This way you will select the original projection curves and NOT the projection curves themselves.
- Once done, check the Perspective view to make certain that you have in fact only selected the original projection curves.
- With the correct curves now selected type the command: Hide at the command line and press Enter.
- See the following screenshots:



This **Perspective Viewport** screenshot shows that all of the original projection curves used previously have now been selected and are ready to be hidden.

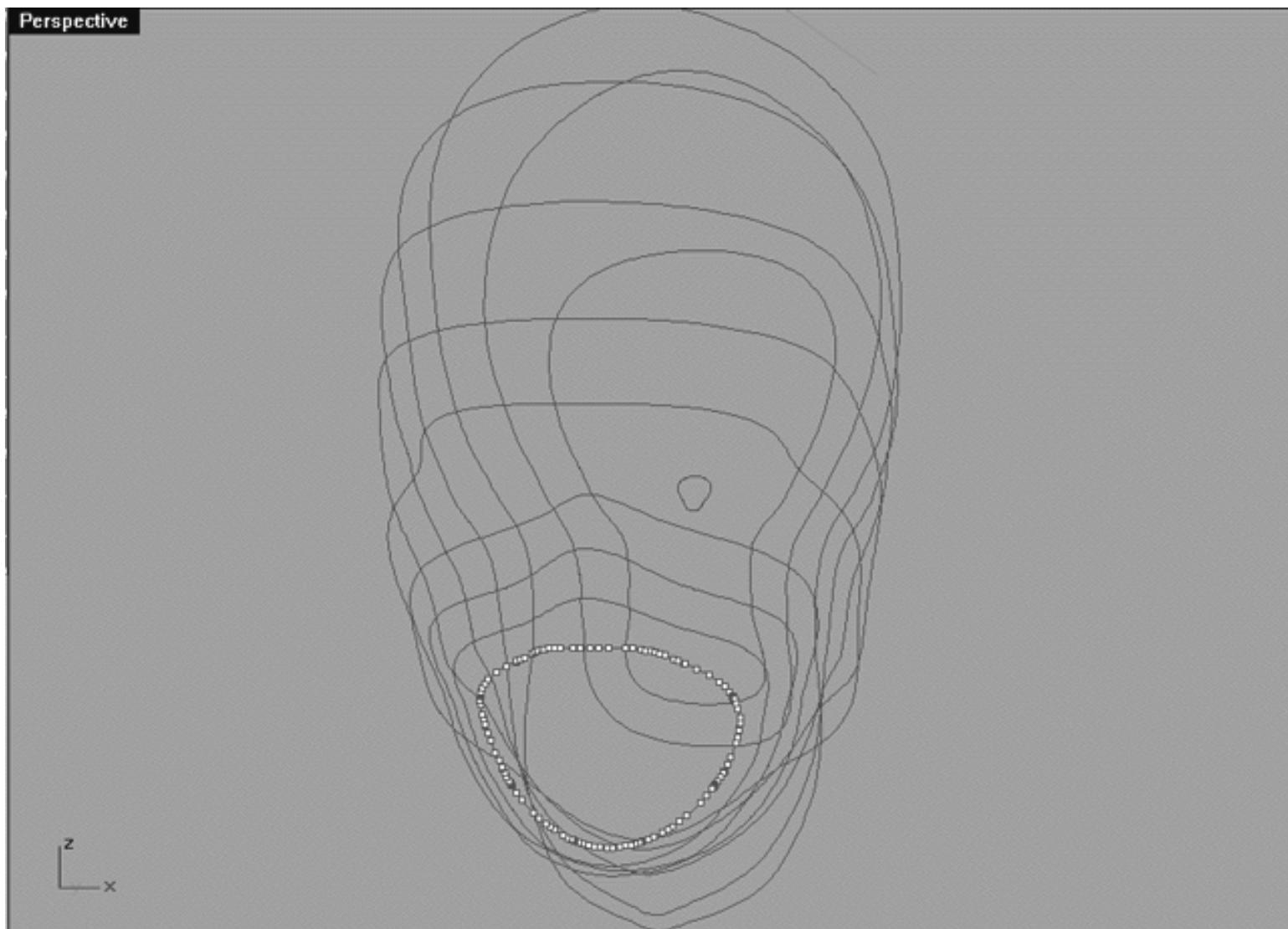
- Open the Edit Layers dialogue box and Turn off the layer entitled: COS\_v2\_Guides.



This **Perspective Viewport** screenshot shows that all of the original guides and projection curves have now been hidden or turned off.

# There Is Always a Catch

Unfortunately, despite how well this projection procedure works we still have a bit of a problem. These new curves are useless for "skinning" (lofting) since they contain way to many edit points and are unevenly parameterised -- see the following screenshot:



This **Perspective Viewport** screenshot shows that edit points have now been displayed on the 1st of the new radial curves. As you can see there must easily be a few hundred points on this curve alone, so many in fact that I wouldn't even dare trying to display all the points on all the curves for fear of bringing the computer to a grinding halt. Obviously this is a problem, there are far too many points with no logical parameterisation.

As you can see we've got a bit of trouble on our hands. The question now becomes where do we go from here? Well, now that you asked I'll be happy show you the solution -- it's so easy and straight forward you'll hardly believe it!

If you think back to the previous lesson when we created the mouth curves you may remember that we went to great lengths to make sure that we used a total of only 22 points on each curve that were evenly spaced out along a star like pattern -- if you can't remember that long ago I suggest you review that chapter. Okay, now I will reveal a very big secret which is this: that the 22 points that made up the mouth curves will be the sole basis for determining the logical parameterisation across our new radial head it is in fact the key to everything!


Right then, with this in mind we've got to accomplish a few things. First, we've got to reduce the number of points on each of new radial curves from hundreds down to a total of 22. Second, we've got to make sure that all the points on the new radial curves remain positioned exactly as they are on the mouth curves that we created earlier.



But how in the world can we do this? Luckily for us Rhinoceros has some extremely powerful tools that make what could be a very difficult job child's play -- just watch...

---

## Synchronization and Reduction

Next on the list we are going to want to make copies of all the mouth curves we created earlier on in the tutorial. The reason for this is because we are going to perform some fairly drastic operations on these curves. We don't really want to risk messing up the originals since later on we may need them for reference or for something else. So the plan is that we will create a bunch of new layers, make copies of the originals and then hide the originals. We will then assign each of the copies to their respective new layer.

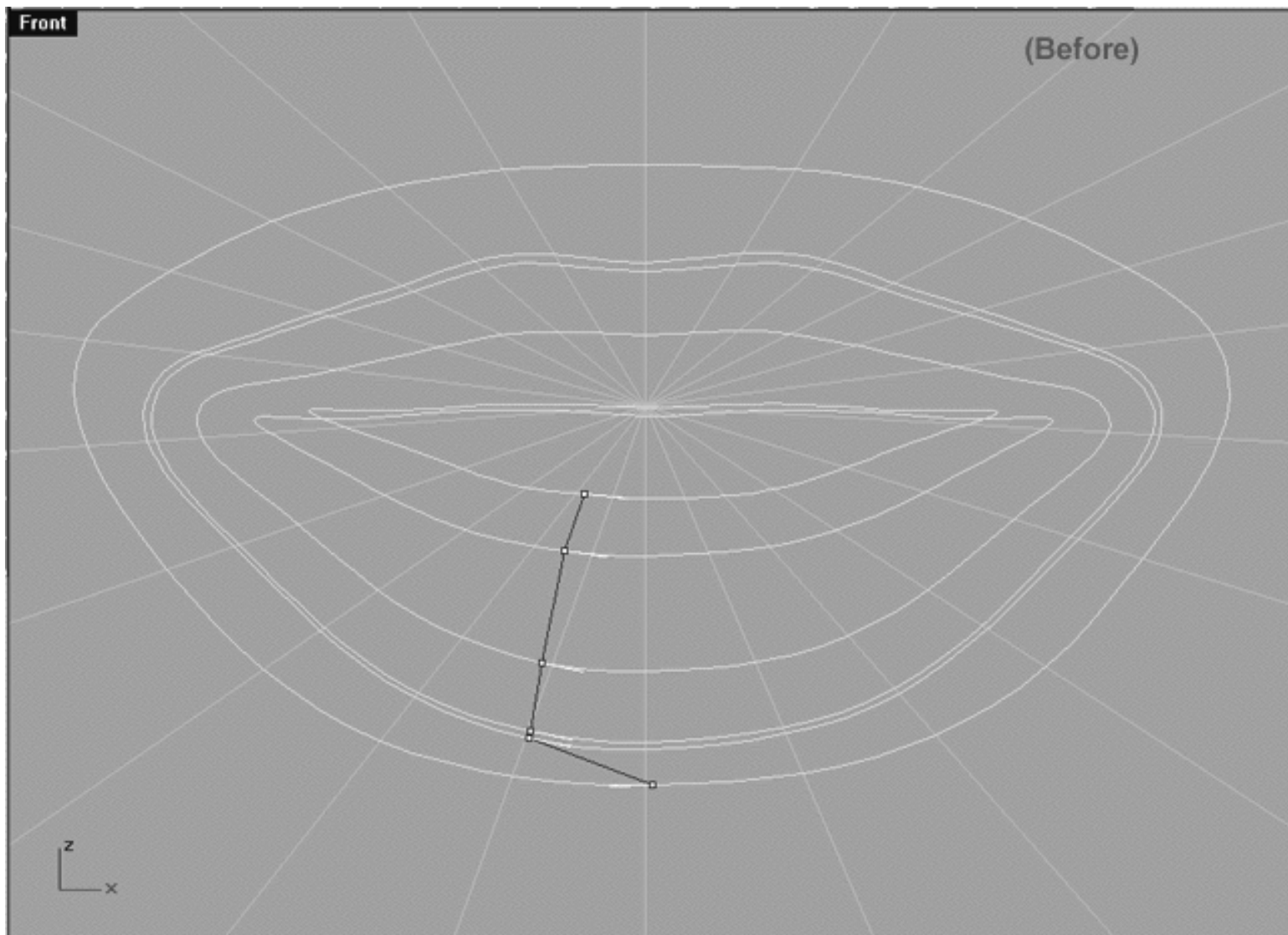
- Open the Edit Layers dialogue box and create 6 new layers, call them Nu\_MouthMerge\_01, Nu\_MouthMerge\_02, Nu\_MouthMerge\_03, Nu\_MouthMerge\_04, Nu\_MouthMerge\_05, and Nu\_MouthMerge\_06. Assign each of these layers colour to black.
- Create yet another new layer, call this one Nu\_MouthMerge\_Comp. Assign the layer colour to blue.
- Set the layer entitled: Nu\_MouthMerge\_Comp as the ACTIVE layer.
- Now, Temporarily turn off the COS layer.
- Turn on Nu\_Mouth\_Curve's 01 through 06.
- Press OK to exit.
- Zoom and pan the views as required.
- Carefully select each of the mouth curves as you do each will highlight. Once done, choose the Copy icon  or type the command: Copy at the command line and choose the InPlace option.
- Start with the outside curve (Nu\_Mouth\_Curve\_01) by selecting it. The "Choose One Object" dialogue box should appear, just press OK and then from the toolbar choose hide or type the command: Hide at the command line and then press Enter.
- Repeat this procedure for each of the remaining mouth curves. Your aim in doing this should be to leave only one set mouth curves selectable.
- Next, once again select the outside curve (Nu\_Mouth\_Curve\_01) -- it will highlight.

- Change its layer assignment from its default to (Nu\_MouthMerge\_01) using the Edit Layers / Change Layers icon  highlighting the correct layer in the list and then pressing OK to complete the operation.
- Once done, continue working inward and select the next curve (Nu\_Mouth\_Curve\_02) -- it will highlight.
- Again, change its layer assignment from its default to (Nu\_MouthMerge\_02) using the Edit Layers / Change Layers icon .
- Repeat this procedure for all the remaining curves until each has been placed on its new respective layer.
- Open the Edit Layers dialogue box and turn off the original mouth curves (i.e., Nu\_Mouth\_Curves 01 through 06).
- If you not already done so (you should have) Set the active layer to Nu\_MouthMerge\_Comp.

At this stage, 6 mouth curves should be visible in All Viewports. Double check your lower status bar and confirm that Nu\_MouthMerge\_Comp is in fact active is should be listed in the Layers Info window.

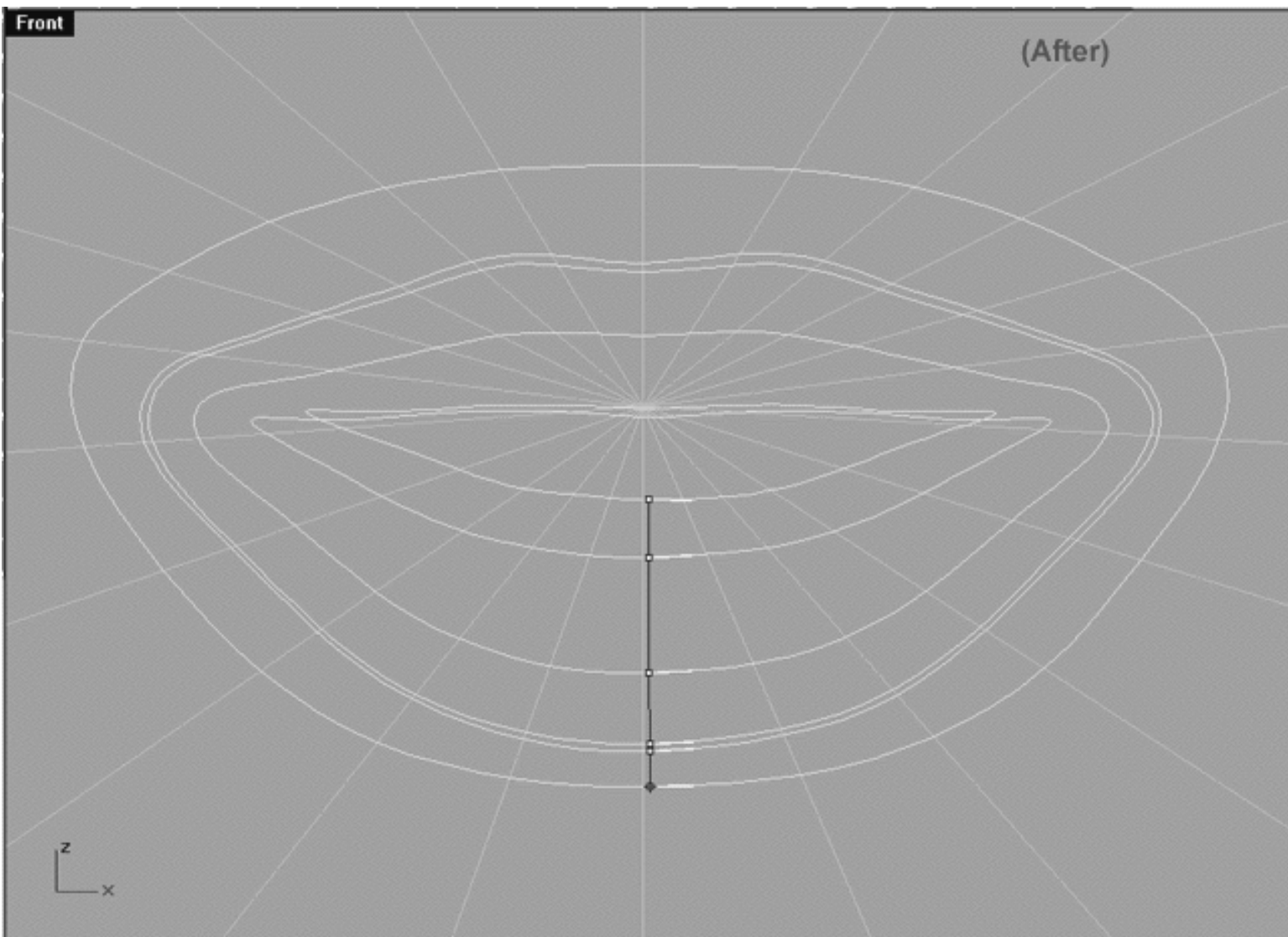
- All 6 mouth curve objects should be clearly visible in All the Viewports, zoom as required.
- Open the Edit Layers dialogue and turn on the layer entitled: Mouth\_Guides\_01 and LOCK the layer.
- Maximize the Front Viewport by double clicking on its label.
- At the command line type the command: **CrvSeam** and press Enter.
- The system will respond with the following prompt at the command line: **Select curve:**
- Start by selecting the 6th mouth curve (the small innermost one) and continue working your way outward, clicking each time near the 6pm position, when you've selected the final curve press Enter to complete this phase of the operation.
- The system will respond with the following prompt at the command line: **Select seam point to adjust. Press Enter when done (FlipDirection Automatic Natural):**
- See the following screenshot entitled: (Before):





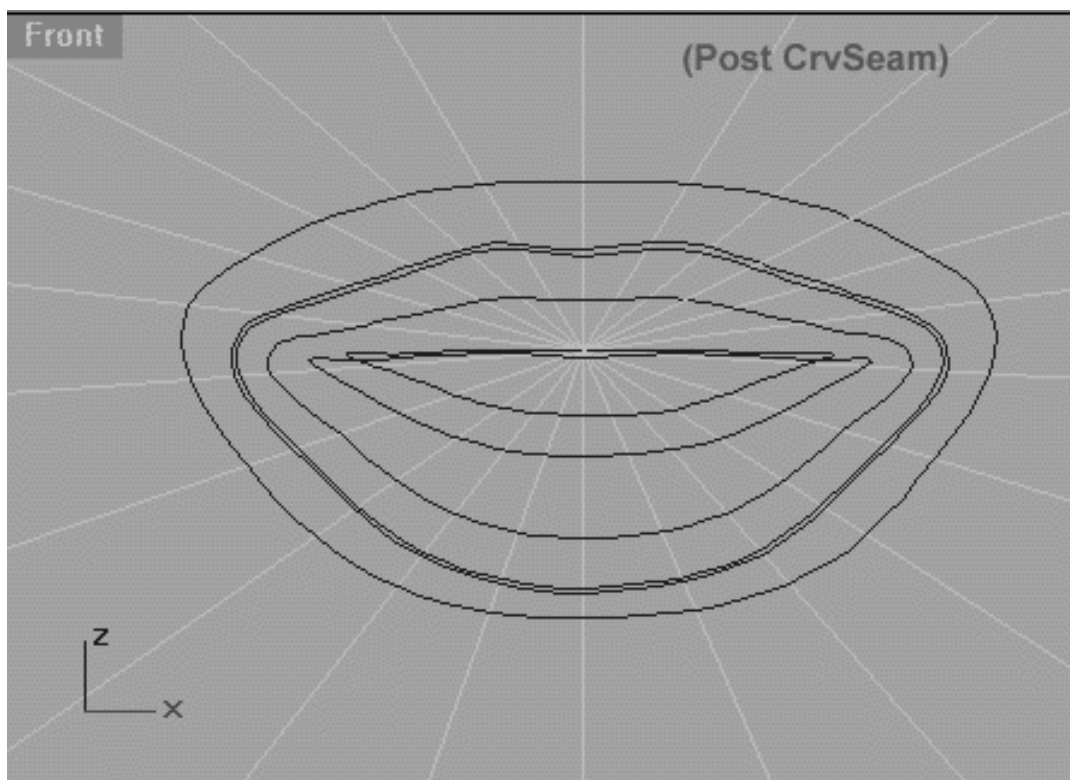
This **Front Viewport** screenshot above shows the curve seam. As you can see it's a bit off centre and the point at the 6pm position on the 6th mouth curve is also heading in the wrong direction.





This **Front Viewport** screenshot shows the curve seam. As you can see it has now been correctly centred and the point at the 6pm position on the 6th mouth curve is now pointing in the correct direction.

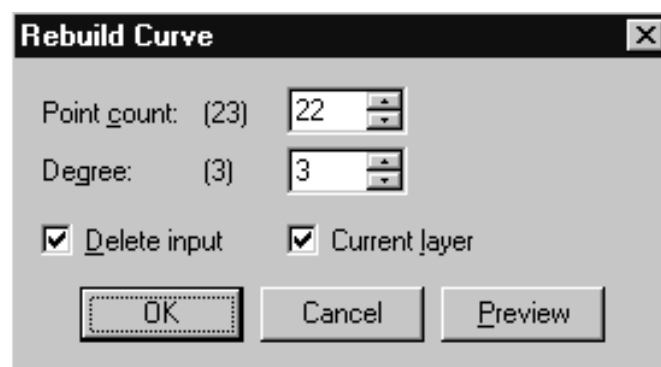
- With your mouse click on any of the points along the curve seam that are off centre and adjust them so that they are. You will also have to flip the direction of the seam on the 6th mouth curve (the large outermost curve) so that all the seam points are heading in the same direction. How can you tell what direction the seam points are heading? Easy, just look at the little white arrows as you can see in the previous screenshot they are all pointing the same way -- this is just what you want. When you've finished your monitor should resemble the previous screenshot entitled: (After).
- To complete the operation press Enter. All the curves should turn blue as in the following screenshot entitled (Post CrvSeam):



This **Front Viewport** screenshot shows the result of having used the *CrvSeam* command.

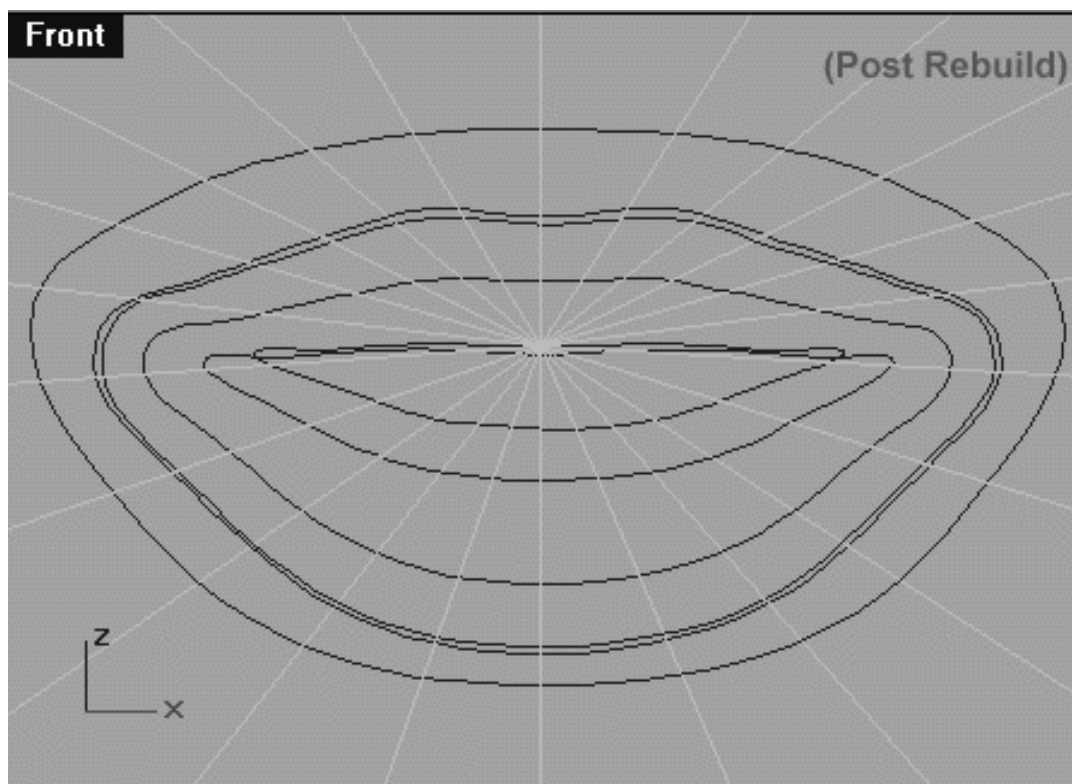
We must now set about rebuilding the curves and we will do this automatically using another very powerful feature of Rhinoceros.

- At the command line type the command: **Rebuild** and press Enter.
- The system will respond with the following prompt at the command line: **Select curves to rebuild:**
- Starting by selecting the innermost mouth curve at roughly the 6pm position. Continue to work your way outward, repeating the procedure with the remaining curves.
- When you've selected all the curves press Enter. The Rebuild Curve dialogue will appear, enter values as seen in the following screenshot:



This screenshot shows the *Rebuild Curve* dialogue box and the values that should be set.

- Once done, press OK to complete the operation.
- Your monitor should now resemble the following screenshot entitled: (Post Rebuild).



This **Front Viewport** screenshot shows the curves after the rebuilding operation.

Some thoughts on Automatic Curve Rebuilding...

Although this is an incredibly useful and powerful feature of Rhino, the automatic rebuilding of curves, especially closed curves that have been previously edited is probably not optimal in the larger scheme of things. You may have noticed that after the rebuild has taken place the curves shape has changed just a bit. In fact, this will introduce some surface rippling but this is something that we can repair with minor refinement.

---

## Curve Direction and Alignment

As you may know, NURBS curves have a direction to them. Under normal circumstances you hardly take notice of what direction a curve is headed in, however when creating a surface from a series of curves this becomes crucially important. The point is that you always want all your curves to be heading in the same direction, either all clockwise or all anti-clockwise. What you absolutely do not want is to have some curves going clockwise and others going anti-clockwise. What happens if you do? Well not much, that is until you try and loft a surface from them, then you can expect a horrible twisted mess and the end result -- not what we are after. How does a curve get a direction in the first place? Essentially it mainly down to how the curve was constructed, for example if it was initially drawn in a clockwise or anti-clockwise manner the curve will head either to the right or the left.

The relevance of this to our project is simple. First we need to make sure that our seam is positioned in the same location on each curve and that the seam is in alignment on each curve. How do we tell the direction that any given curve in our model is heading? Easy, Rhino has a feature just for this and the command is: Dir -- which if you hadn't guessed stands for direction. When you type this command little white arrows will appear showing where the curves seam is located and the direction the curve is headed. If the curve is heading the wrong way you just type: F and press Enter, which will flip the curve so that it is headed in the opposite direction.

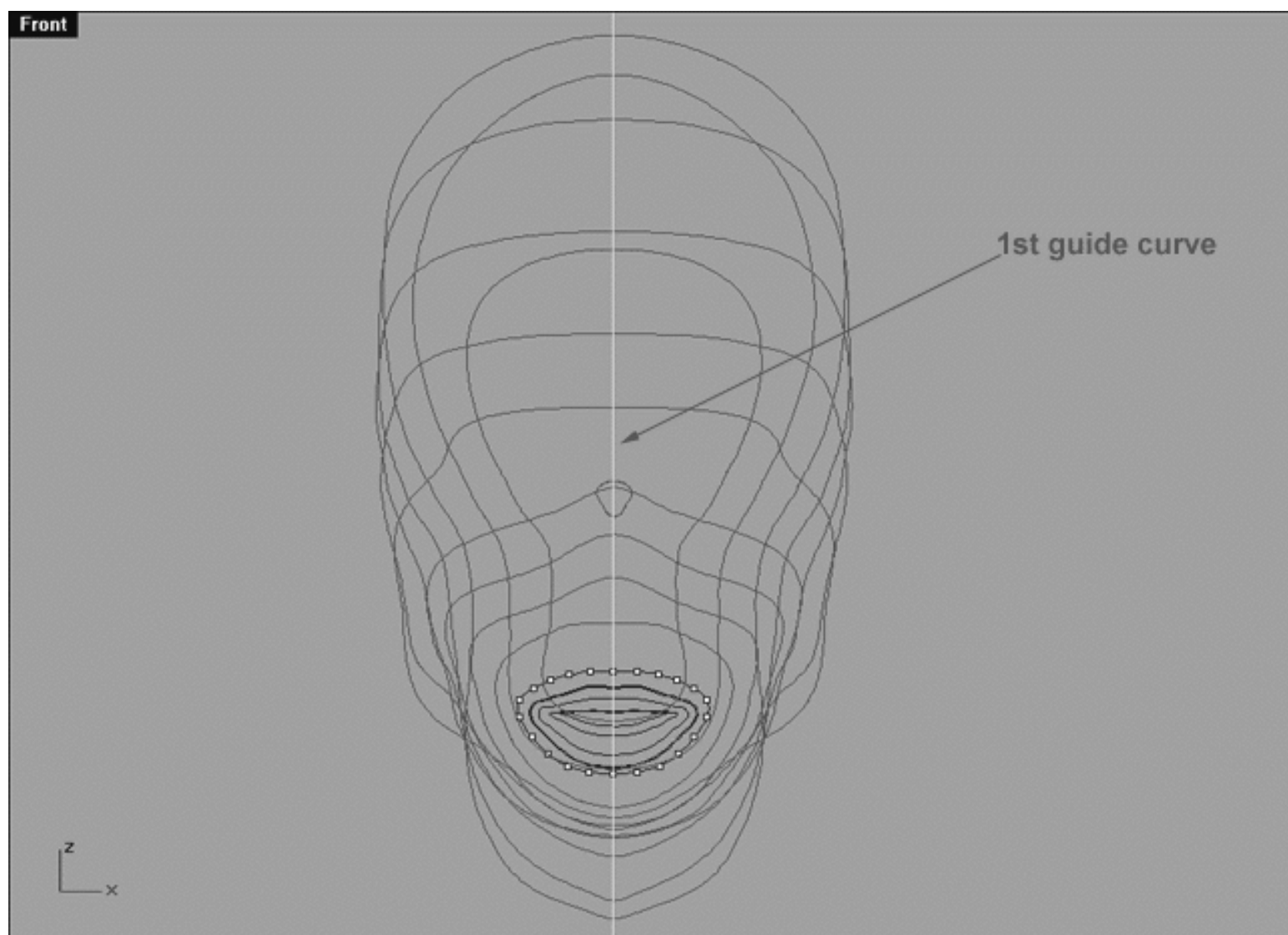
Now since we've just set the seam and rebuilt the curves for the 6 mouth curves we already know that those curves are all headed in a anti-clockwise direction and that the seam is at the bottom of each of the curves (as viewed from the front viewport) so we don't have alter them any further.

Our task is now to set each of the new remaining radial curves so that they are heading in the same direction as our mouth curves. Naturally we will use the "Dir" command to do this.

- Maximise the Front Viewport if you've not done so already.
- Open the Edit Layers dialogue box and turn on the layer entitled: COS, press OK to exit.
- Zoom and Pan the viewport so that all curves can clearly be seen.
- Select the 1st mouth curve (the large outermost one) and display its edit points.

We must now create a few quick guides to help us with our alignment...

- Zoom out the front viewport just a bit so that you have space above and below your head.
- From the toolbar choose the Polyline icon **ICON MISSING** and draw a single straight vertical line along the Z axis making sure that it extends well above and below the head. To do this just set the first point then hold down the Shift key and set the 2nd point.
- Once you've created a perfectly straight vertical line, move it across the X axis so that it is in alignment with the 12 & 6 o'clock positions on the 6th mouth curve.
- When you've finished your monitor should resemble the following screenshot:

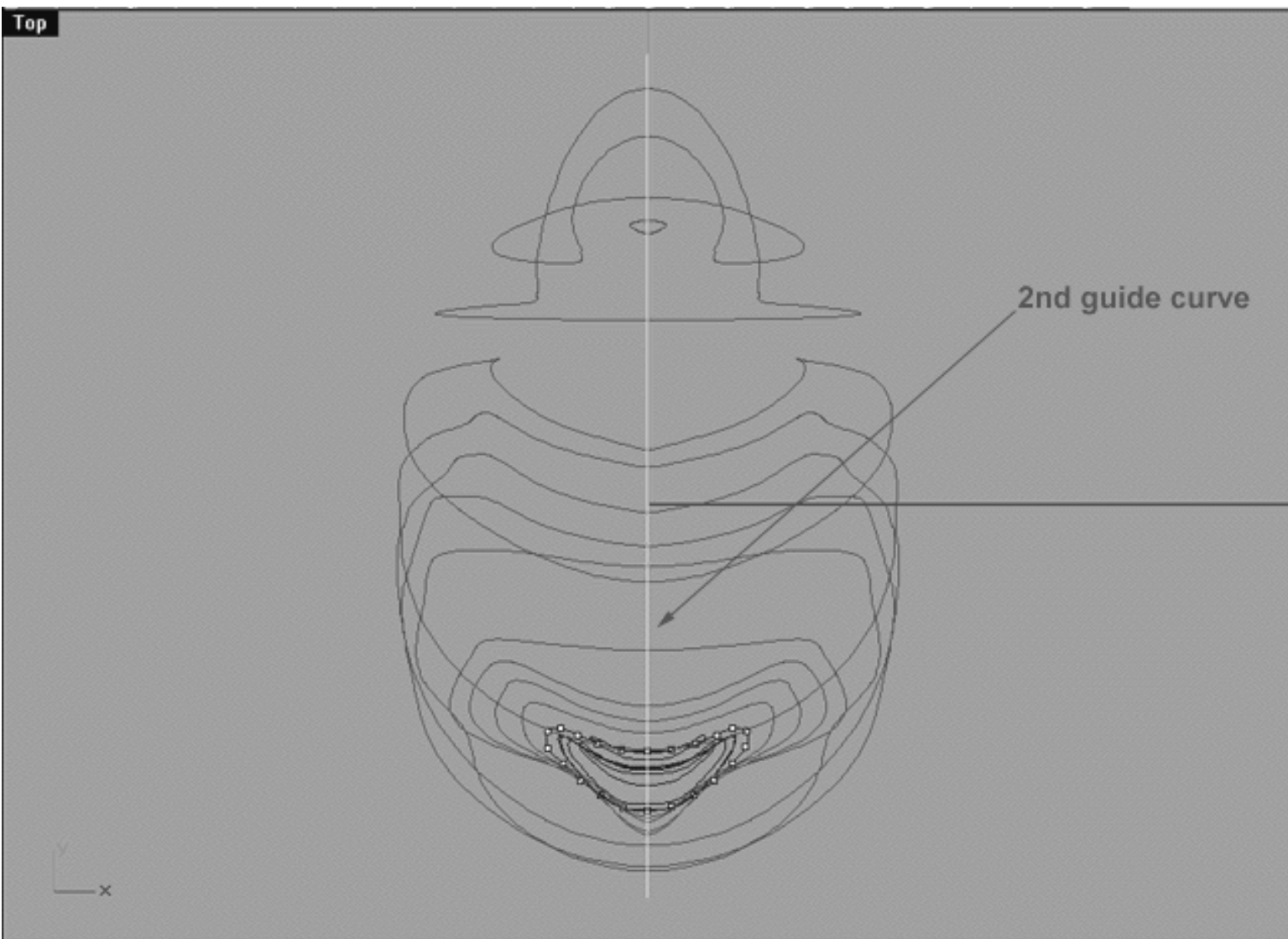


This **Front Viewport** screenshot shows that a vertical guide curve has been drawn along the Z axis. It has then been aligned with the points at the 12 & 6 o'clock positions on the 1st mouth curve (the large outermost one).

We must now create another quick guide to help us with our alignment, this time in the Top View...

- Minimise the Front Viewport and switch into the Top Viewport and maximise it.
- Zoom out the **Top Viewport** just a bit so that you have space in front and behind your head.
- From the toolbar choose the Polyline icon MISSING ICON and draw a single straight vertical line along the Y axis making sure that it extends well in front and behind the head. To do this just set the first point then hold down the Shift key and set the 2nd point.
- Once you've created a perfectly straight vertical line, move it across the X axis so that it is in alignment with the 12 & 6 o'clock positions on the 6th mouth curve.
- When you've finished your monitor should resemble the following screenshot:





This **Front Viewport** screenshot shows that a vertical guide curve has been drawn along the Y axis. It has then been aligned with the points at the 12 & 6 o'clock positions on the 1st mouth curve (the large outermost one).

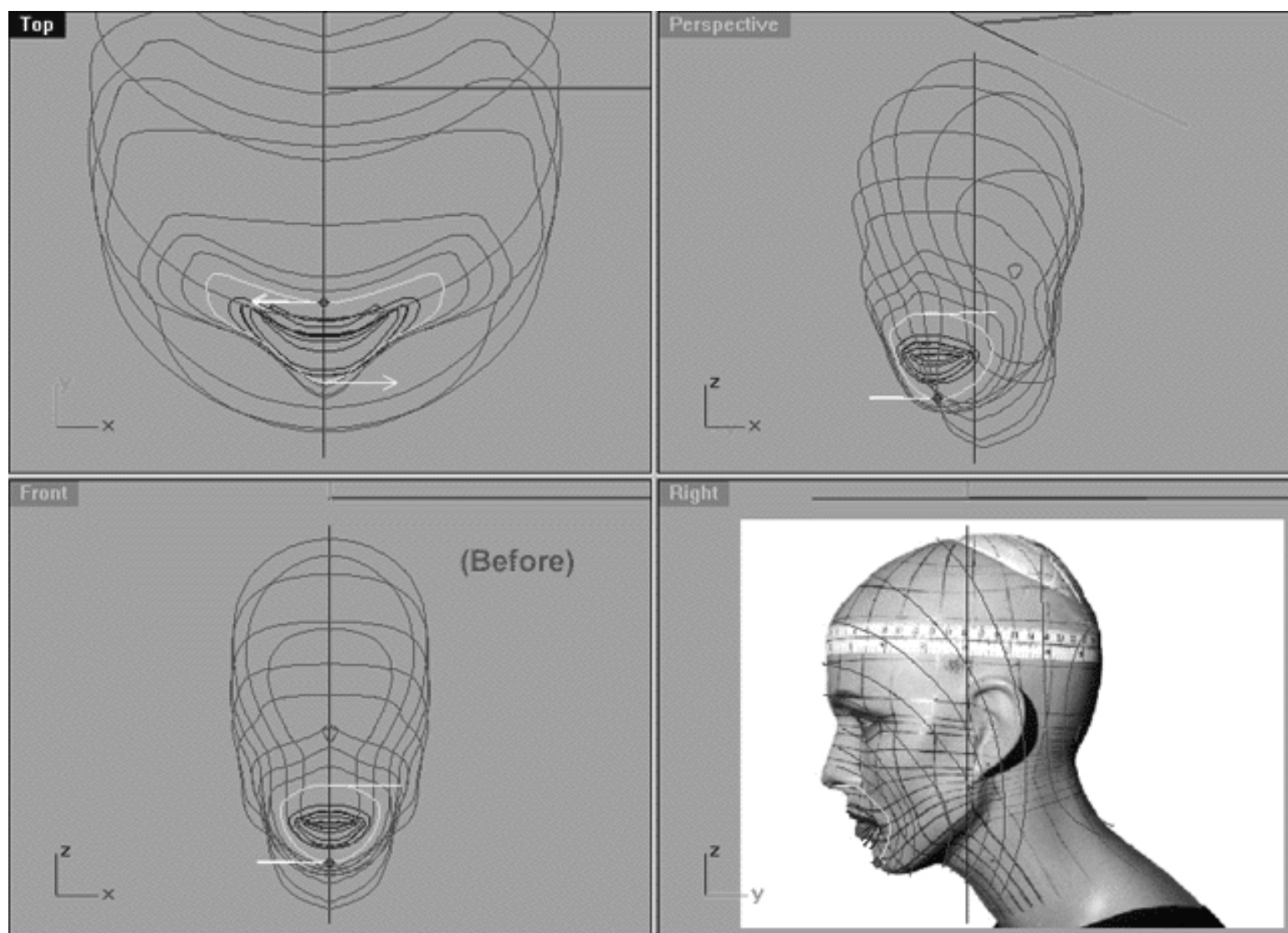
Now that we've got some guides set up it's time to set the new seam and direction.

- Minimise the Top View and then zoom all the views as required so that you can clearly see the area in which you are working.
- Turn off any edit points that may currently be displayed.
- Based on the curve layout plan that we devised early in the lesson, select the next logical curve which would be "A" -- see the following screenshot entitled: (Before).
- At the command line type the command: Dir and press Enter. Two white arrows will should now appear and look something like the screenshot below entitled: (Before). These arrows are telling us that this curve is headed clockwise, but our mouth curves could be headed in the opposite direction (anti-clockwise). See the following important warning:

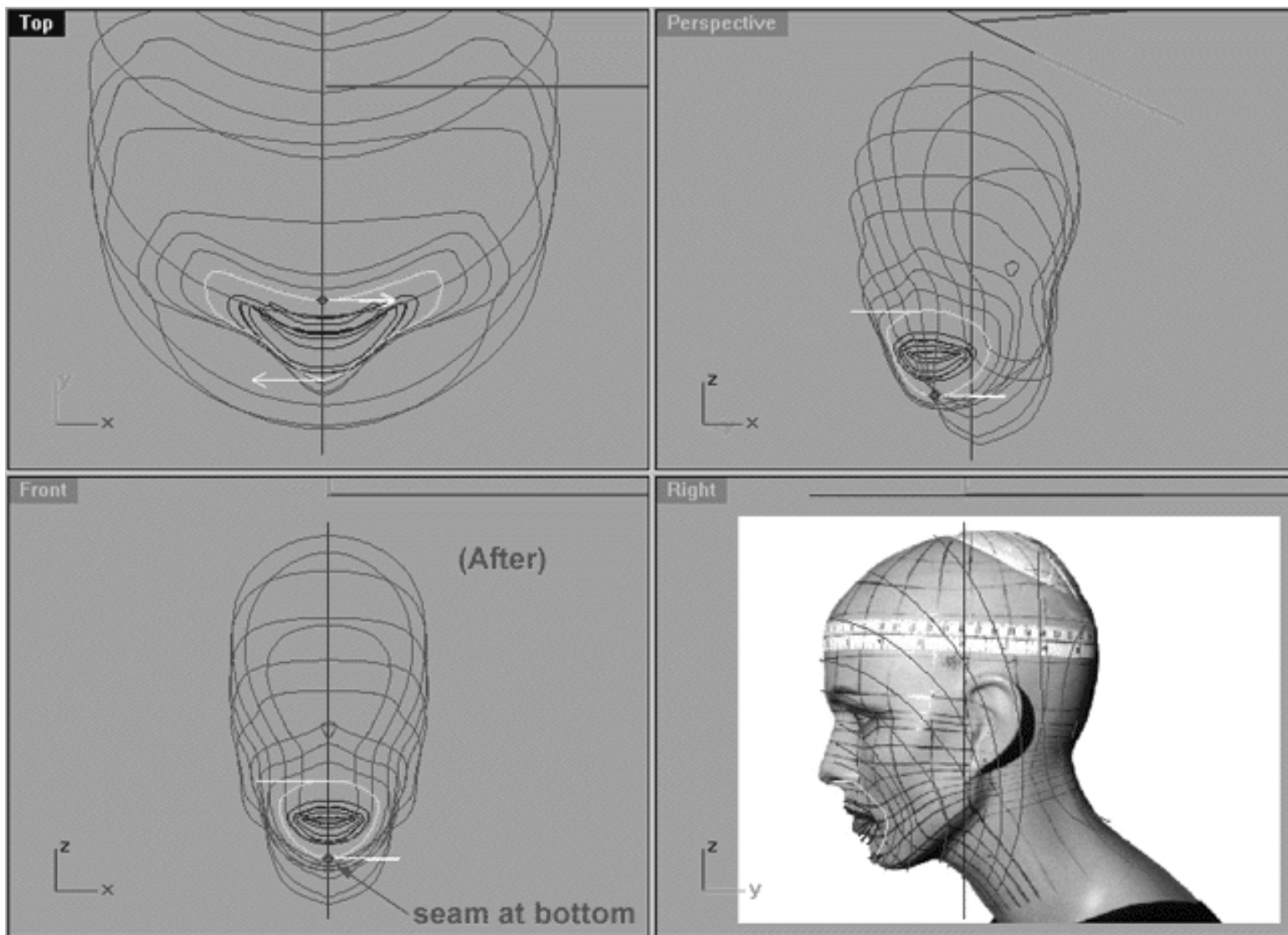
**WARNING** -- Your actual results MAY VARY! The direction in which your curves face depends on how you drew them. The point is, if your head curves are heading in the same direction as the mouth curves -- perfect! However, in the event that they are not then use the flip command as described in order to sort out the problem -- it's as simple as that.



- The system will respond with the following prompt at the command line: **Press enter to finish viewing direction (Flip):**
- At the command line type: F and press Enter.
- Once done, the arrows should point in the opposite direction. Your monitor should now resemble the following screenshot entitled: (After).
- If you move your mouse you will notice that there is a little "node" with a cross hair that is attached to an arrow which can travel along the curve as the mouse is moved. You should be certain to locate this point at the bottom of the curve (as seen from front view) and in alignment with the guide in both the front and top views. Your monitor should resemble the following screenshot entitled: (After).
- Once you've positioned the seam node exactly, left click with your mouse to set the seam and complete the operation.



*This **All Viewport** screenshot shows that according to our layout the "A" curve has now been selected and direction is being displayed by the two white arrows. Observe that the arrows are indicating that the curve is heading in a clockwise direction.*



This **All Viewport** screenshot shows that according to our layout the "A" curve has now been selected and direction is being displayed by the two white arrows. The curves direction has now been flipped, observe that the arrows are now indicating that the curve is heading in a anti-clockwise direction. Also take note of the location of the seam, which has been placed at the bottom of the curve (as seen from the front view).

Now comes the really fun part...(not).

- Repeat this procedure for each of the remaining radial curves "B" through "M". Don't worry it's not as much work as it seems, it should only take a few minutes to complete.

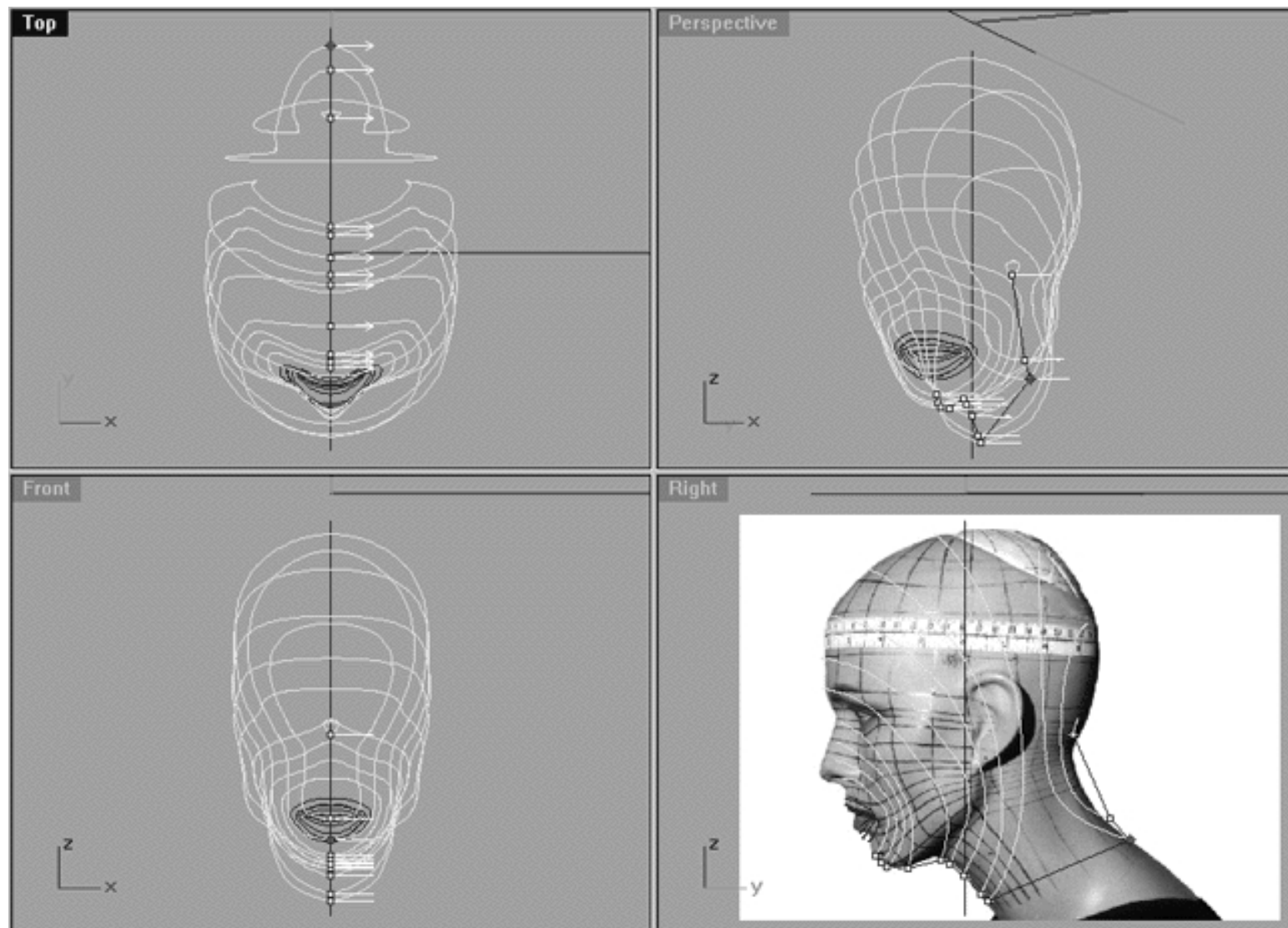
## Final Rebuild

Now we will perform an automatic rebuild of the all the radial curves but before we do one final check.

Although we've now set the direction for each of the curves I've found that for some reason this does not always work 100% of the time. To be completely sure that the seam is now aligned correctly do the following...

- At the command line type the command: CrvSeam and press Enter.

- Examine your viewports, is the seam running as you'd expect? It should be aligned perfectly along the bottom of the head/neck. If it's not for any reason and/or if any curves are still pointing in the wrong direction you must correct the errors now.
- Press Enter to complete the operation -- all the curves should now turn blue.
- Once done, your monitor should resemble the following screenshot:

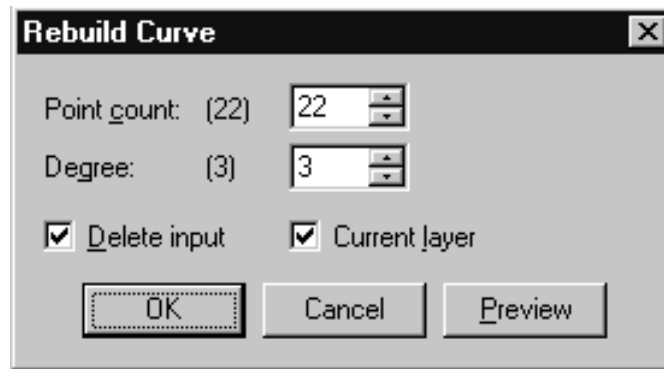


*This **All Viewport** screenshot shows that according to our layout the curves "A" through "M" have now been selected and the **CrvSeam** command has been applied. Any curves that were found displaying a wrong direction or with their seam in an incorrect location have now been corrected. Observe how all the white arrows are pointing in the same direction and the location of the seam (as indicated by the blue line running across the bottom the head & neck).*

We are now ready to perform the final rebuild of the radial curves.

- At the command line type the command: **Rebuild**. The system will respond with the following prompt at the command line: **Select curves to rebuild:**

- In the Right Viewport select the "heads" of each of the radial curves "A" through "M", once done press Enter.
- The Rebuild Curve dialogue will appear, when it does enter the values as in the following screenshot and press OK to complete the operation.
- In a few seconds you should see that the curves have now been rebuilt.

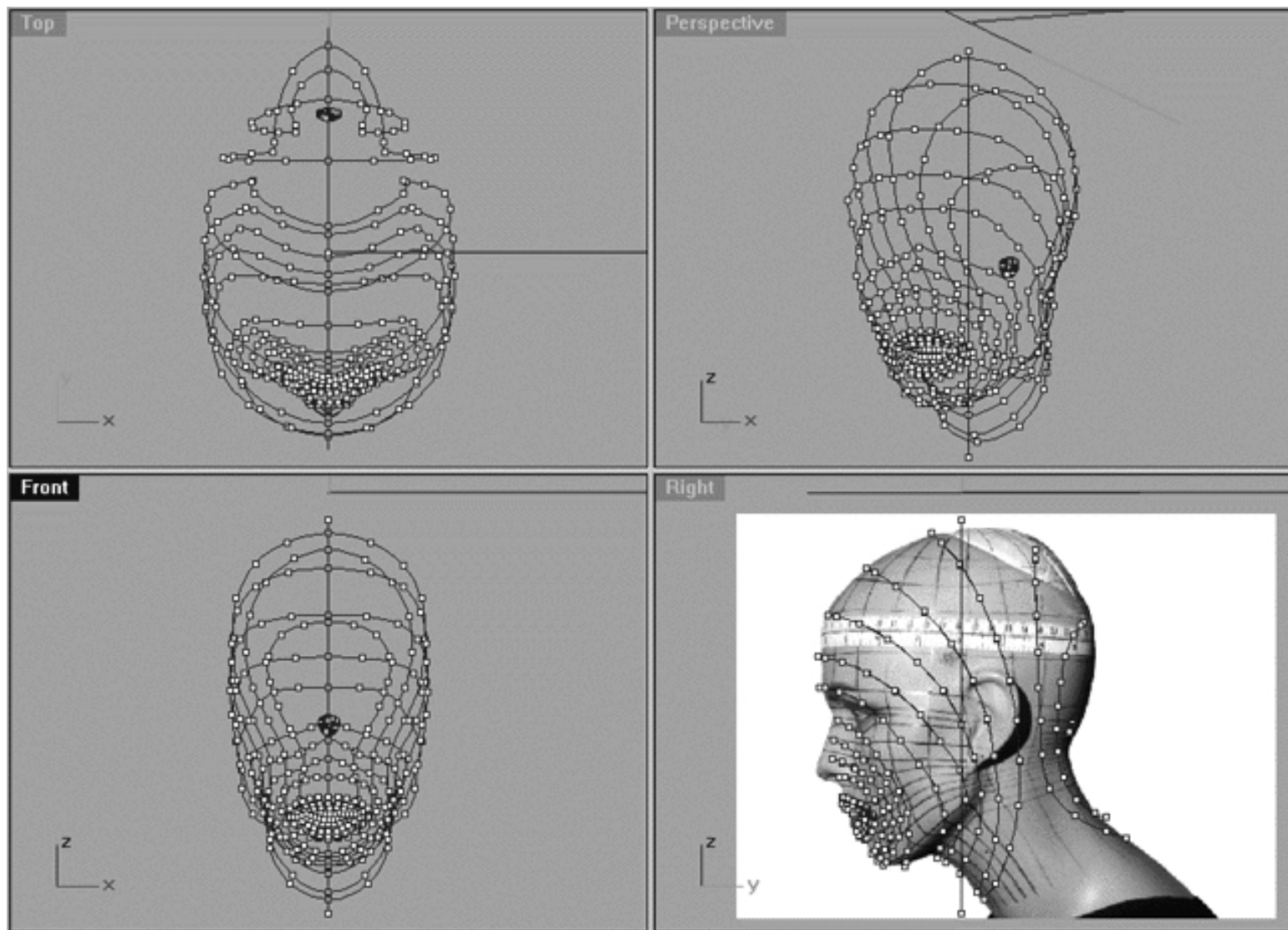


*This screenshot shows the Rebuild Curve dialogue box and the values that you should enter.*

Now if we've done everything correctly each curve should have exactly 22 edit points and they should all be in alignment with each other, let's confirm that this is in fact the case.

- Frame select all of the curves and display their edit points. Your monitor should resemble the following screenshot:





This **All Viewport** screenshot shows the rebuilt radial curves, now with a logical parameterisation and a total of 22 points per curve.

## Summary

This has been a long, complex and fairly confusing part of the tutorial. If you come away from it with anything it should be the following knowledge:

- Curves have a direction and a seam.
- The direction of a curve can be seen using the command: Dir.
- A curves direction will vary depending on how it was initially drawn.
- The direction of a curve can be changed using the command: Flip.
- The location of the seam of a curve or curves can be changed using the command: CrvSeam.
- Curves can be automatically rebuilt (i.e. the number of points can be increased or decreased) using the command: Rebuild.

- The automatic rebuilding of curves is a very powerful and useful feature but is not always optimal, be aware that it will change the shape of the curve (a bit).
- In order for curves to be successfully lofted all curves must be headed in the same direction and seams should be aligned.

We have now reached the stage in this project where everything is beginning to come together. As you can see, by converting the head from a north/south pole based model to one of a front/back radial type parameterisation we have succeeded in drastically simplifying the basic construction of its geometry whilst maintaining the overall shape and optimizing the model for the purposes of animation.

The model can now be lofted and a test surface can be produced. Granted this surface is not going to be perfect, but at least now we will be much closer to reaching our ultimate goal of the ever elusive final head surface.

---

## Shutting Down the Scene

If you plan on continuing immediately to the next lesson then you can skip this procedure, however, we do recommend that you save your scene now anyway.

In the event that you wish to take a break and continue working later, than please perform the following procedure:

- Save the file.
- Unhide any objects that may no longer be visible. Type the command: Show at the command line and press Enter.
- Unlock any currently locked curves by typing the command: Unlock at the command line and pressing Enter.
- Turn off any edit points that may currently be displayed.
- Open the Edit Layers dialogue box and...
- Turn ON the layer entitled: SCENE START UP and make it the active layer.
- Turn ON the layer entitled: Photopoints.
- Turn OFF the layer entitled: COS.
- Turn OFF the layer entitled: Mouth\_Guides\_01.
- Turn OFF the layer entitled: Nu\_MouthMerge\_Comp.



- DELETE the layers entitled: Nu\_MouthMerge\_01 through 06.
  - With the exception of those mentioned, all other layers should be set to OFF.
  - Press OK to complete the operation and exit.
  - Perform a ZoomExtentsAll.
  - SAVE THE FILE.
- 

Go to the NEXT LESSON

RETURN to the Top of Page -- [Click Here](#)

Written by Joseph R. Saltzman.

Co-produced in association with Steven Ståhlberg

©1998-1999 Cinemagic Productions Limited. All Rights Reserved.

Duplication of this document including images and text by any means is expressly forbidden without prior written consent of Cinemagic Productions Limited.

Web Site: <http://www.cmagic.co.uk> Telephone: +44 (0)1753 733 190 Fax: +44 (0)1753 736 619 email: [cmagic@cmagic.co.uk](mailto:cmagic@cmagic.co.uk)

**RETURN** to previous page -- [Click Here](#)

**GOTO** the NEXT LESSON




# THE EYEBALL


## Contents:

- [Scene Setup](#)
- [Create an Eyeball](#)
- [The Iris and Pupil](#)
- [A few thoughts on rendering](#)
- [Summary](#)
- [Shutting Down the Scene](#)

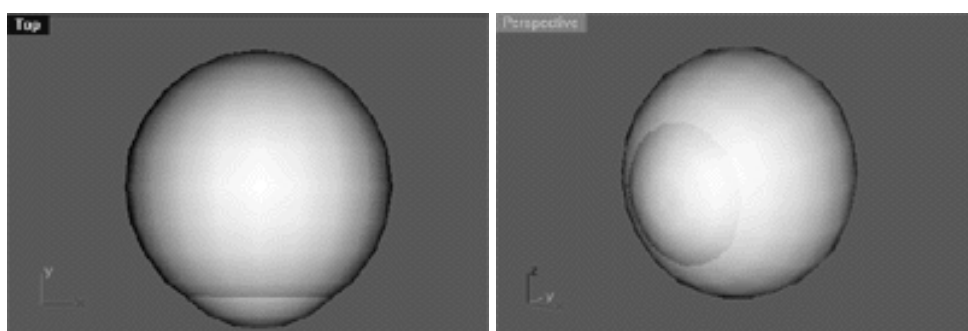
---

## Scene Setup

- If you've not done so already start a Rhinoceros session by **Double clicking** on the desktop icon  the application will begin.
- Choose File, Open from the menu bar and Double click on **START\_A.3DM** in the file list, it will load and open.
- Confirm at the Lower Status Bar the currently active layer is entitled SCENE START UP. If it is active proceed to the next step, if it's not then make it active by left clicking on the layer box, highlighting the correct layer and clicking on it.
- Again, at the Layers Box on the Lower Status Bar this time right click on the box, the Edit Layers Dialogue box will open. Confirm the following switches have been enabled or disabled:
  - The Layer entitled Photopoints should be ON.
  - The Layer entitled Frozen should be LOCKED.
  - The Layer entitled SCENE START UP should be ON.

- All other layers should be set to OFF.
- When you've finished making your changes ( if any ) click on OK.
- Confirm that you can see the background image in the Front and Right viewports.
- Confirm that the grid display in the viewports has been disabled.
- Zoom out all the viewports by selecting the Zoom Extents All icon  or by typing the command: **ZoomExtentsAll** at the command line and pressing ENTER.



## Create an Eyeball



Once again it's the same old story, there are numerous ways to create a representation of a human eye -- this is only one method. You might be tempted to just create a sphere and trim a hole in with a surface for the iris behind and let that be an end of it, there are however good reasons not to proceed with that approach.


Our main focus should be and is to create objects that do not contain trimmed surfaces or if they do a minimum of them. Again, the rationale behind this idea is that using trimmed surfaces at any time within your model will add a significant amount of computational overhead and can really slow things down display wise even on a very fast and powerful system. Of course we are assuming that you plan on animating your model once completed. If this is the case you will want the real benefit of maximum interactivity and you will no doubt want to be able to move your model and have it respond quickly to changes in setup and pose. However if you don't plan on animating later then by all means trim away to your hearts content.

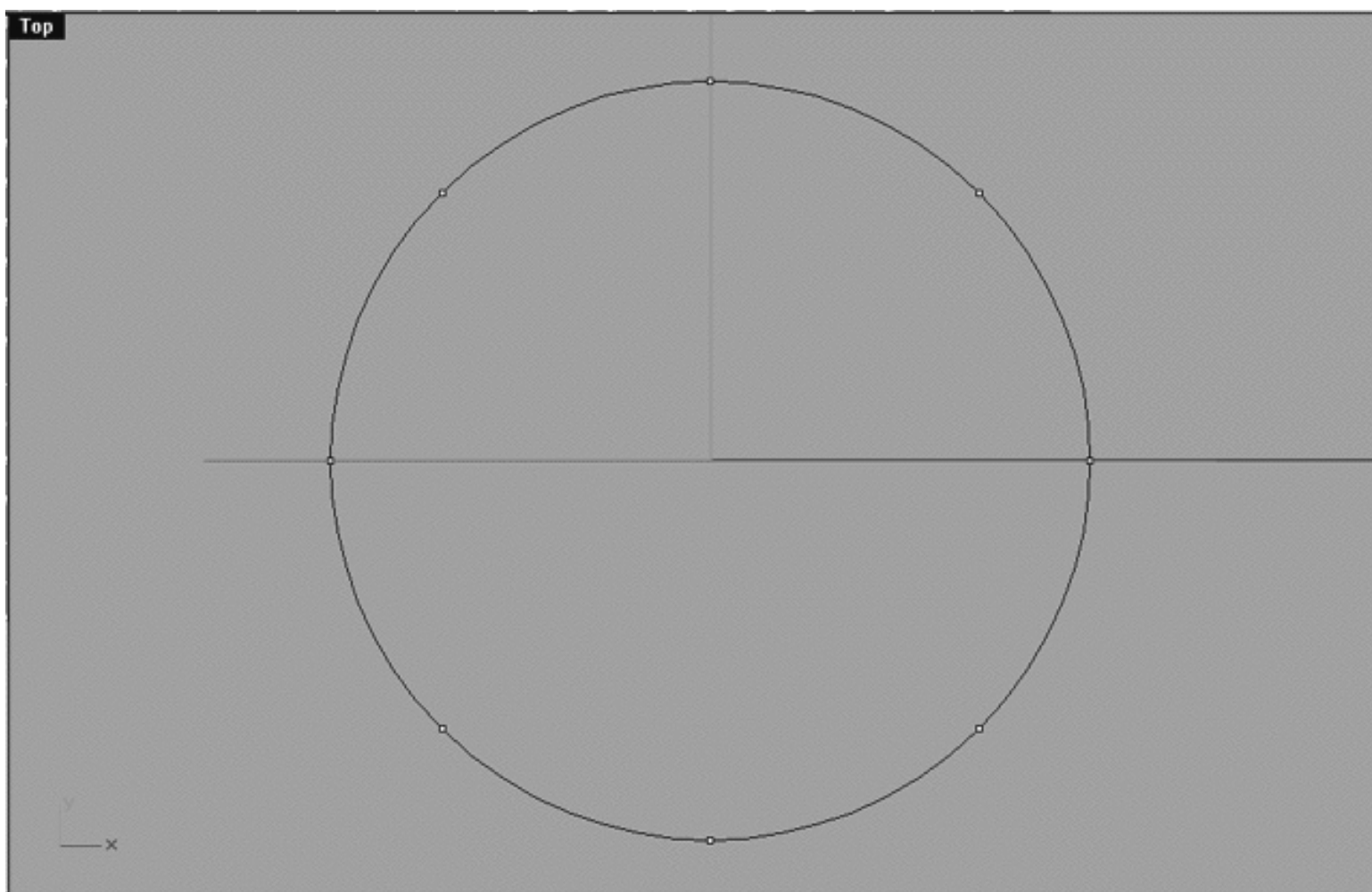
For our eye model we will create two spherical objects a large one and a smaller one. We will show you how to create a spherical primitive with Rhino that is suited to the task. The large one will have a flat front end and will make up the white part of the eyeball. A smaller sphere will be created from the large one and will be rotated 180 degrees so that it's rounded end now faces front. This sphere will resided inside the larger one and will be moved forward so that the rounded end protrudes out of the large sphere, thus creating what would be cornea of the eye. Prior to rendering this cornea object will be assigned a clear material that will add highlights to the eye in addition to allowing us to see the iris which would otherwise be obscured. A patch object can be created to represent the surface of the iris, however, one drawback is that this is actually a trimmed surface. This is somewhat of a contradiction to our ethos of trying not to use trims if possible within our model so if your a purist you may choose leave this object out of your model. If you do, you can still create an iris for your eye by "painting" one on the flat surface of the eyeball with a map which will work just fine. We will also show you how to create the eyelids too, but we will hold off saying any more about it until a bit later on in the tutorial but for now, let's get stuck in to the eyeball..!

- Create a new layer entitled EyeTemp. To do this, open the Edit Layers dialogue box by Right Clicking on the layer info window at the lower status bar -- the dialogue box will appear. Click on the New button and type in the name EyeTemp in the highlighted field. Leave the layer colour at it's default (black) and press OK to complete the operation.
- Make the EyeTemp layer active by Left Clicking on the Layer Info window at the lower status bar. Find the EyeTemp layer in the list, highlight it and Left Click to complete the operation. The layer entitled Eyetemp should now appear in the layer info window.
- Activate the grid snap by pressing the F9 key.
- From the toolbar choose the Circle: Centre, Radius icon  by Left Clicking on it or type the command: Circle at the command line.
- The system will respond with the following prompt at the command line: **Centre of Circle (Vertical AroundCurve):**
- In the Top Viewport, define the centre of the circle by snapping to the following coordinates: X: 0.000 Y: 0.000 Z: 0.000 and Left Click with your mouse to establish.
- Press the F9 key again to toggle off and disable the grid snap feature.
- Now at the command line type in 15 and press Enter to complete the operation, this will create a circle in the Top Viewport of exactly 15 units in size.
- In Any Viewport select the circle you've just created by Left Clicking on it -- It will highlight.
- Display its edit points by choosing the Edit Points On/Off icon  or by typing EditPtOn at the command line and pressing Enter, in any event the edit points should now become visible.
- Create a new layer entitled EyeCurve. Open the Edit Layers dialogue box by Right Clicking on the layer info window at the lower status bar -- the dialogue box will appear. Click on the New button and type in the name EyeCurve in the highlighted field. Set the layer colour to magenta, to do this just click on the colour field, the Select Colour dialogue will appear. Choose the magenta colour from the list and press OK and then OK again to complete the operation.
- Make the EyeCurve layer active by Left Clicking on the Layer Info window at the lower status bar. Find the EyeCurve layer in the list, highlight it and Left Click to complete the operation. The layer entitled EyeCurve should now appear in the layer info window.
- Open the Edit Layers dialogue box by Right Clicking on the Layer info window at the lower status bar -- the dialogue box will appear.
- Find the layer entitled: EyeTemp in the list and LOCK the layer, then press OK to exit.
- Maximise the Top viewport by Double Left Clicking on its label.

- Press F9 to activate the grid snap feature.



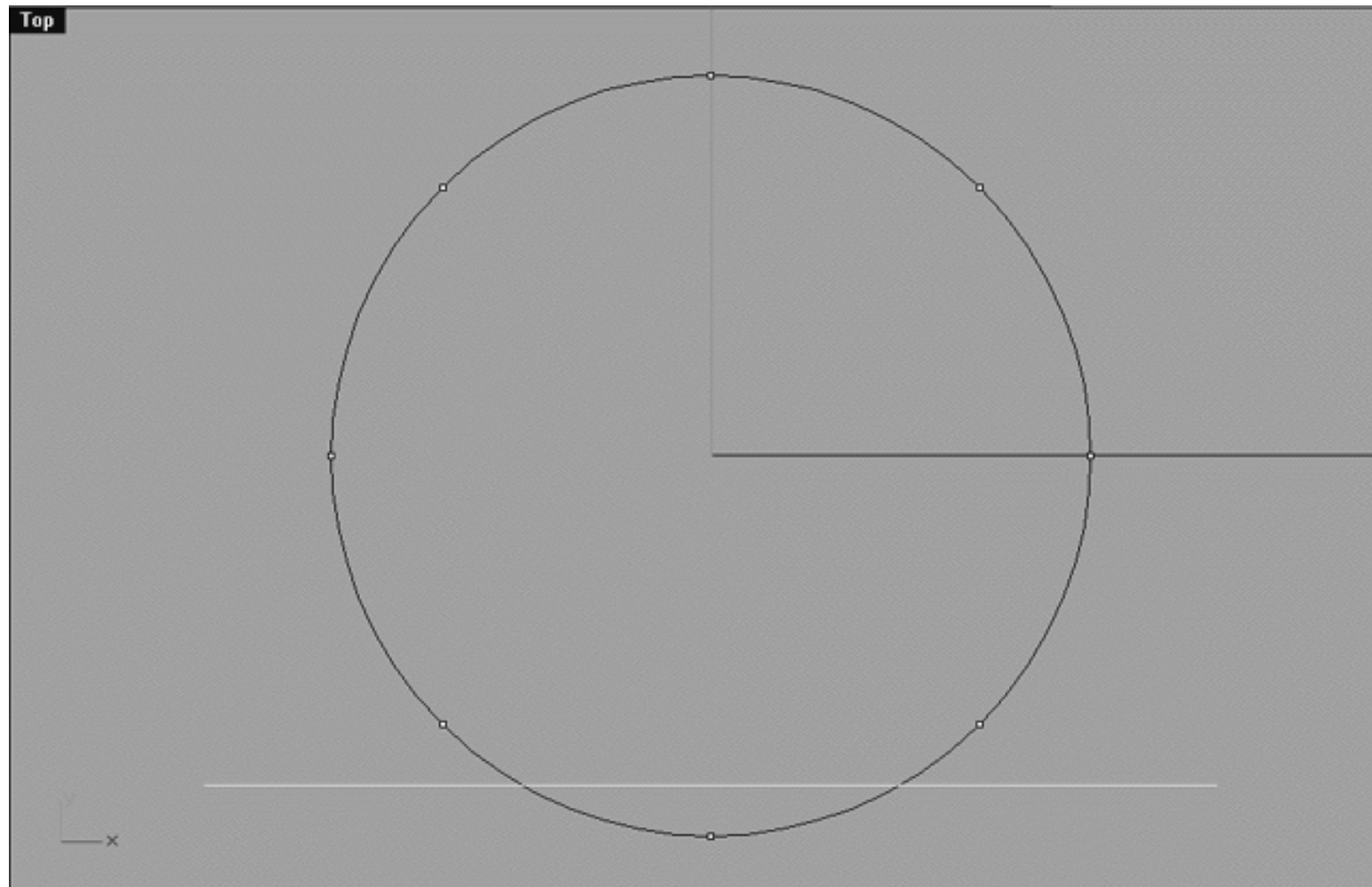
- From the toolbar choose the Polyline icon  or type: Polyline at the command line and press enter. The system will respond with the following prompt at the command line: Start of Polyline:
- Draw a straight horizontal line across the centre of the circle. To do this, place a point to the left side of the circle at approximately the following coordinates: X: -20.000 Y: 0.000 Z: 0.000, your cursor should snap to this location when the mouse is moved near this area. When it snaps to these coordinates Left Click to set the first point.
- Now drag the mouse straight across from left to right until the cursor snaps to the following coordinates: X: 20.000 Y: 0.000 Z: 0.000. When it does, Left Click to set the second point and then Right Click to complete the operation.
- Press F9 to disable the grid snap feature.
- Your monitor should now resemble the screenshot below:



*This **Top Viewport** screenshot shows the circular curve in black on the EyeTemp layer (now locked) and the horizontal Polyline on the EyeCurve layer. Notice that the polyline starts just to the left of the circle and ends just to the right (although it's end point is hard to see in this illustration).*

- In Any Viewport select the horizontal polyline by Left Clicking on it -- it will highlight.

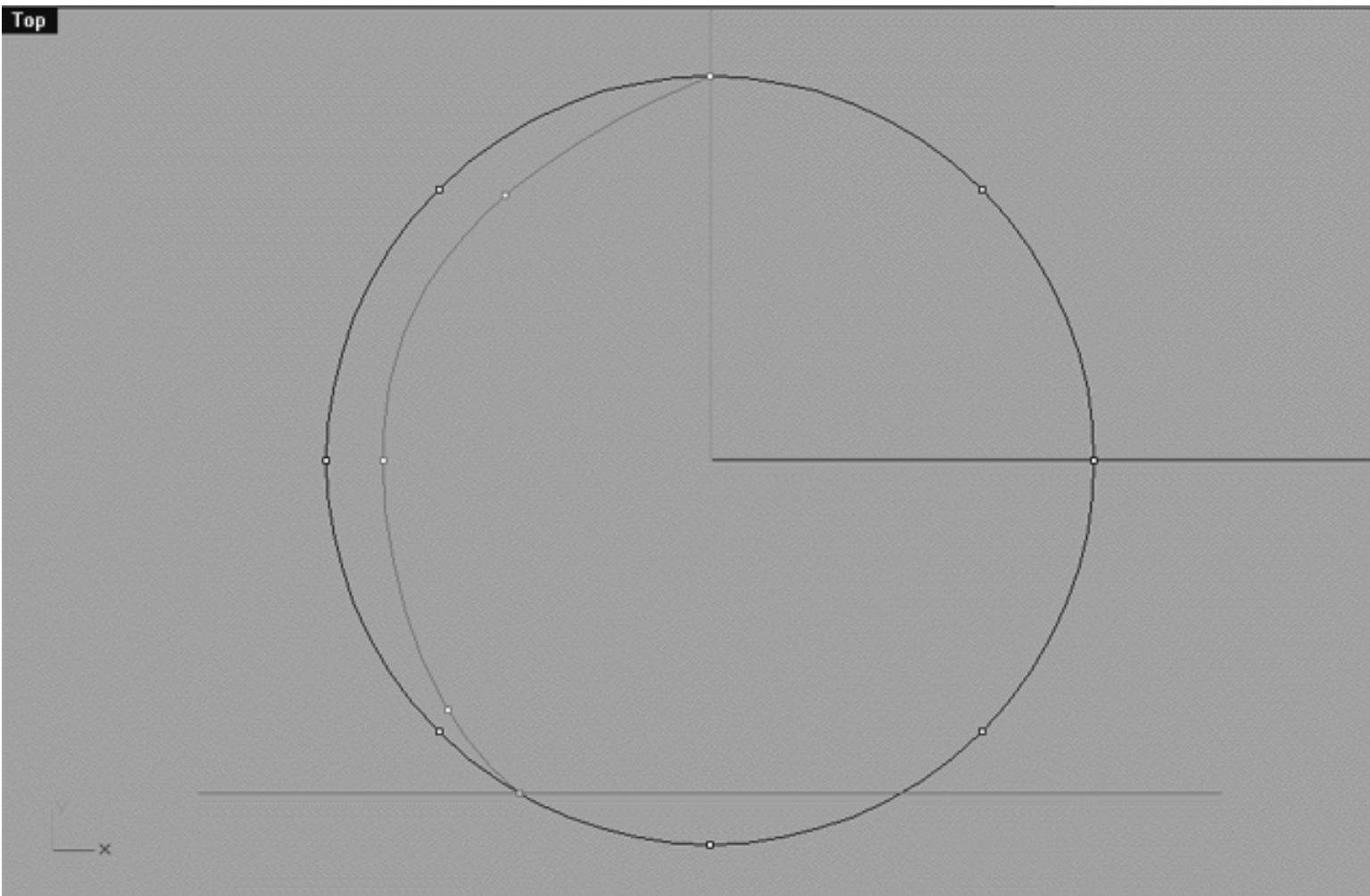
- Now working in the Top Viewport, hold down the Shift Key and drag the polyline downward toward the bottom of the screen 13 units.
- Your monitor should now resemble the screenshot below:



*This **Top Viewport** screenshot shows that the polyline has now been dragged downward along the Y axis roughly 13 units.*

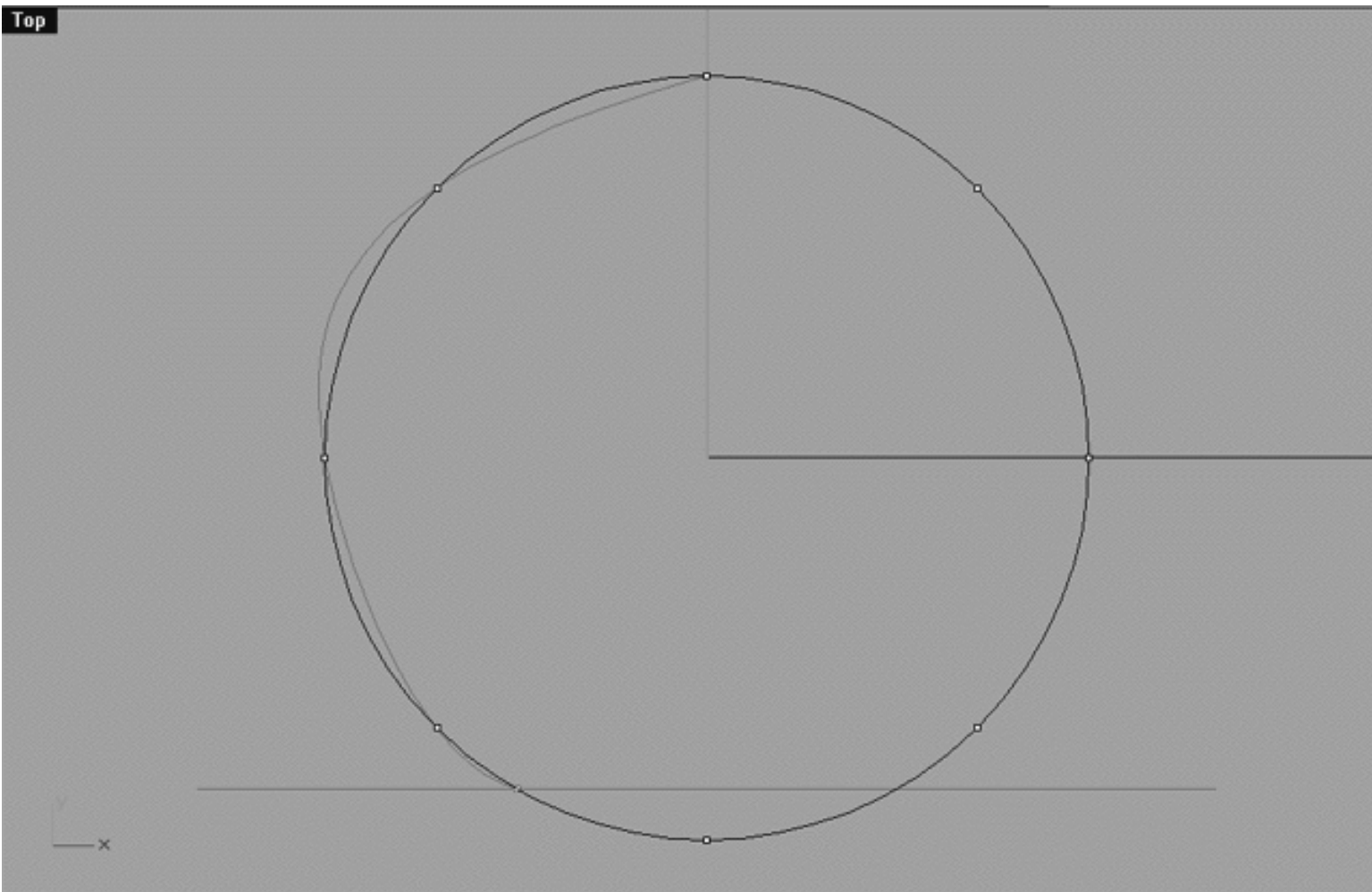
- Enable Osnap/point to do this Left Click on Osnap at the lower status bar, the dialogue box will open. Place a tick next to point and press X to close the dialogue.
- From the toolbar choose the Control Point Curve icon or type the command: Curve at the command line and press Enter. The system will respond with the following prompt at the command line: Start of Curve:
- Now begin by snapping the start of the new curve to the point at the 12 o'clock position by Left Clicking on it. Continue by placing points along the circle by clicking at the 10, 9, and 8 o'clock positions. Place the last point at the location where the horizontal line intersects with the circle and right click to finish.
- Select the new curve by Left Clicking on it -- it will highlight. Once done, display its edit points.
- Your monitor should now resemble the screenshot below:





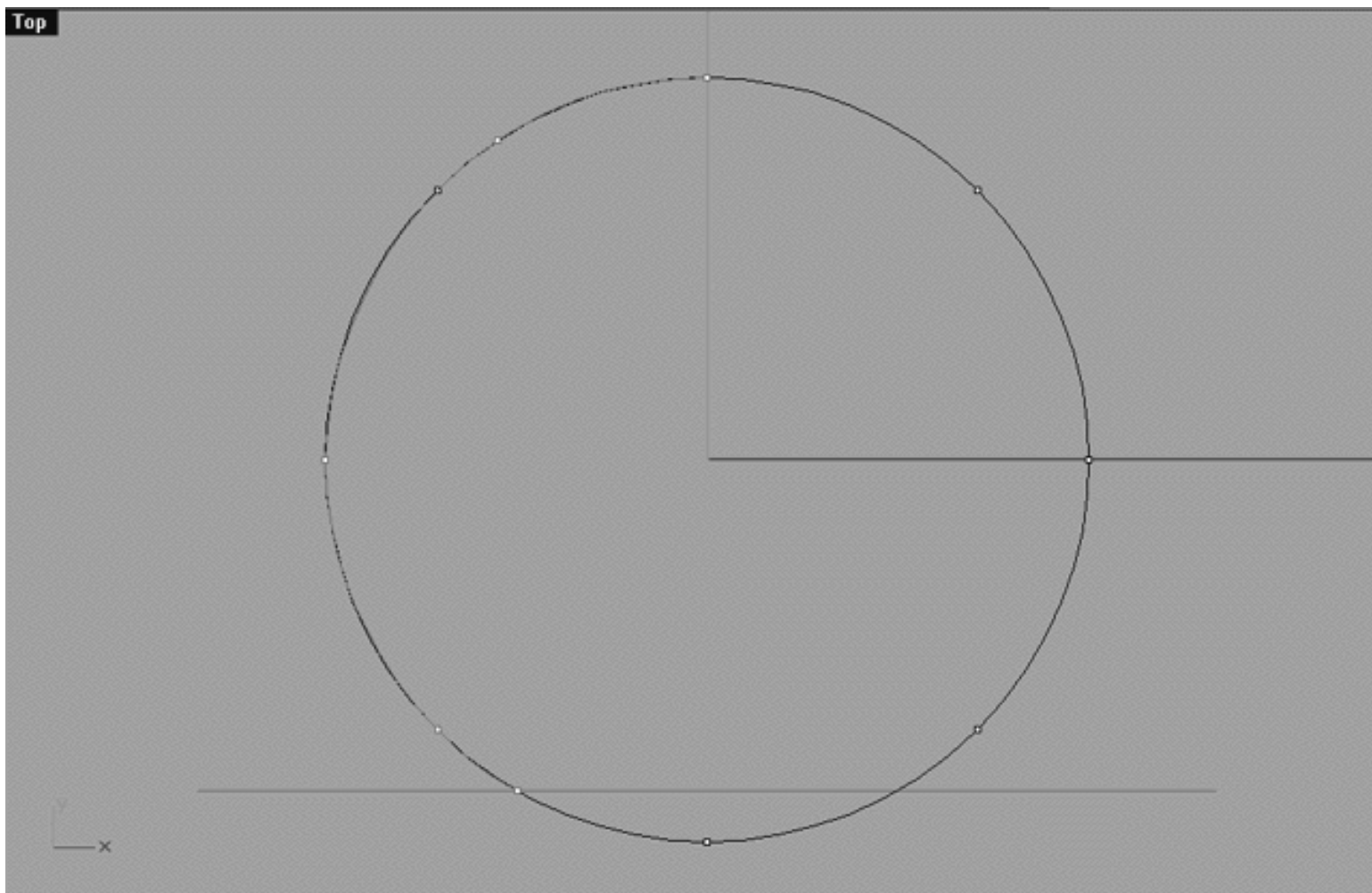
This **Top Viewport** screenshot shows the circular curve in black on the EyeTemp layer (locked) and the horizontal Polyline on the EyeCurve layer near the bottom of the screen. The new curve we just created has been drawn beginning with the point at 12 o'clock position. Additional points have then been placed at the 10, 9 and 8 o'clock positions with the last point being set at the location where the horizontal polyline intersects with the circular curve. Even though we snapped the points to the circle they haven't really stuck where we want them, that is, with the exception of the first and last points. Don't worry, we are going to edit the curve so the points lie where they should next.

- Move each of the points on the new curve at the 10, 9 and 8 o'clock positions so that they snap to their respective point on the circular curve, do NOT move the first or last point.
- Once done, your monitor should resemble the screenshot below:




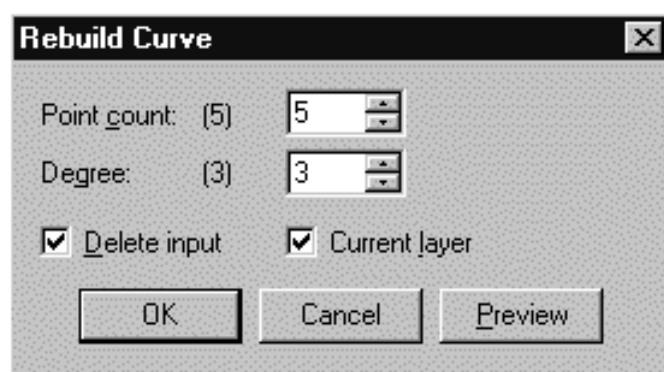
*This **Top Viewport** screenshot shows that although we are getting closer its still needs to be refined a bit more. To do this, we should only have to tweak one point just a bit -- what could be easier?*

- Select the point at the 10 o'clock position and move it just a bit along the circle toward the 12 o'clock point, hopefully this should tighten things up.
- Your monitor should now resemble the screenshot below:




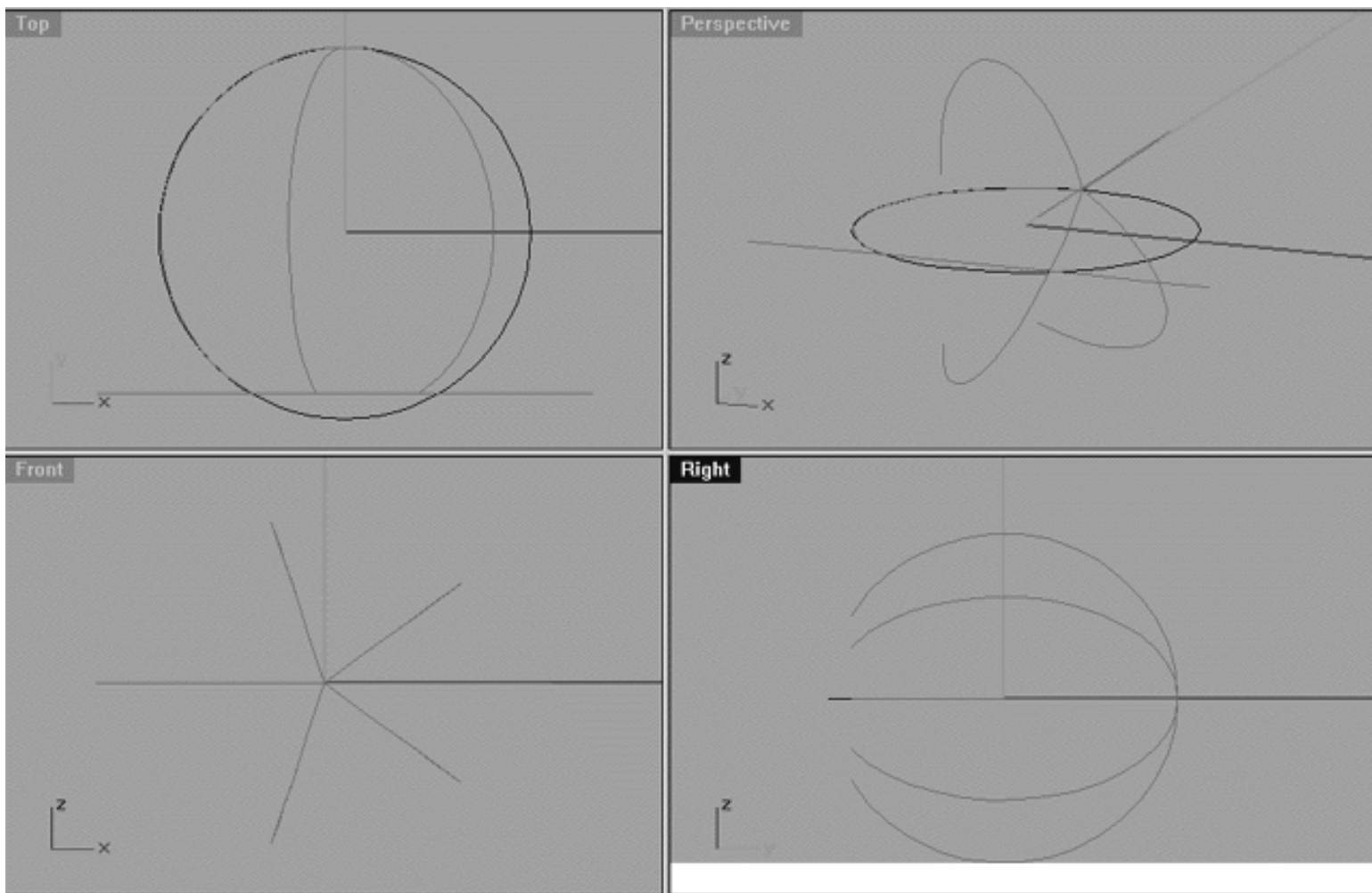
*This **Top Viewport** screenshot is more like it -- the new curve is now following the circular template quite well indeed.*

- Minimise the Top Viewport by Double Left clicking on its label.
- Hide the edit points by choosing the Edit Points On/Off icon  from the toolbar and Right Clicking on it or type: PtOff at the command line and press Enter.
- In Any Viewport select the new curve by Left Clicking on it -- it will highlight.
- At the command line type: Rebuild and press Enter -- the following dialogue box will appear:




*This screenshot shows the Rebuild Curve dialogue box and the values you should enter within.*

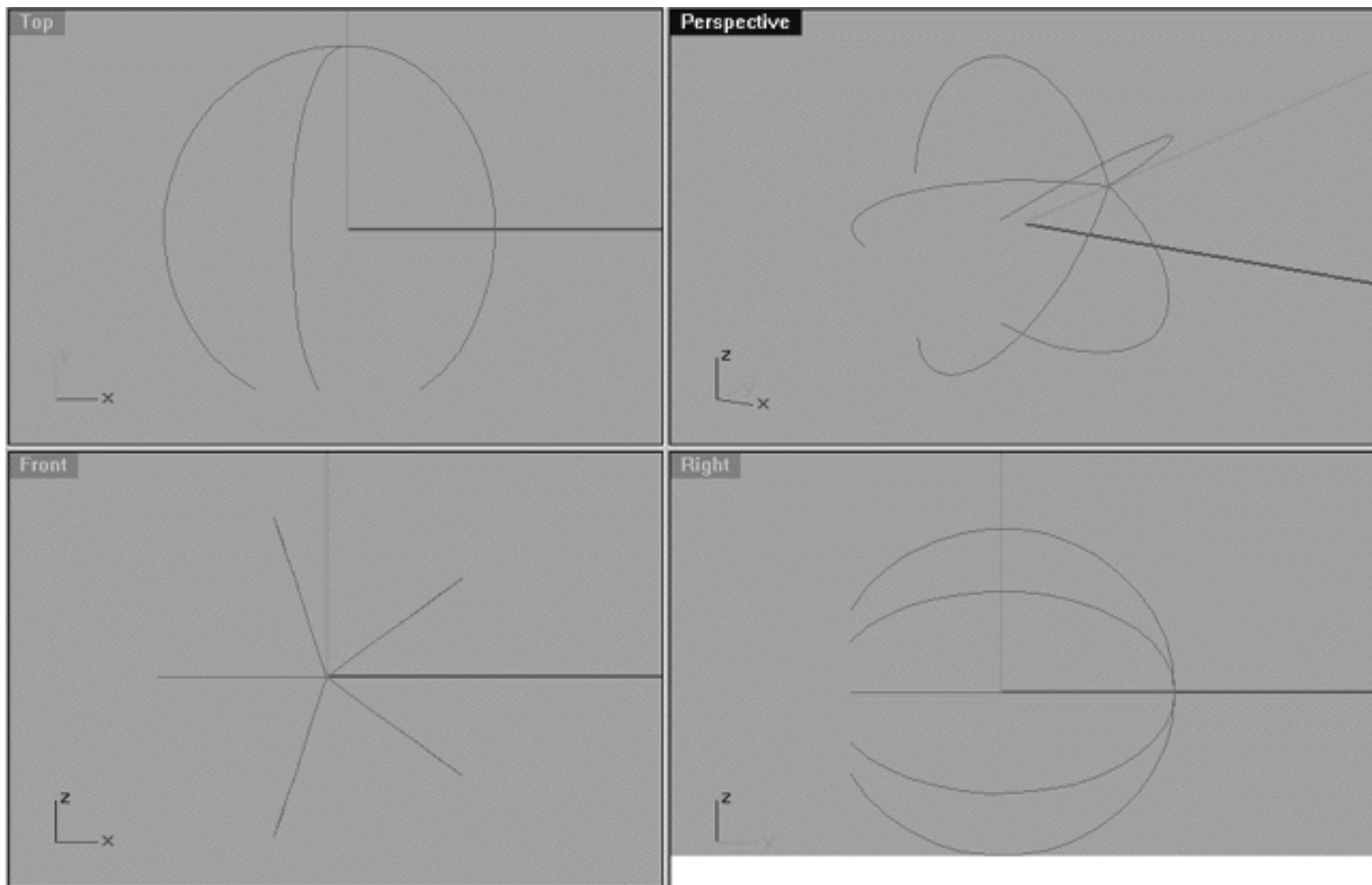
- Enter the values just as they are in the previous screenshot above, (i.e., Point count = 5, Degree = 3, Delete input = Yes, Current layer = Yes) once done, press OK to continue. By performing this procedure Rhinoceros will make sure that the points are as evenly spaced and weighted as possible given the current shape of the curve.
- Once again, select the curve by Left Clicking on it -- it will highlight.
- Open the Osnaps dialogue box by Left Clicking on the Osnap info window at the lower status bar, untick point and then tick End. Once done, exit the dialogue by clicking on X.
- From the toolbar choose the Polar Array icon  or type ArrayPolar at the command line and press Enter.
- The system will respond with the following prompt at the command line: Centre of polar array:
- In the Front Viewport move your cursor to the X: 0.000 Y: 0.000 Z: 0.000 coordinate, the cursor should jump to it when moved nearby. When it has done Left Click.
- The system will respond with the following prompt at the command line: Number of elements:
- Type 5 and press Enter.
- The system will respond with the following prompt at the command line: Angle to fill <360>
- Press Enter -- an array of 5 curves will be created. Your monitor should now resemble the screenshot below:



*This **All Viewport** screenshot shows that a polar array of curves has now been created.*

- Disable any currently active Osnaps.
- Open the Edit Layers dialogue box by Right Clicking on the Layers Info box at the lower status bar. Once done, find the layer entitled EyeTemp and turn it OFF then press OK to exit.
- In Any Viewport select the horizontal polyline by Left Clicking on it -- it will highlight.
- Hide the polyline by choosing the Hide icon  from the toolbar or by typing Hide at the command line and pressing Enter.
- Move your cursor into the Perspective Viewport and move your mouse while holding down the Right mouse key, this will cause the object to rotate in the perspective view. Situate the object so that it is aligned in such a way that picking the end curves can be easily accomplished as in the screenshot below:






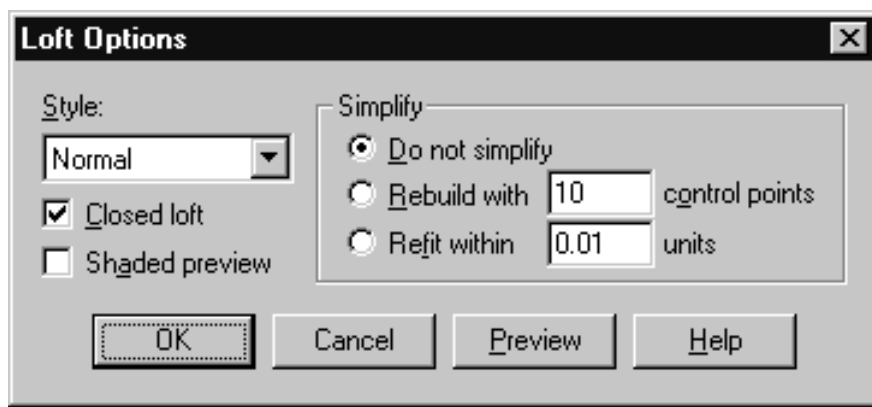
This **All Viewport** screen shot shows how the objects on your monitor should now look.

- Create a new layer entitled EyeSurf. To do this, open the Edit Layers dialogue box by Right Clicking on the layer info window at the lower status bar -- the dialogue box will appear. Click on the New button and type in the name EyeSurf in the highlighted field. Leave the layer colour at it's default (black) and press OK to complete the operation.
- Make the EyeSurf layer active by Left Clicking on the Layer Info window at the lower status bar. Find the EyeSurf layer in the list, highlight it and Left Click to complete the operation. The layer entitled EyeSurf should now appear in the layer info window.

We can now create a surface for the eyeball by lofting.

- From the toolbar choose the Loft icon  or type: Loft at the command line and press Enter.
- The system will respond with the following prompt at the command line: Select curves to loft ( Point ):
- In the Perspective Viewport starting with the curve at the 12 o'clock position and working in a clockwise manner select the open end of each curve one by one, as you do they will highlight. When you reach the last one and all the curves are highlighted press Enter.
- The following dialogue box will appear as in the screenshot below:

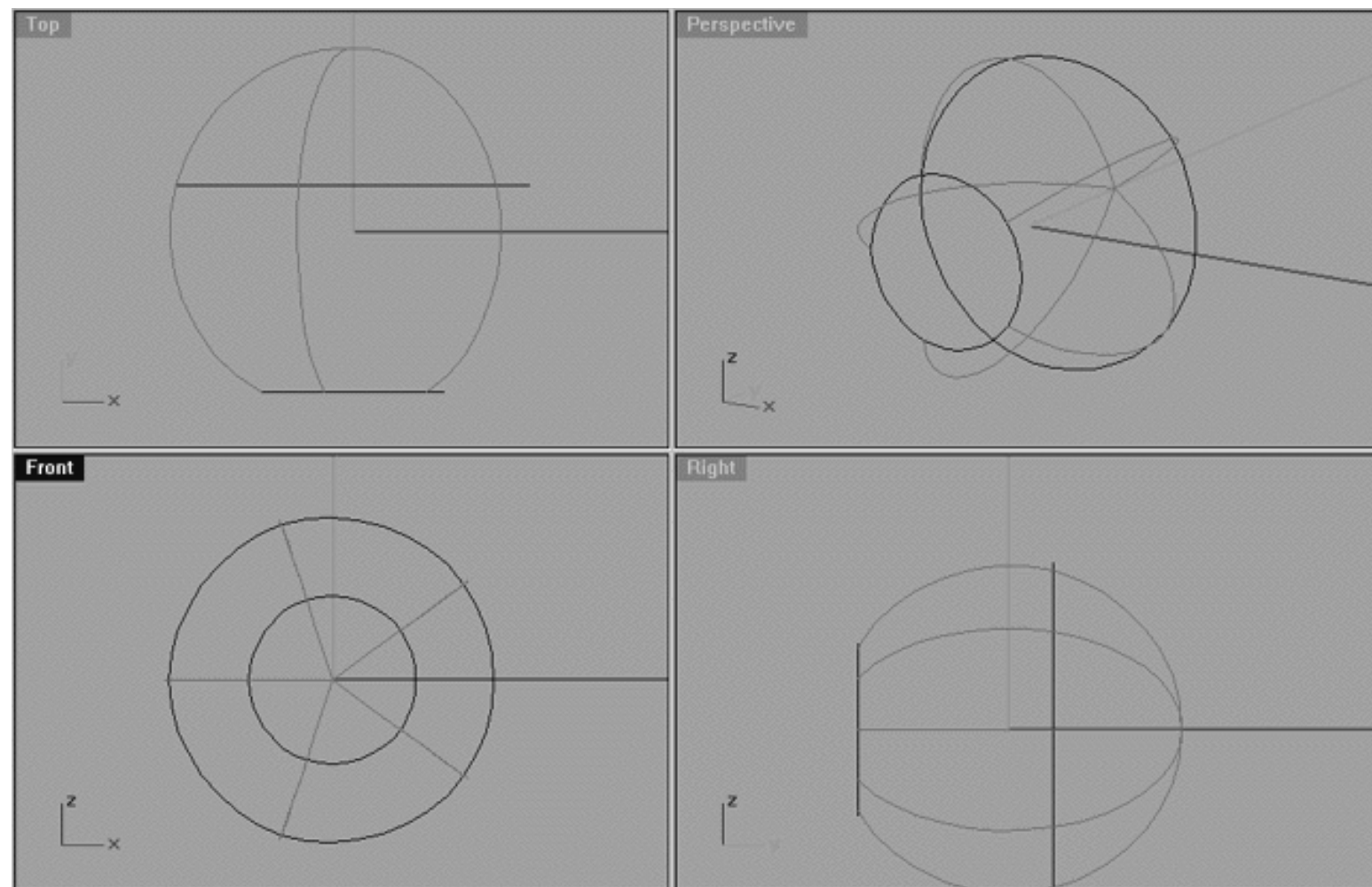




*This screenshot shows the Loft Options dialogue box and the values that should be set within.*

Make sure you set all the values as in the screenshot above. Style = Normal, Closed loft = Yes, Shaded preview = No, Simplify = Do not. When all the values have been correctly set press OK.

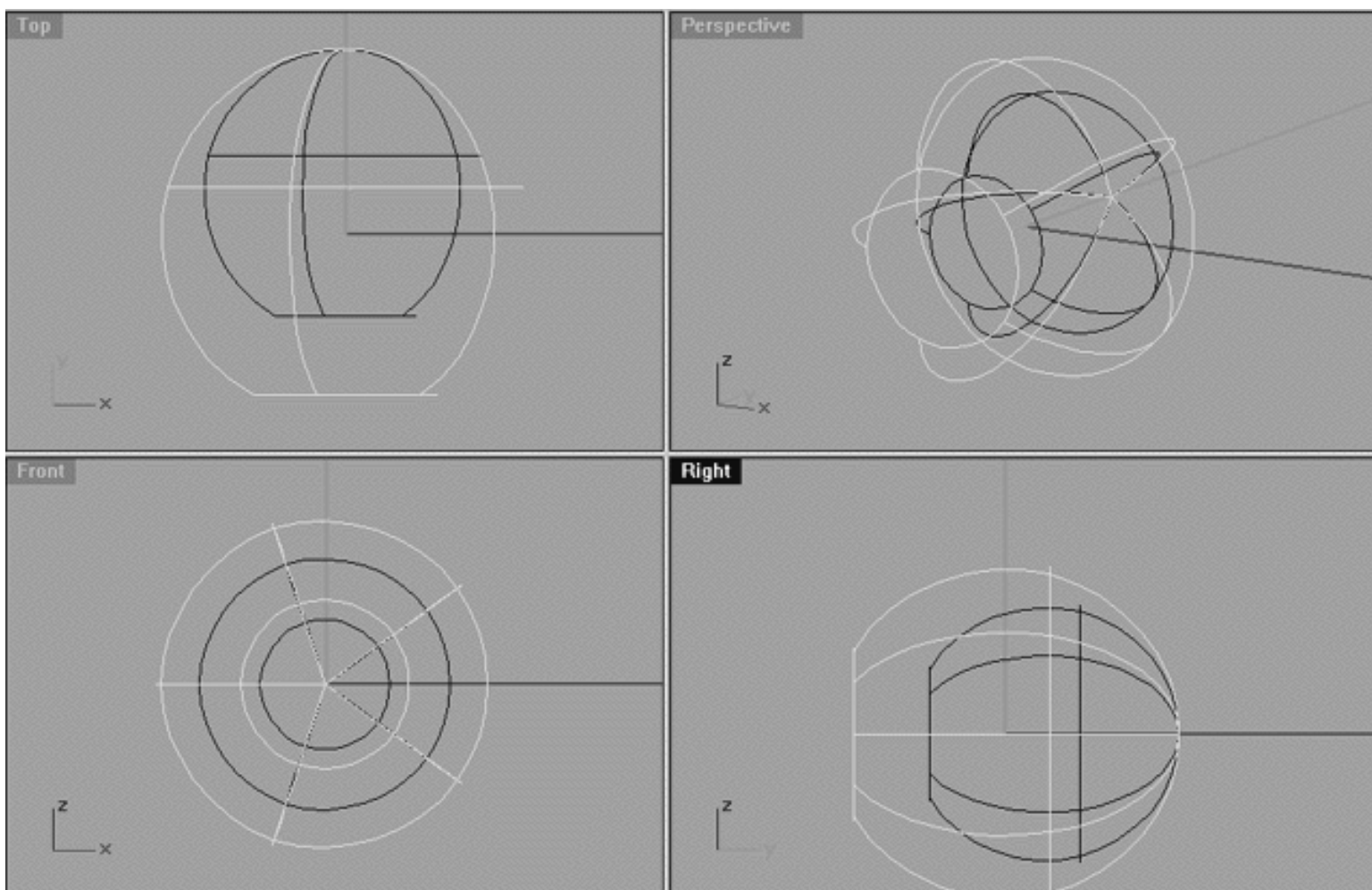
Your monitor should now resemble the screen shot below:




*This **All Viewport** screenshot shows that a surface has now been created by lofting the array of curves.*

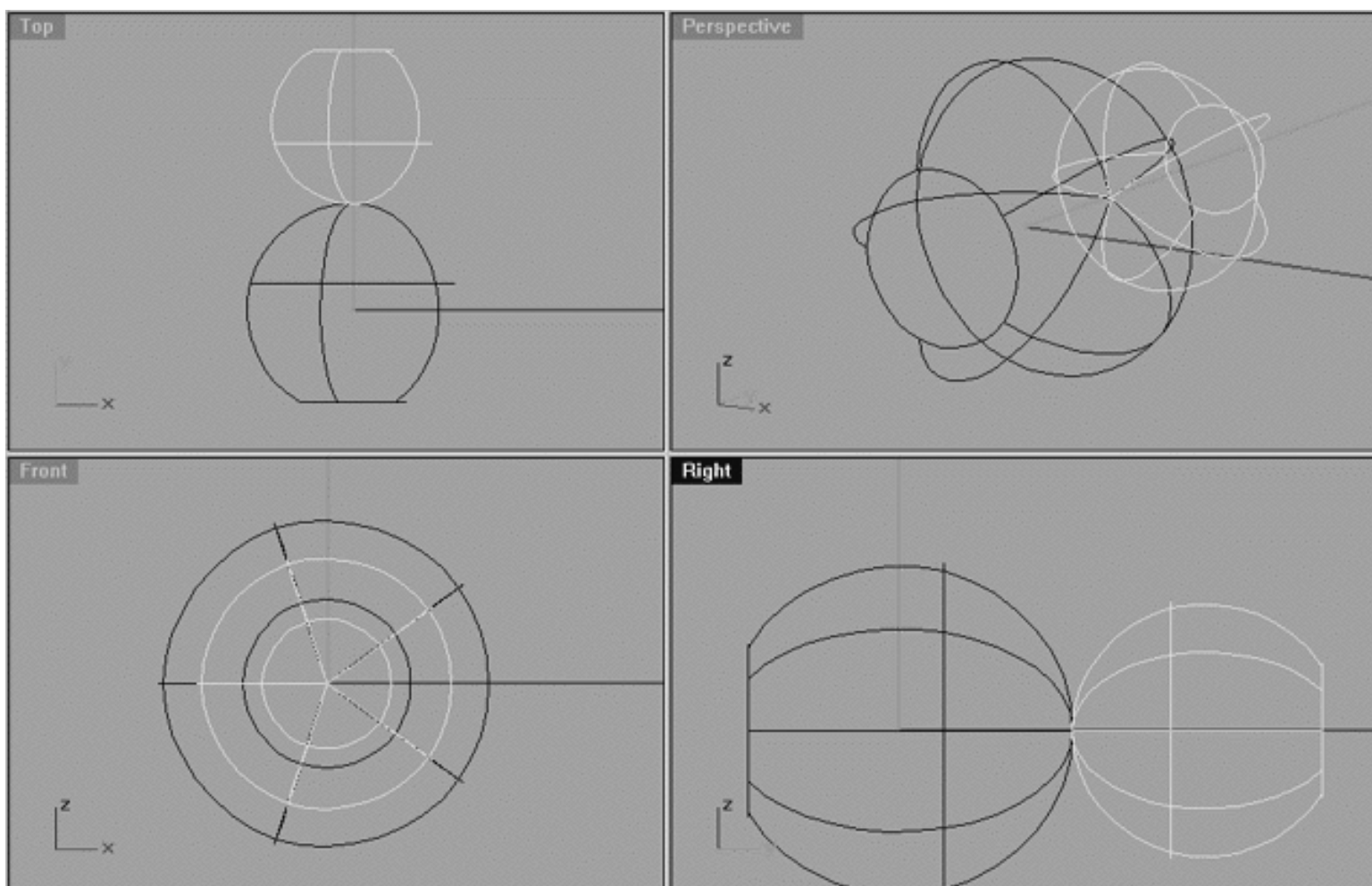
- Open the Edit Layers dialogue box by Right Clicking on the layer info window at the lower status bar -- the dialogue box will appear. Locate the layer entitled EyeCurve and turn it OFF. Once done, press OK to complete the operation.
- In Any Viewport select the Eyeball surface by Left Clicking on it -- it will highlight.

- From the toolbar select the Scale icon or type: Scale at the command line and press Enter.
- The system will respond with the following prompt at the command line: Origin point ( Copy ):
- At the command line type: Copy and press Enter.
- The system will respond with the following prompt at the command line: Origin point:
- Enable the Osnap/End.
- In the Front Viewport place your cursor in the dead centre of the surface, when you do so it should snap to the following coordinates: X: 0.000, Y: 15.000, Z: 0.000 which is the end point of the eyeball surface (the closed end). Once it's jumped to those coordinates Left Click with your mouse.
- The system will respond with the following prompt at the command line: Scale factor or first reference point:
- Type in: 0.769 at the command line and press Enter, then once done, hit Esc to complete the operation.
- A 2nd smaller eyeball surface should have now been created. Your monitor should resemble the screenshot below:



*This **All Viewport** screenshot shows that the eyeball surface has been duplicated and scaled thereby creating a smaller eyeball inside the larger one.*


- Zoom out the Right Viewport so that there is plenty of room on either side of the eyeball.
- In Any Viewport select the smaller eyeball by Left Clicking on it -- it will highlight.
- From the toolbar select the Rotate 2D icon  or type: Rotate at the command line and press Enter.
- The system will respond with the following prompt at the command line: Centre of rotation ( Copy ):
- In the Front Viewport place your cursor in the dead centre of the small eyeball surface, when you do so it should snap to the following coordinates: X: 0.000, Y: 15.000, Z: 0.000 which is the end point of the small eyeball surface (the closed end). Once it's jumped to those coordinates Left Click with your mouse.
- The system will respond with the following prompt at the command line: Angle or first reference point ( Copy ):
- Move your cursor into the Right viewport, hold down the Shift key and drag your cursor along the Y axis in the direction of the open end of the sphere, when you've gone about 30 units Left Click your mouse to set the first reference point. Once done, begin to rotate the sphere until you've gone about 170 degrees and then hold down the shift key. The sphere should then snap down at exactly 180 degrees, when it's done so Left Click to complete the operation.
- Your monitor should now resemble the screenshot below:

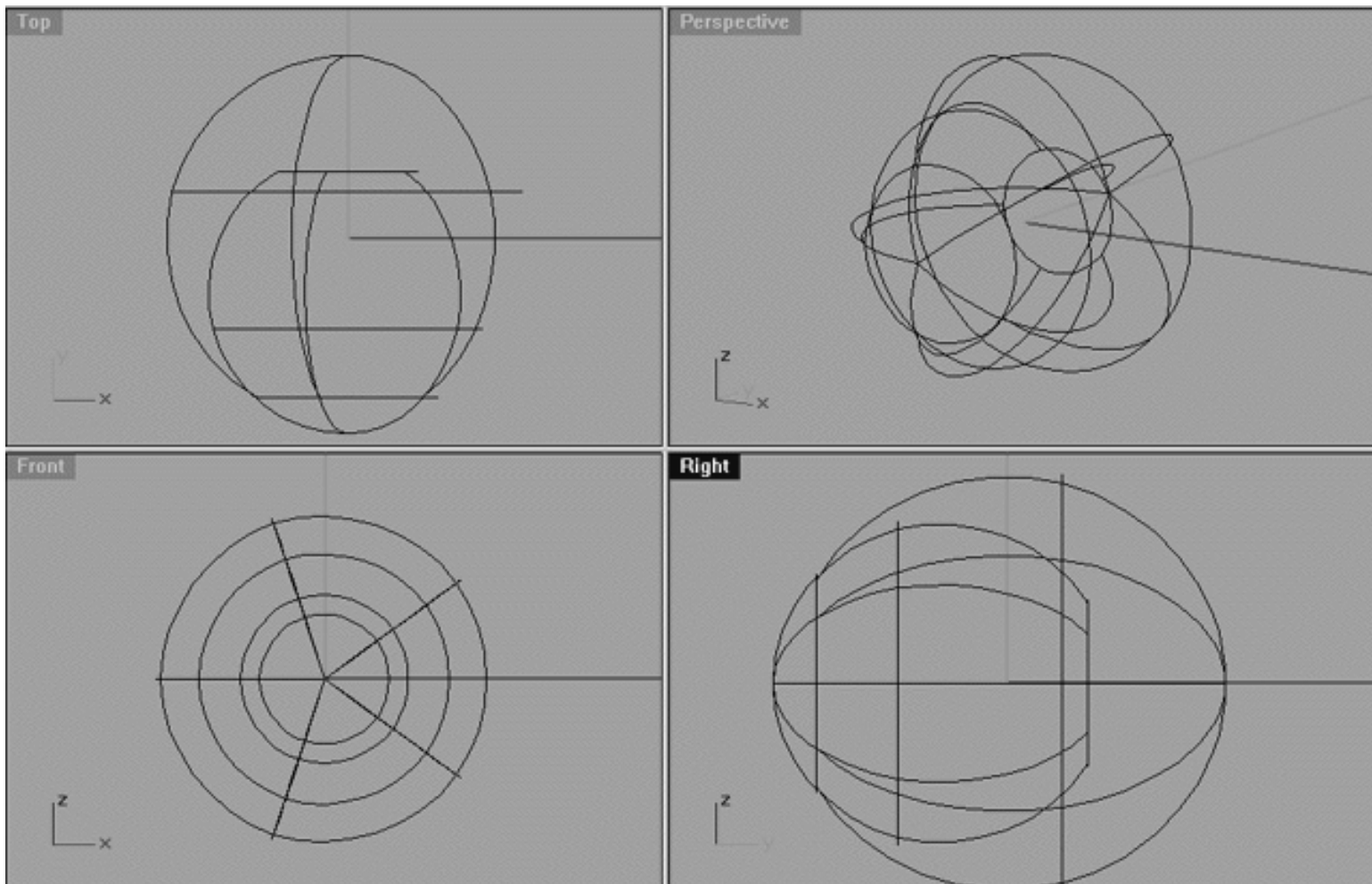


*This **All Viewport** screenshot shows that the smaller "inside" eyeball has now been rotated 180 degrees.*





- From the toolbar choose the Move icon  or type: Move at the command line and press Enter.
- With the Osnap/End still active, In the Right Viewport move your cursor to the end point of the closed curve (i.e., the point at which both spheres are touching) the cursor should snap to the end point, when it does Left Click. Then hold down the Shift key and move the object along the -Y axis until you've gone about 30.970 units, then Left Click again to complete the operation.
- Your monitor should now resemble the screenshot below:




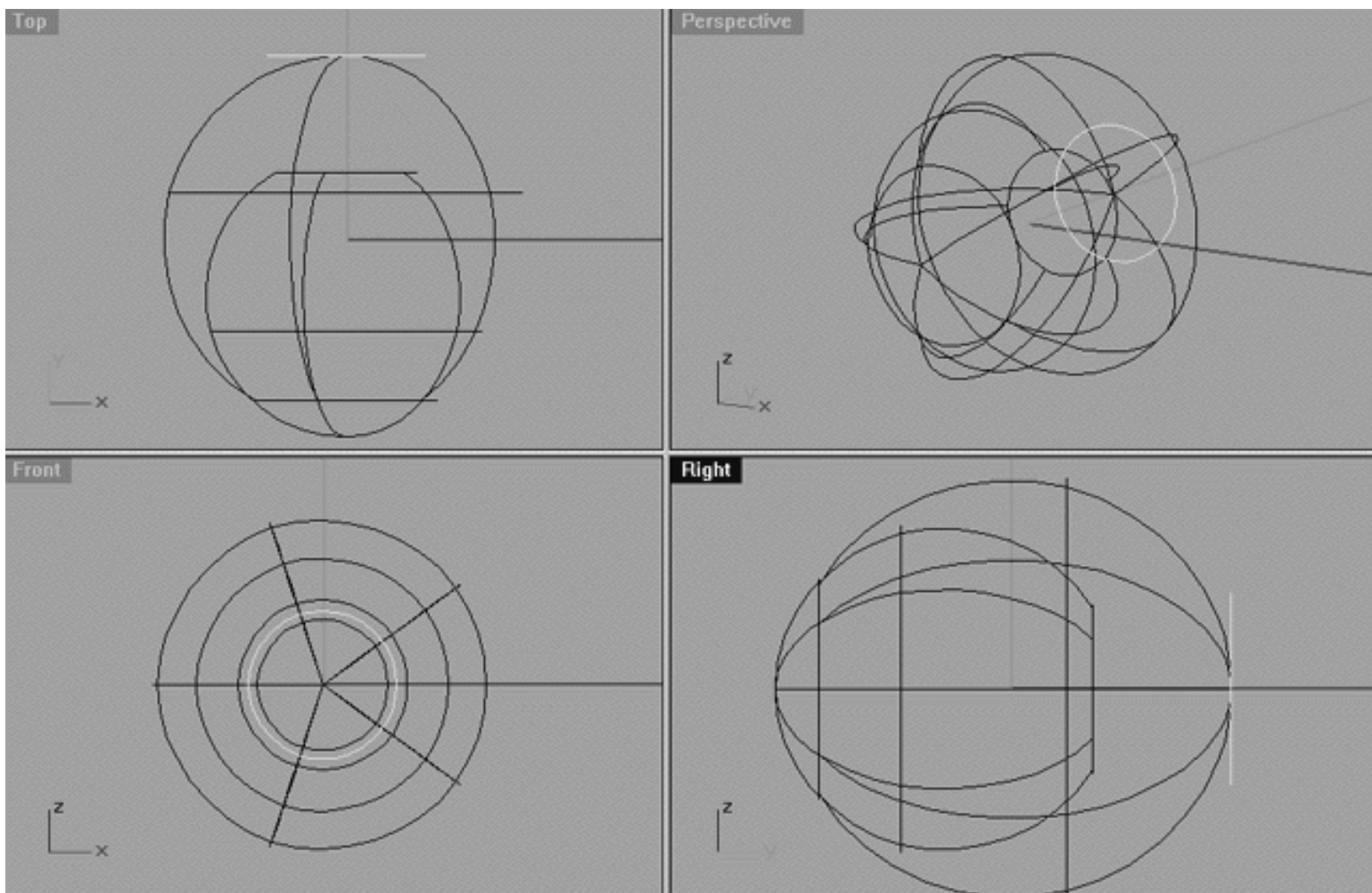
This **All Viewport** screenshot shows the "inner" eyeball surface has now been moved into position along the Y axis.

## The Iris and Pupil


Next we will create the Iris and Pupil...

- Maximise the Front Viewport by Double Left Clicking on its label.
- Make certain that the Osnap/End still active, if not enable it.

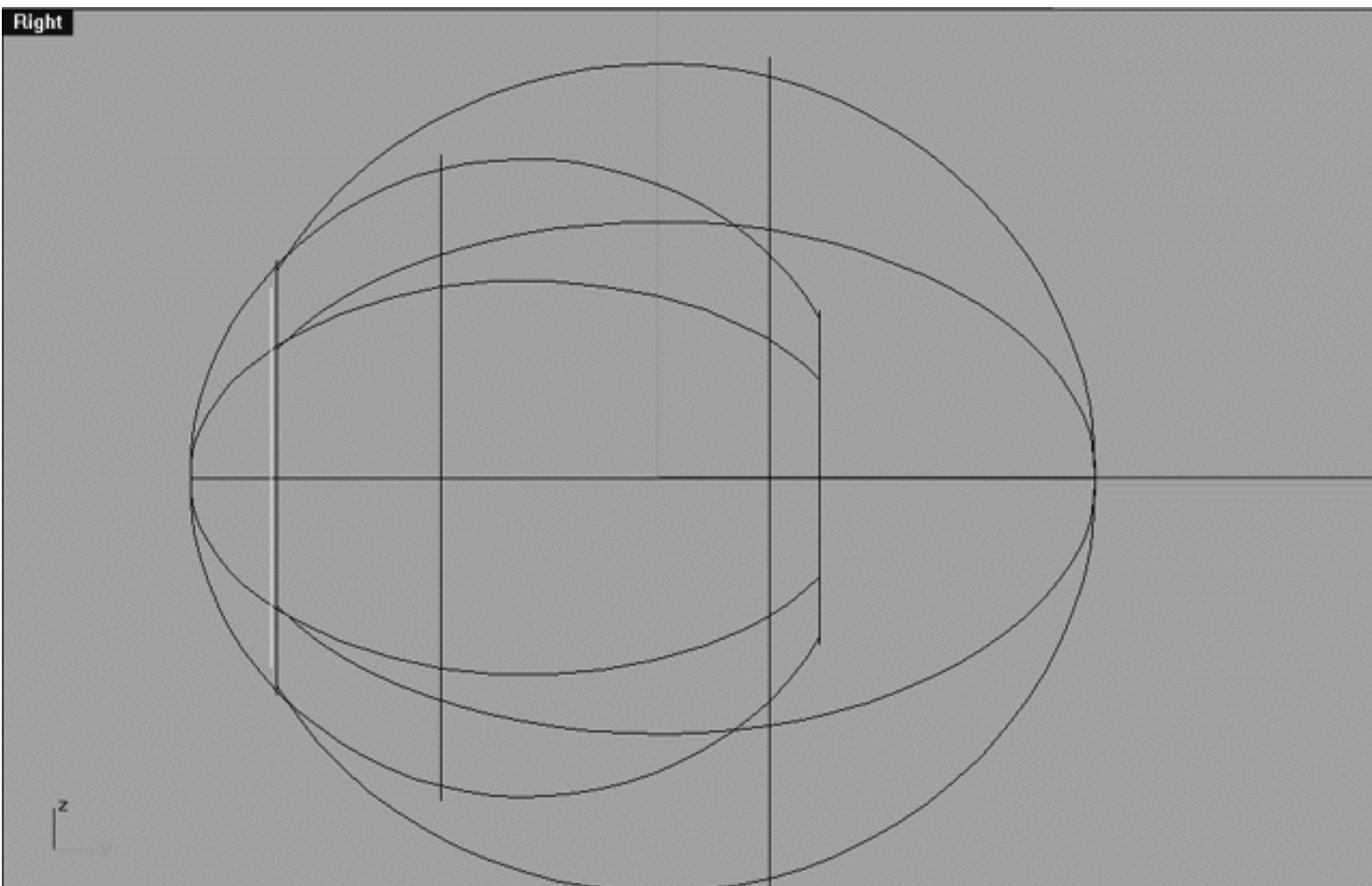
- Select the small "inner" eyeball surface -- it will highlight.
- Temporarily hide the object by choosing the hide icon from the toolbar or typing the command: hide at the command line and pressing enter.
- Once done, only the larger eyeball surface should now be visible.
- From the toolbar choose the Circle: Centre, Radius icon  by Left Clicking on it or type the command: Circle at the command line.
- The system will respond with the following prompt at the command line: **Centre of Circle (Vertical AroundCurve):**
- In the Front Viewport, define the dead centre of the circle by snapping to the following coordinates: X: 0.000 Y: 15.000 Z: 0.000 and Left Click with your mouse to establish.
- Now hold down the Shift Key whilst dragging out the circle about 6.480 units along the X axis. Once done, Left Click to complete the operation thus creating a new object.
- Unhide the smaller "inner" eyeball surface by choosing the hide icon from the toolbar and right clicking on it or type the command: Show at the command line and press enter.
- Minimise the Front Viewport by Double Left Clicking on its label.
- In Any Viewport select the new circle object you just created -- it will highlight.
- Your monitor should now resemble the screenshot below:



This **All Viewport** screenshot shows the circle object that has been created and situated at the rear of the large eyeball.

- Maximise the Right Viewport by Double Left clicking on its label.
- From the toolbar choose the Move icon  or type: Move at the command line and press Enter.
- With the Osnap/End still active, In the Right Viewport move your cursor to the end point of the new curve (i.e., the point at which the new curve and large sphere is touching) the cursor should snap to the end point at the following coordinates: X: 6.480, Y: 15.000, Z: 0.000, when it does Left Click. Then hold down the Shift key and move the object along the -Y axis until you've gone about 28.213 units, then Left Click again to complete the operation.
- The new curve will now be situated ever so slightly in front of the large sphere which makes up the eyeball surface. Your monitor should now resemble the screenshot below:

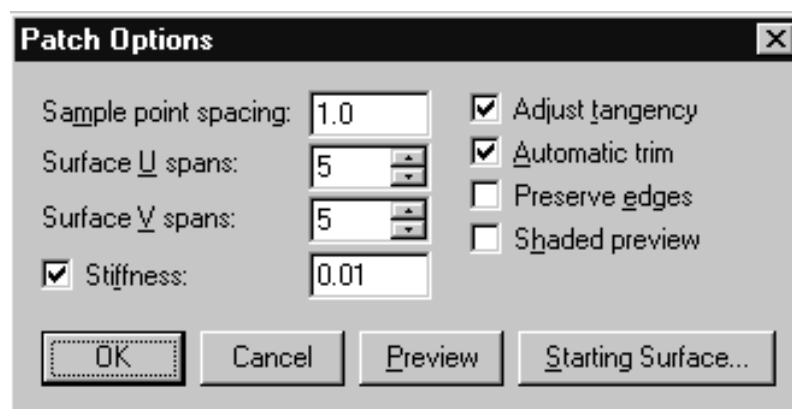




This **Right Viewport** screenshot shows the circle object has now been moved along the Y axis and is now situate just slightly in front of the large eyeball surface.

Now let's create a simple surface for the Iris -- it's easy!

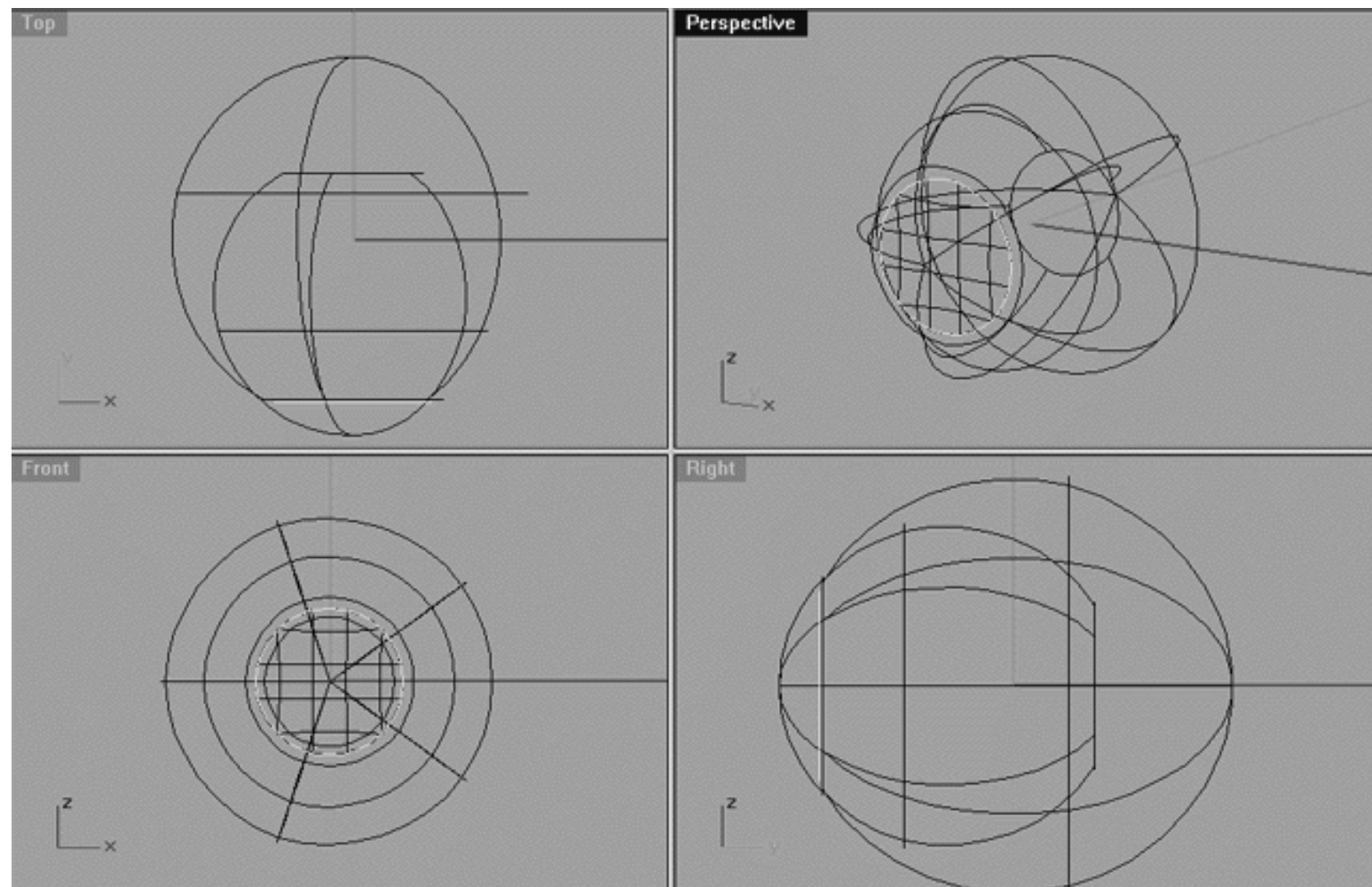
- Minimise the Right Viewport by Double Left Clicking on its label.
- The new curve should still be selected.
- From the Surface menu choose Patch or type the command: Patch at the command line and press enter.
- The Patch Options dialogue box will appear as in the screenshot below:



This screenshot shows the Patch Options dialogue box with the values you should enter.

Make sure to set all the values as follows: Sample point spacing = 1.0, Surface U spans = 5, Surface V spans = 5, Stiffness = Yes, Adjust tangency = Yes, Automatic trim = Yes. When all the values have been set as in the screenshot above press OK to complete the operation.

Your monitor should now resemble the screenshot below:

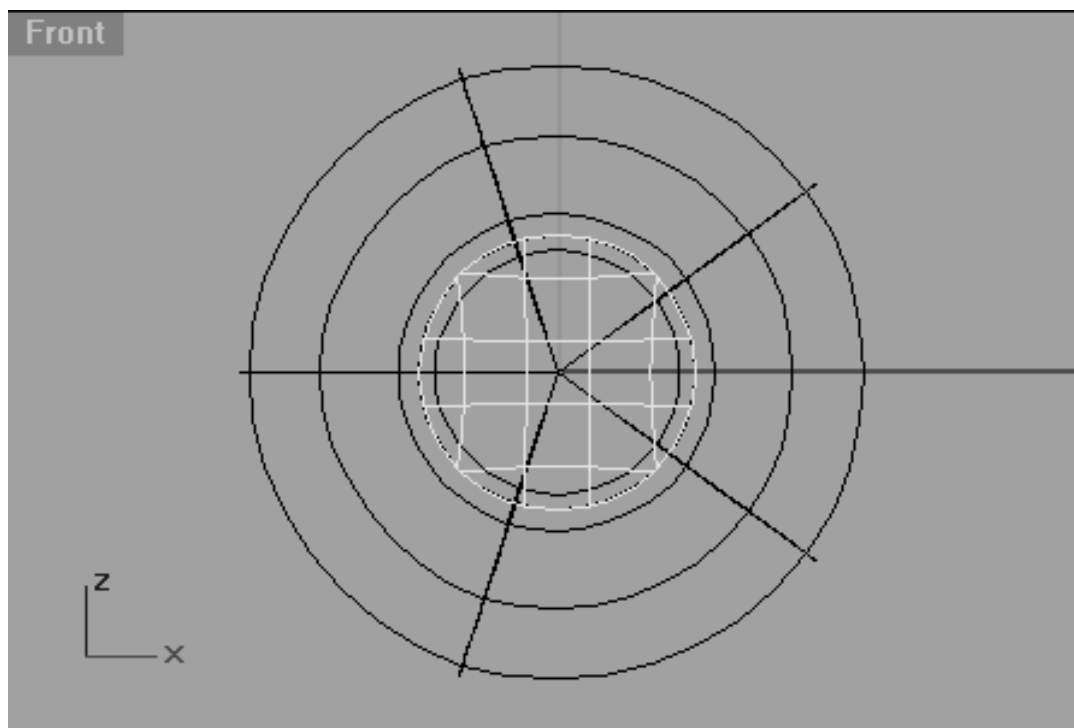


This **All Viewport** screenshot shows that a patch surface has now been created on which an iris texture map could be placed.

You will notice that a patch comprised of a grid like pattern of isoparms has now been created thus producing the surface of the Iris. \*Note -- This patch is actually a trimmed surface. Also, be aware that you don't have to use so many surface U and V spans when creating the patch as few as 1 or 2 in both the U and V will do nicely.

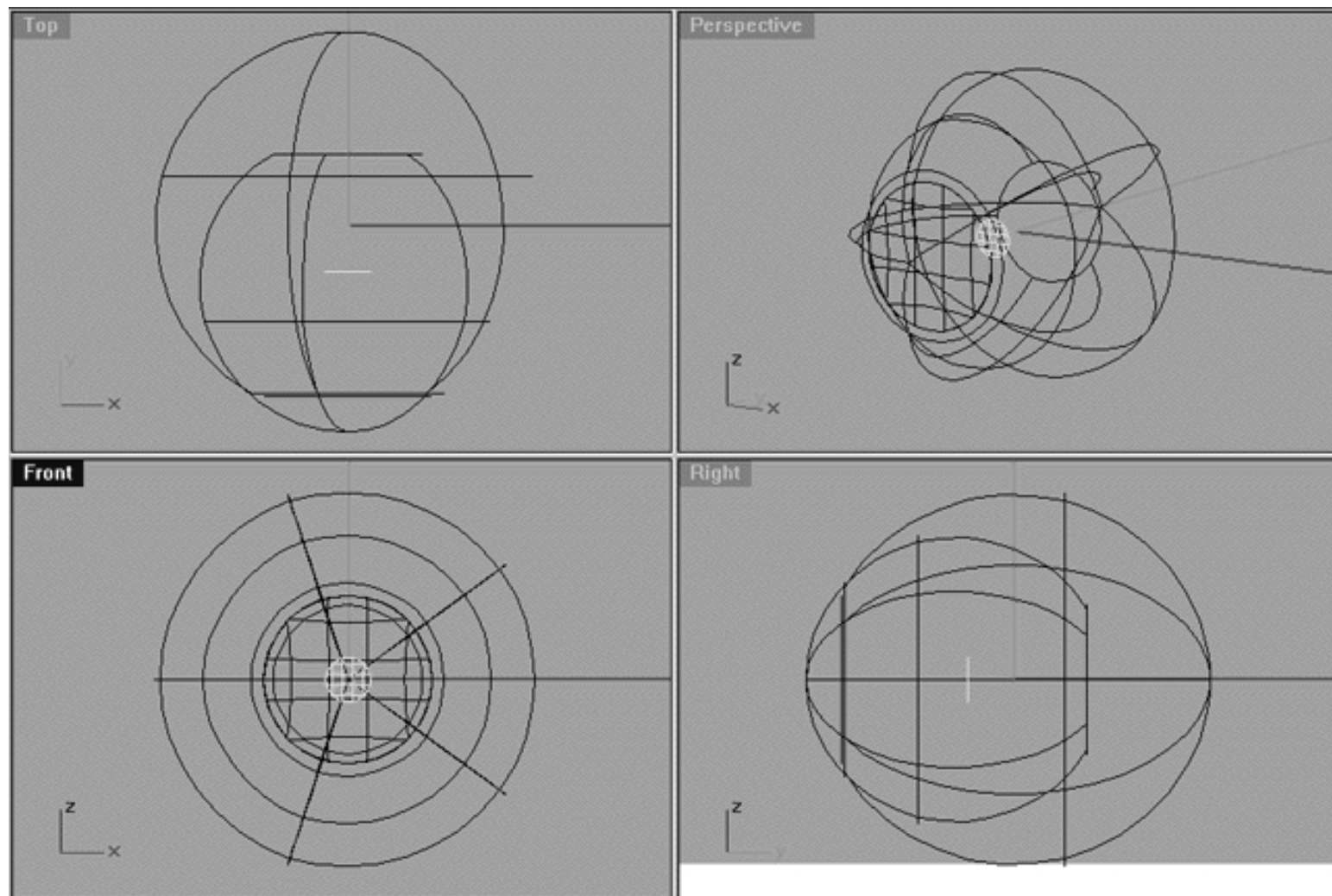
Now that we've got a surface for the iris we can set about creating the pupil -- this is easy!

- In the Front Viewport select the iris patch surface -- it will highlight, your monitor should resemble the following screenshot:



This **Front Viewport** screenshot shows the iris patch surface has now been selected (highlighted).

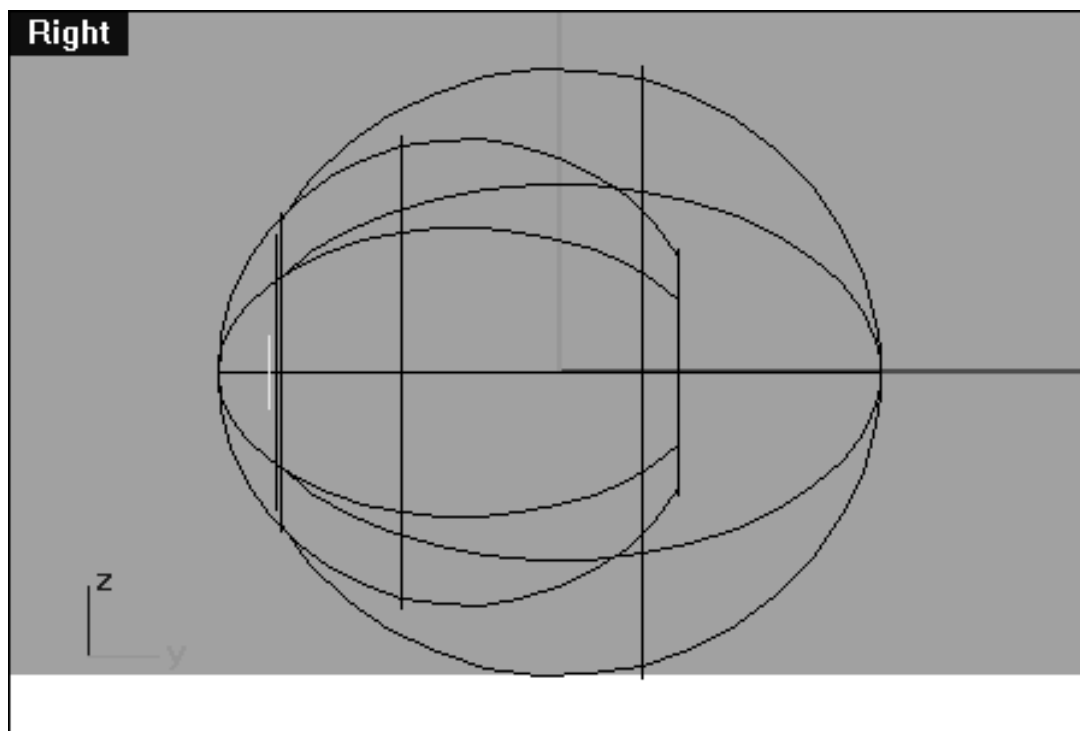
- Disable any Osnaps that may currently be active -- no Osnaps should be enabled at this time.
- Press the F9 key, this will enable the grid snap feature.
- From the tool bar choose the Scale icon or type the command: scale at the command line and press enter.
- The system will respond with the following prompt at the command line: Origin point (Copy):
- At the command line type: Copy and press enter.
- The system will respond with the following prompt at the command line: Origin point:
- Now working in the Front Viewport, move your cursor to dead centre, X:0.000 Y:0.000 Z:0.000 -- the cursor should snap to this location, once it has done, left click.
- Press the F9 key again, this will disable the snap feature.
- The system will have responded with the following prompt at the command line: Scale factor or first reference point:
- Hold down the shift key and move the cursor roughly 6 units along the X axis, once done, left click.
- The system will respond with the following prompt at the command line: Second reference point:
- Whilst still holding down the shift key, move the cursor inward toward the centre, roughly about 0.269 units, then left click.
- Once done, press the Esc key to complete the operation -- your monitor should now resemble the following screenshot:



*This **All Viewport** screenshot shows the new patch surface that has now been created and is currently located inside the smaller inner sphere (the cornea).*

As you can see, the new patch surface which will act as our pupil object is now located inside of the smaller inner sphere as a result of scaling procedure. Obviously, we don't want the pupil inside of the eye, rather it needs to be moved just above that of the iris surface -- let's do that now.

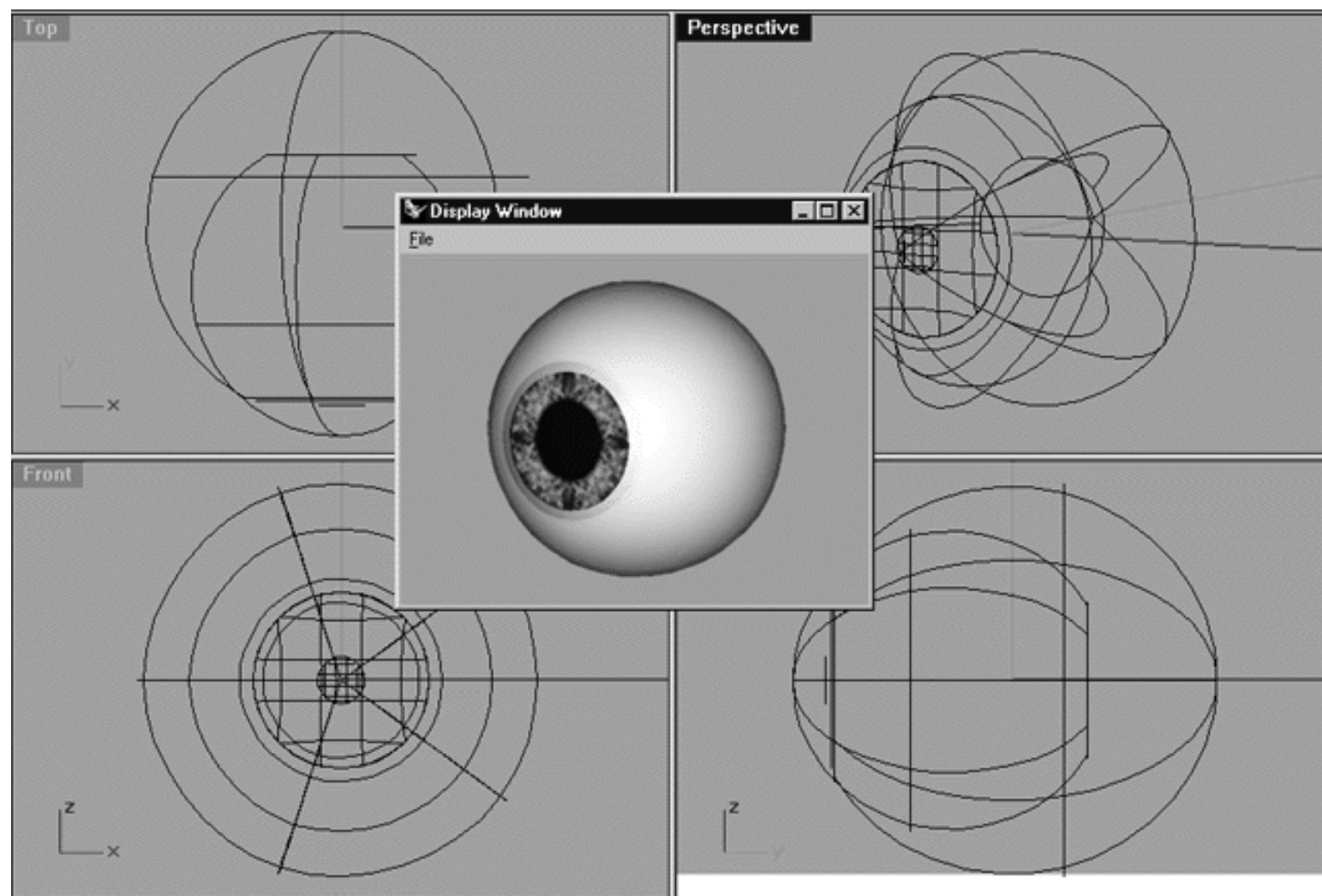
- If you've not done so already, locate the new pupil surface (it will be inside the eye) and select it -- it will highlight.
- Whilst holding down the shift key, in the Right Viewport click on the highlighted pupil object and move it along the Y axis until it is located just above that of the iris surface. You needn't worry about being too accurate as it's not important, just as long as the pupil is above that of the iris.
- Once done your monitor should look like the following screenshot:



This **Right Viewport** screenshot shows that the pupil surface (highlighted) has now been moved along the *Y* axis so that it is now located just above that of the iris surface.




So how is all this supposed to work then? Easy, just have a look at the following screenshot:

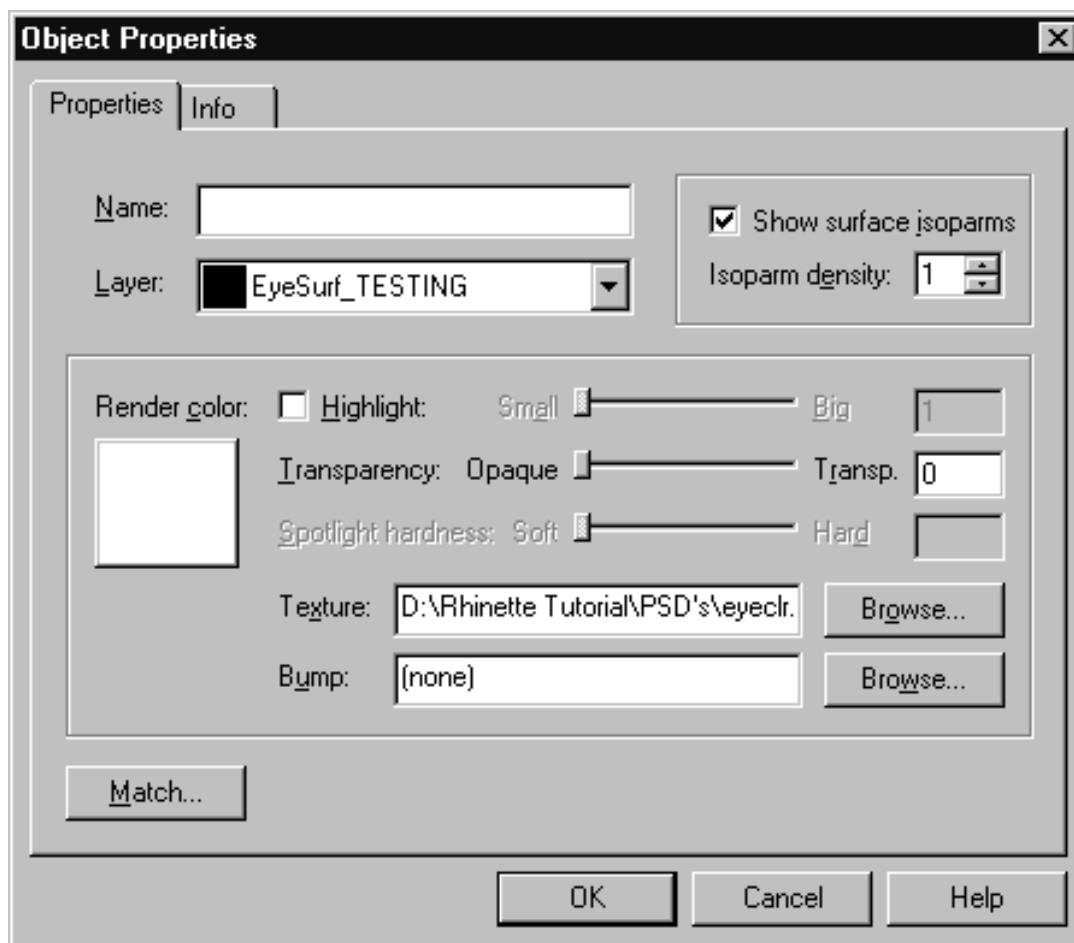


This **All Viewport** screenshot shows how all the components of the completed eyeball should work. Observe that I've placed a simple iris texture map onto the iris surface. The small window in the centre is a full colour rendering of the Perspective Viewport. I've put a slight blue tint onto the cornea surface so that you can see edge where it intersects with the large eyeball surface sphere.

In order to bring the effect altogether you'll want to do the following:

- Create your own iris texture map in within your favourite photo editing application -- like Photoshop for example. The image itself needn't be very large at all 100 x 100 or 200 x 200 should be perfectly adequate. Once you've come up with something your happy with save it as a \*.bmp, or \*.jpg etc., and name it something like iris.bmp for example.
- Then in the Front Viewport select the iris surface -- it will highlight.
- From the toolbar choose the Object Properties icon  or type the command: Properties at the command line and press enter.
- The Object Properties dialogue box will open, see the following screenshot:





*This screenshot shows the Object Properties dialogue box.*


- Locate the input field entitled: Texture: and enter the name and location of the texture image file that you wish to use, alternatively use the Browse button to help find the image file your after.
- Once you've assigned an image as a texture map it will be placed on to the surface automatically according to the objects UV parameters.
- When you have finished entering the file name and path of your texture map press OK to complete the operation.

You've now stuck your iris image onto the surface, a bit like a label or a decal. Despite the fact that we've now placed an image on the surface we still wouldn't be able to see it if we were to render the image, why not? Quite simply because the surface that represents our cornea object is obscuring it, after all it's currently opaque. Naturally, you will have to alter the surface properties from that of an opaque object to one that is transparent and once again this is something that you will do within the object properties dialogue box.


- In Any Viewport select the cornea surface object -- it will highlight.

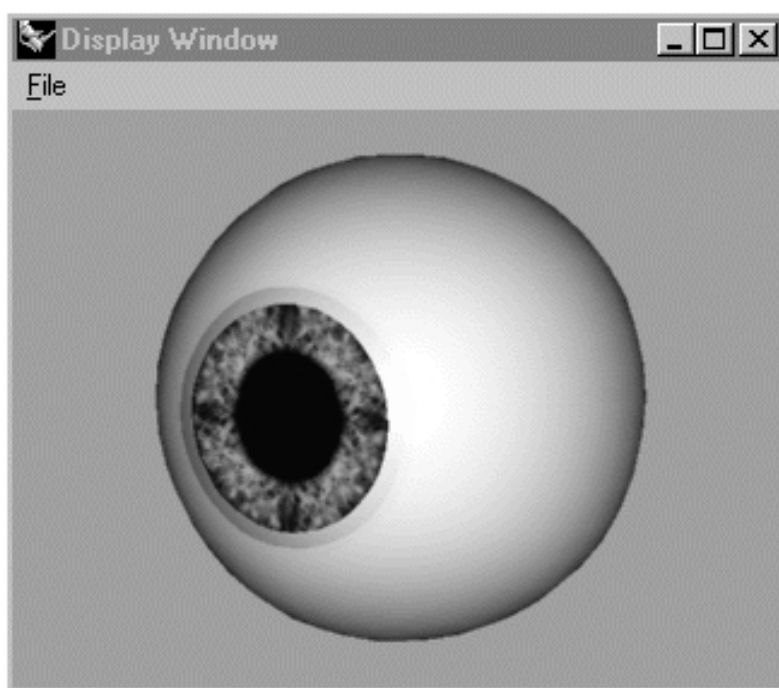
- From the toolbar choose the Object Properties icon  or type the command: Properties at the command line and press enter.

- Locate the Transparency slider and move it to roughly 95% (if you plan to add a slight amount of colour to the cornea) or fully to 100% if you wish.



- It's also a good idea to put a tick in the Highlight box to enable it. This will add a specular highlight to the surface of the object and help to make it look quite a bit more realistic. In respect to specular highlights the smaller they are the more shiny the object will appear, conversely, the larger the more dull it will look. Human eyes in real life are very wet (at least young ones -- the more one ages the drier they become) so the highlight should probably be rather small. I suggest you experiment until you find something you like.
- Once done click OK to exit.
- Lastly, In Any Viewport you should select the pupil object -- it will highlight.
- From the toolbar choose the Object Properties icon  or type the command: Properties at the command line and press enter.
- Click on the Render Colour box and select black from the list of named colours, once done, click OK to exit.

You should now be able to perform a full colour render and see the results.

- Make the **Perspective Viewport** active by clicking anywhere within it.
- Hold down the right mouse key and rotate the view until you've got a nice 3/4 view or whatever suits your fancy.
- From the toolbar select the render icon  or type the command: Render at the command line and press enter.
- Your final result will only take a few moments to appear and should resemble the following screenshot:



*This full colour render of the **Perspective View** shows the final result.*

- When you are satisfied with your results close any render display windows that may currently be visible.
- At this stage it's a good idea to put all of the individual components of the eyeball onto a single layer.
- Open the Edit Layers dialogue box and create a new layer entitled: Eyeball\_Final, the colour should be set to it's default (black). Press OK to exit.
- In Any Viewport, hold down the Ctrl key and select the following objects: The large spherical eyeball surface, the small spherical cornea surface, the iris surface, the pupil surface.
- Now let's assign the currently selected objects to the new layer entitled: Eyeball\_Final. Do this by choosing the Layer Control icon  from the toolbar by left clicking on it and holding down the key, then choose the Change Layer icon  from the flyout.
- Locate the layer entitled Eyeball\_Final in the list, then double click on it to set the layer and close the dialogue box.
- Confirm that the objects have been assigned to the correct layer, do this by opening the Edit Layers dialogue box, locating the layer entitled: Eyeball\_Final and setting the layer to OFF. Once done, press OK.
- All the objects with the exception of a single circular curve should now have disappeared. This circular curve is no longer needed and can be deleted.
- In Any Viewport, select the circular curve by clicking on it -- it will highlight. Once done, press the delete key on your keyboard -- it's gone!

Congratulations the eyeball has now been completed! In practice you should use this eyeball setup something like this. You will recall that the pupil has been set to a default black colour and is floating just above the surface of the iris. The main reason for this is so that you can vary the size of the pupil just by scaling the pupil object itself. When you bring your completed model into your favourite animation and rendering application it's easy to make this eyeball seem react to different lighting conditions by scaling the pupil and animating that value over time.

---

## A few thoughts on rendering...

Although Rhinoceros is a very powerful software modelling application, at the present time its rendering capabilities are less so. Fact is, Rhino's rendering and texture mapping capacity is extremely limited. It think it would be fair to say that Rhino is a world beating modelling application first and foremost, not a rendering or animation package -- it was simply not designed for that purpose. Whilst is true that Rhino can render reasonable images, I think this more of a added bonus than anything else. Yes, it is possible to render good looking images with Rhino but I'm not convinced it is worth the effort, that is unless you have no other choice.

Most people will want to create the geometry for their models within Rhino and leave the texture mapping and rendering aspects for completion within another software application. The vast majority of you will be working with other applications such as Maya, MAX, Softimage, Lightwave, etc., all of which have vastly superior rendering and mapping functions.

However, those of you who don't have access to or can't afford such software products don't despair, there are still very good and inexpensive options available. If you want quality mapping and rendering but are on a budget than look into BMRT (Blue Moon Rendering Tools -- a RenderMan compliant ray tracing renderer) it's not the fastest on earth but it will sure produce some impressive results. BMRT works well with Rhino and the best part is that it's freely available for download as shareware on the Internet provided that it's not used for commercial work. To find out more about BMRT -- [Click Here](#). Yet another option worth looking at is POV-Ray, again a ray tracing renderer that produces very high quality images. POV-Ray is freeware and you can find out more about it by -- [Clicking Here](#).

Here are a few general tips than can vastly improve the look of your eyes:

1. Avoid "dead eye" at all possible costs -- make certain that your eyes look bright and alive.
2. To help make your eyes appear wet and alive make the shiny with a small and visible specular highlight.
3. Take your time in creating a good texture map for the iris -- study real eyes and observe how they look (not how you think they look).
4. Don't make the eyeball appear too constant and white, it should be shaded. This is a real indicator of amateurish work and is a dead give away that your not paying complete attention to detail. The eye should not look like a bright white ping pong ball. It should be a bit blueish even greyish and get darker towards the corners.
5. When mapping watch the image proportions, don't make the pupil or iris too large or small -- it will not look right.
6. Try putting just a hint of colour into the cornea surface and experiment with not making it 100% transparent.

---

## Summary

In this lesson you've seen that a good representation of a human eyeball can be easily created by first producing a simple polar array of crescent shaped curves and then lofting them into a large spherical object. Once done, a smaller sphere can then be created inside that of the larger and then rotated and moved in such a manner so that a bump is created at the front of the eye. The reason the "bump" has been created to simulate the cornea of the eye as in real life. Obviously, you will need to put a semi-transparent glass like texture on to this object so that it will catch the specular highlight and give the impression that the eye is wet and alive. In addition, the cornea object will need to be transparent so that you can see the iris below it. A flat circular patch surface was then created and positioned just slightly in front of the large eyeball sphere. Because we created the eyeball surface from a lofted array of crescent shaped curves it was open in the front and closed at the back. The patch surface will hide the fact that the eyeball is open and will provide us with an object on which a texture map of a human iris can be placed.

There is nothing that can destroy the look of a good model quicker than "dead eye" syndrome. It's a dead give away that the image is fake and a clear sign that the artist wasn't paying complete attention to details. When the eye looks dead it is a clear signal to the brain that something is very wrong indeed, eyes should look bright, healthy and bursting with life.

Once again, there are many ways you can go about constructing human eyes, however, we have found this general method to be quick, easy, flexible and effective. In terms of making eyes come to life we've only really just scratched the surface during this lesson and there is much more that we have to say on this subject yet. We have a few tricks and special techniques up our sleeve still and we intend to provide you with even more details on this topic in the near future -- so stay tuned!

---

## Shutting Down the Scene

If you plan on continuing immediately to the next lesson then you can skip this procedure, however, we do recommend that you save your scene now anyway.

In the event that you wish to take a break and continue working later, than please perform the following procedure:

- Save the file.
- Unhide any objects that may no longer be visible. Type the command: Show at the command line and press Enter.
- Turn off any edit points that may currently be displayed.
- Open the Edit Layers dialogue box and...
- Turn ON the layer entitled: SCENE START UP and make it the active layer.
- Turn ON the layer entitled: Photopoints.
- If you've not done so already, turn OFF the layer entitled: EyeTemp.
- If you've not done so already, turn OFF the layer entitled: EyeCurve.
- If you've not done so already, turn OFF the layer entitled: EyeSurf.
- If you've not done so already, turn OFF the layer entitled: EyeFinal.

- With the exception of those mentioned, all other layers should be set to OFF.
  - Press OK to complete the operation and exit.
  - Perform a ZoomExtentsAll.
  - SAVE THE FILE.
- 

Go to the NEXT LESSON

RETURN to the Top of Page -- [Click Here](#)

Written by Joseph R. Saltzman.

Co-produced in association with Steven Ståhlberg

©1998-1999 Cinemagic Productions Limited. All Rights Reserved.

Duplication of this document including images and text by any means is expressly forbidden without prior written consent of Cinemagic Productions Limited.

Web Site: <http://www.cmagic.co.uk> Telephone: +44 (0)1753 733 190 Fax: +44 (0)1753 736 619 email: [cmagic@cmagic.co.uk](mailto:cmagic@cmagic.co.uk)

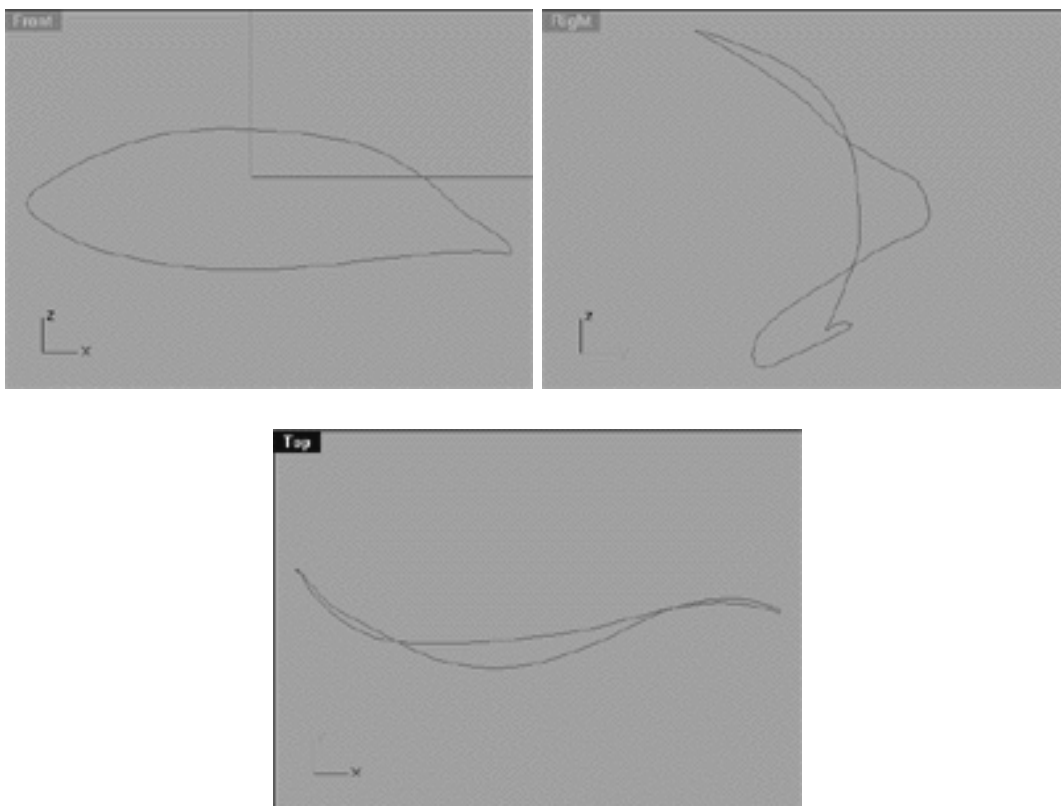


**RETURN** to previous page -- [Click Here](#)

**GOTO** the [NEXT LESSON](#)



## CREATING THE 1ST EYELID CURVE



---

## Skip To:

[Creating the 2nd Eyelid Curve](#)

[Creating the 3rd Eyelid Curve](#)

[Creating the 4th Eyelid Curve](#)

[Creating the 5th Eyelid Curve](#)

[Creating the 6th Eyelid Curve](#)

# Contents:

- [Eyelid Construction -- Some General Thoughts](#)
  - [About the Human Eye -- Some Points to Consider](#)
  - [Scene Setup](#)
  - [Drawing the Eyelid Shape](#)
  - [Example Movie -- How to Create the 1st Eyelid Curve, Pt. 1](#)
  - [Editing the 1st Eyelid Curve -- Upper Row](#)
  - [Editing the 1st Eyelid Curve -- Lower Row](#)
  - [Example Movie -- How to Edit the 1st Eyelid Curve, Pt. 2](#)
  - [Editing the 1st Eyelid Curve, Upper Row \(2\)](#)
  - [Editing the 1st Eyelid Curve, Lower Row \(2\)](#)
  - [Example Movie -- How to Edit the 1st Eyelid Curve, Pt. 3](#)
  - [Cheat](#)
  - [Shutting Down the Scene](#)
- 

## Eyelid Construction Some General Thoughts

Creating the eyelids is perhaps the most difficult part of this entire tutorial and will be a challenge to complete. That said, it is by no means impossible and in fact can be easier than it might be using various other methods that you may have tried already. I should point out that technique that I am going to show you is a bit different than what you might have come to expect and not the standard way in which I would normally approach the construction of the eyelid. I've said it about a hundred times already but I'll say it yet again, there are many, many ways to achieve the same end result in 3D and this is only one of them. I will stress that there is no one right way or wrong way to do this, it's whatever will work best for you and look correct at the end of the exercise, that is all that matters.

I am going to set about creating the surfaces that will constitute the eyelids for our model by constructing them from a series of closed control point curves which will then be lofted -- simple. But the question still remains, why do it this way at all? The answer is straightforward, to avoid using trims at all costs. Trims are truly nasty, they cause huge computational overhead and really will slow the interactivity of your system down. If you plan on animating your characters you should really go out of your way to avoid them and this is one way of doing just that.

Fair enough you might say, but wouldn't it be easier and faster to create the surface by using two closed curves and a cross section curve and doing a 2 rail sweep?

The answer to this is yes, well sort of.

Using a 2 rail sweep to produce this surface would be initially faster and would be the typical method that I'd be inclined to use in most other software that supports NURBS modelling -- but not in Rhino. Why? Well, initially we can create a surface by a 2 rail sweep operation very quickly but the problem is that the surface will be difficult to control, far too complex and suffer from twisting -- not really what we are after. The truth is that this is not a problem with Rhino or 2 rail sweeping per se, you'd have this same thing to contend with using something like Alias so don't despair.

The upshot is that you are going to have to do a lot of editing to the surface after it's produced and this will mean a great deal of point pulling. With that in mind, any initial gains in speed will be lost by the amount of time spent editing the darn surface, so now all of a sudden the method that I suggest begins to look far more attractive. I'm afraid to say that this exposes one of Rhino's weakest areas at the moment, namely the lack of a constantly shaded viewport, which currently is a real problem for those of us who specialize in the creation of organic objects and characters. Yes, you can use the dynamic shading option which does provide an interim solution, however in our view it is really not worth the trouble when dealing with a large amount of points that require pulling. If you've tried dynamic shading and it works for you then by all means use it. This is still early days for Rhinoceros and Robert McNeel and Associates are working on giving us the constantly shaded viewport that we really do need in an future version. Until such time as that happens this is as good a method as any and one well worth considering.

Okay, so the basis for our method is this: Rather than to create a complex surface that has a lot of points to deal with initially, we will set about building one up, one curve at a time thus avoiding dealing with heaps of points.

---

## About the Human Eye Some Points To Consider

Of all the many features of the face there is little doubt that the eyes are the single most important of all. The eyes truly impart emotion and life to a model and unless paid strict attention to will seem flat, boring and dead. Because of this and many other factors they are quite difficult to draw correctly and the slightest error can make or break your look and quality of your model. When setting out to draw the eye it's a good idea to work from some sort of high quality reference image. Even if you're an accomplished portrait artist in your own right, it's a good idea to draw what is actually there and not what you think an eye looks like (although an educated guess is better than nothing).

As Human Beings we place huge importance on the eye for largely psychological reasons, as it one of the very first objects that we see from birth. Because of this and perhaps other reasons as well we may tend to draw the eye much larger than it actually is -- you don't want or model to look like an alien, or do you? The eye and its lid is a small yet very complex surface, it is difficult to see all the detail especially from a distance so it is important to understand clearly within your mind what its surface is doing in terms of shape, scale and proportion.

The most important thing you must remember is that the eye is round in shape and never, ever flat. As a point of fact the eyeball is one of the most perfectly spherical organic shapes in nature. Take a moment to close one of your eyes, place your hands upon your eyelid and gently feel the shape of the eyeball beneath the skin. Notice how the skin that makes up your eyelid follows the eyeball perfectly as if it were sucked to the surface. A good way to imagine what is taking place is to think about a piece of rubber sheet with a horizontal slit cut into it. Now imagine that a golf ball is placed behind the the slit and pushed forward into the rubber. As the pressure is increased and the ball is forced into the rubber sheet the slit will now begin to arc with its rim now following the curvature of the ball and then downward into the corner points -- you should begin to get the idea.

Here are a few key tips to be aware of when creating eyes and lids:

- Always make sure that your eyelids are **ROUNDED**.
- Eyelids are **NOT** symmetrical, in other words if you can turn your drawing upside down and it sill looks the same you've done something wrong -- start over.
- The corners of the eyelids are **NOT** horizontal, the inner corner is lower than the outer corner.


When modelling eyelids you've really have to pay attention to what you're doing, if you fall asleep at the wheel at this stage it will really show. One of the things that makes creating eyelids a difficult task in 3D is the very fact that they are so rounded. Because you're viewing everything on a flat 2D monitor it can be quite hard to judge exactly what your curves are doing and it's common to get fooled by optical illusions and becoming confused and disorientated when performing this sort of work. This is a major source of angst for many artists, just don't let it get to you. Just step away and try again a bit later, you'll find that things fall more easily into place after a break. So how can you avoid this from happening? Well, I recommend that you really take time to look at what you are doing in **ALL VIEWS**, I can't begin to stress this enough. You should also get in the habit of constantly spinning around your curves, objects, surfaces, etc. within the perspective viewport. I don't recommend that you move any points in the perspective view, not at this stage anyway -- but viewing your eyelid curves from all possible angles within the perspective view is very important and something that should not be overlooked.


As you work through this portion of the tutorial many will wonder just how we figured out how to get the isoparms to run the way we wanted them to. The simple answer to this is experimentation by trial and error. One of the very best ways possible to judge if the surface is being produced as you had intended is to perform test lofts very frequently as you model and refine edit points. For example, once you've created two closed curves they can be lofted into a surface. Look at the surface produced, and then ask yourself are the isoparms running as planned? They should in most cases be smooth and as evenly spaced as possible, point bunching should be avoided. If the isoparms are not doing what you'd like make a note of the ones that are going wrong and where. Then delete or hide the temporary surface. Next move the points that are at the root of the bad geometry to a new location and loft again. Ask yourself are the isoparms running better this time round? If so, great you're headed in the right direction -- If not, try yet again things will work out if you keep at it.

So what is the point in all of this?

Quite simply that you should always try to work with as few and as simple objects as possible. Why? Because when you use the technique of loft, check, refine and re-loft you are dealing with a far smaller number of points and curves at any one time. It is a million times easier to do things in this manner as opposed to creating the entire surface and trying to edit several hundred points by moving them -- no thanks!


## Scene Setup

- If you've not done so already start a Rhinoceros session by **double clicking** on the desktop icon  the application will begin.
- Choose File, Open from the menu bar and double click on **START\_A.3DM** in the file list, it will load and open.
- Confirm at the Lower Status Bar the the currently active layer is entitled: **SCENE START UP**. If it is active proceed to the next step, if it's not then make it active by left clicking on the layer box, highlighting the correct layer and clicking on it.
- Again, at the Layers Box on the Lower Status Bar this time right click on the box, the Edit Layers Dialogue box will open. Confirm the following switches have been enabled or disabled:
- The Layer entitled: **1st\_Eyelid\_Curve\_EX** should be **ON**.
- The Layer entitled: **SCENE START UP** should be **ON**.
- The Layer entitled: Photopoints should be **ON**.
- All other layers should be set to **OFF**.
- When you've finished making your changes ( if any ) click on **OK**.
- Confirm that you can see the background image in the Front and Right viewports.
- Confirm that the grid display in the viewports has been disabled, if not turn it off now.
- Confirm that no Osnaps are currently enabled, if any are disable them.
- Confirm that no edit points are currently displayed, if any are hide them.

- Zoom out all the viewports by selecting the Zoom Extents/Zoom Extents All Views icon  or by typing the command: **ZoomExtentsAll** at the command line and pressing ENTER.

## Drawing the Eyelid Shape

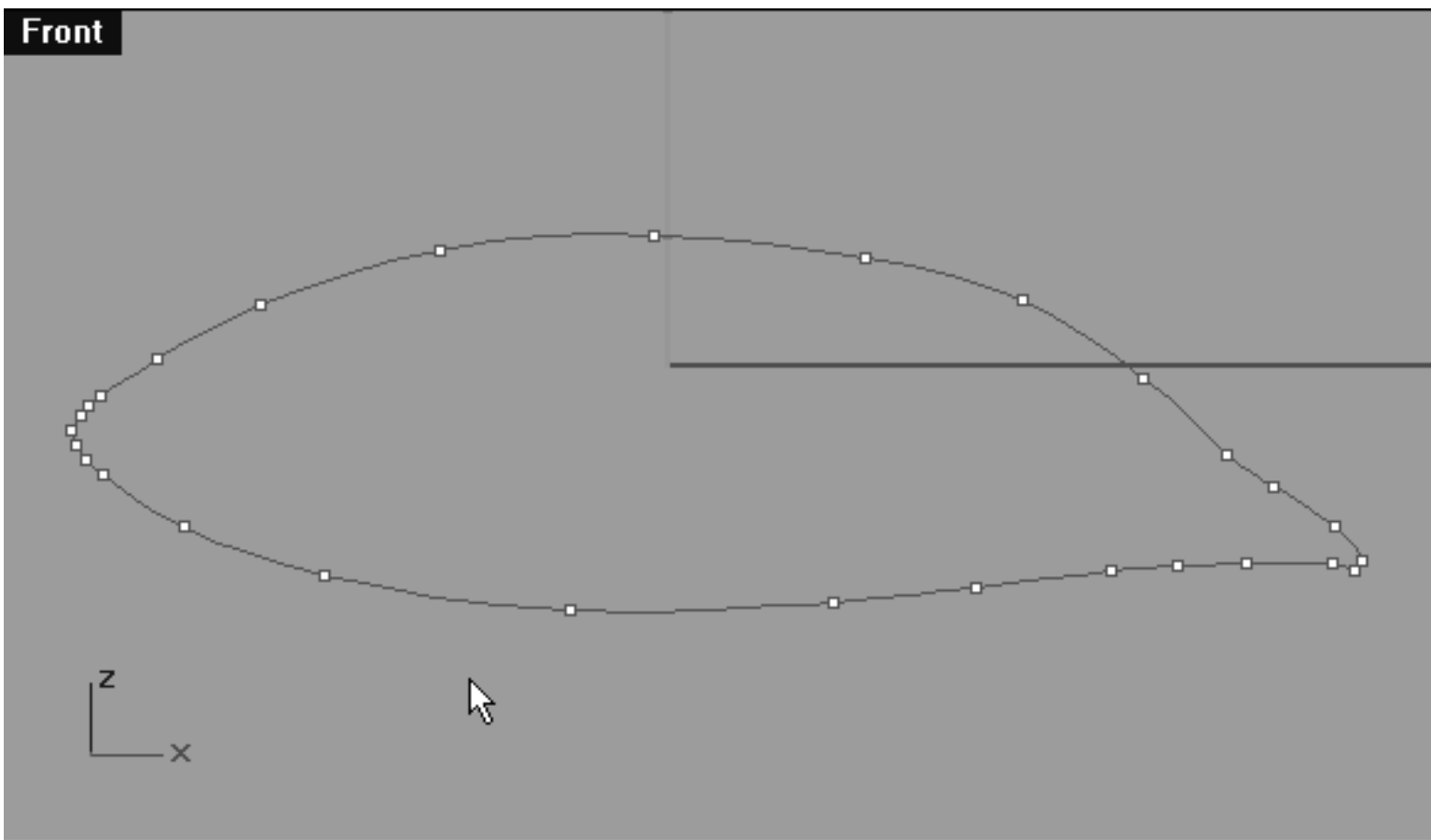
- In **Any Viewport**, select the **1st\_Eyelid\_Curve\_EX** and then display its edit points.
- Open the Edit Layers Dialogue box, locate the layer entitled: **1st\_Eyelid\_Curve\_EX** and **LOCK** it, press **APPLY**.
- Create a new layer entitled: **Eyelid Curves**, set its colour to **red** and make its layer **active**.

- From the toolbar choose the create Control Point Curve icon  or type the command: **Curve** at the command line.
- Maximise the **Front Viewport** and starting from about the 12 o'clock position, draw an eye shape using **exactly 28** points, (see screenshot below).

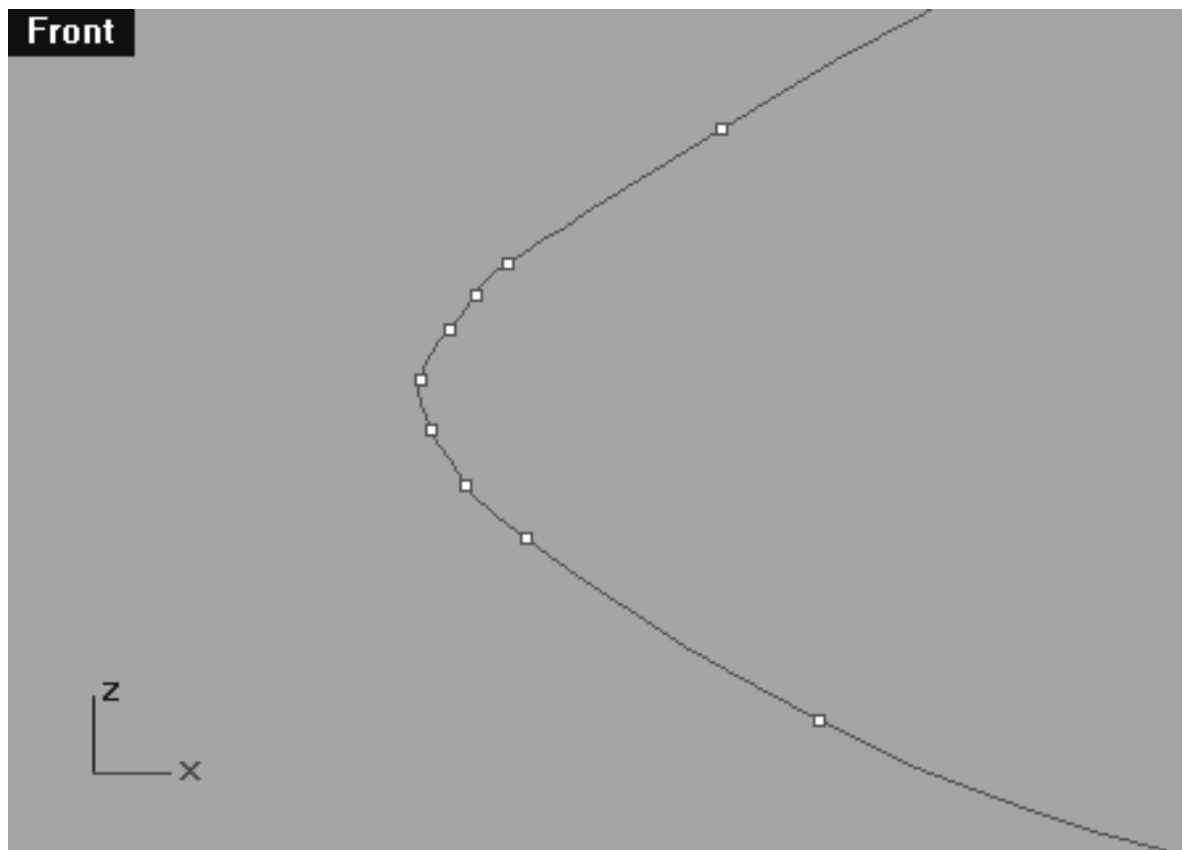
Pay particular attention to the way I've placed the points and their locations, especially at each corner as this is really rather important. It's highly recommended that you use some sort of background reference image to help you get the eye shape correct in both scale and proportion. I'm just going to wing it and draw it freehand but you don't have to, just use the **1st\_Eyelid\_Curve\_EX** as a guide to help you get the shape and point placement right.

- Select the curve you just drew (Eyelid Curves) and display its edit points.
- Now that you've finished drawing the new curve (Eyelid Curves) and while still working in the **Front View** only, next refine all the points so they are in alignment with those on the **1st\_Eyelid\_Curve\_EX**, zoom as required.
- When you've completed the refinement, open the Edit Layers Dialogue box, locate the layer entitled: **1st\_Eyelid\_Curve\_EX** and turn it **OFF**, press **OK** to exit.





This screenshot of the **Front Viewport** shows the 1st eyelid curve that we've just drawn using only 28 points.



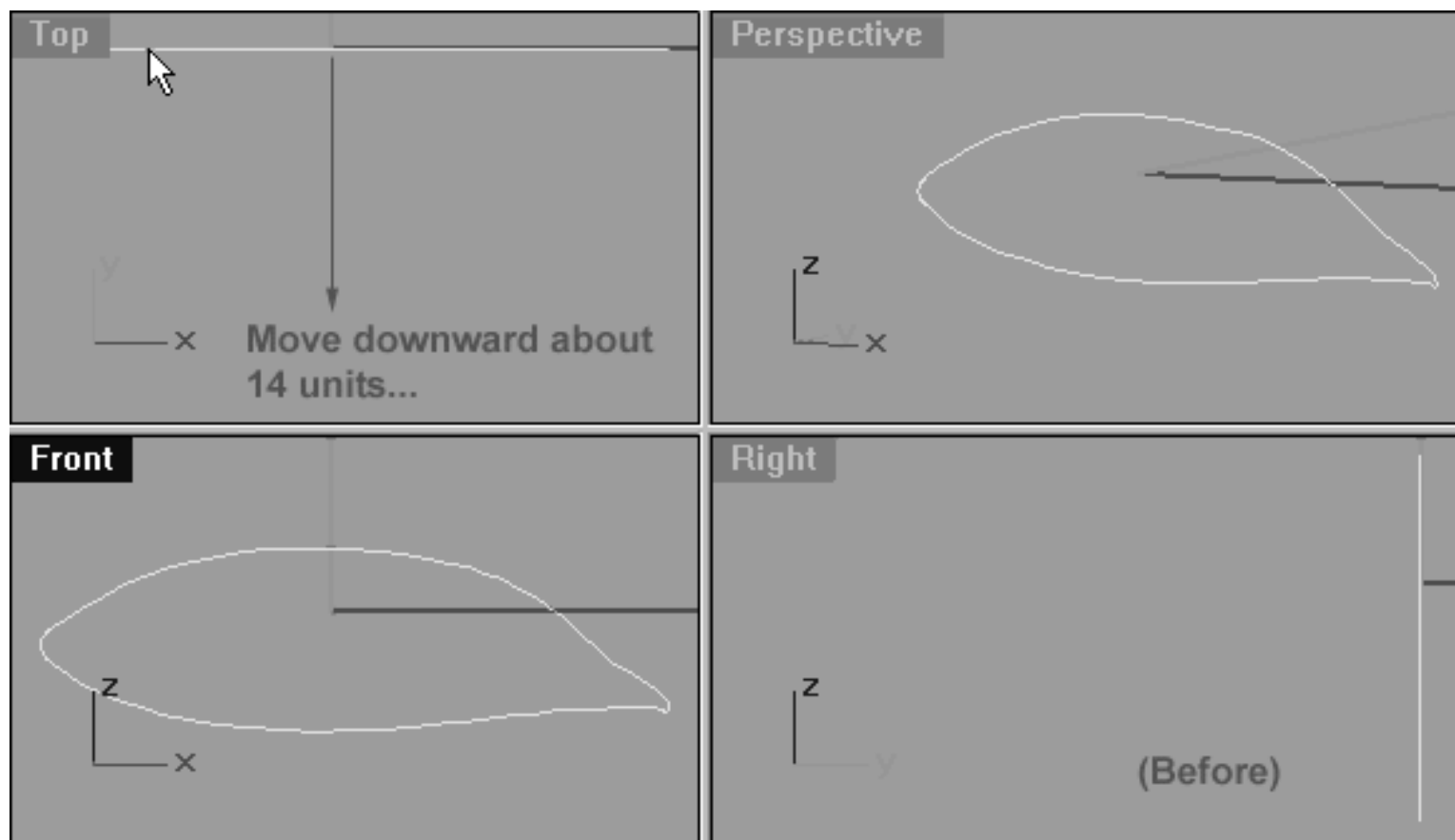
This screenshot of the **Front Viewport** shows a detailed view of point placement in the **left** corner of the eye.



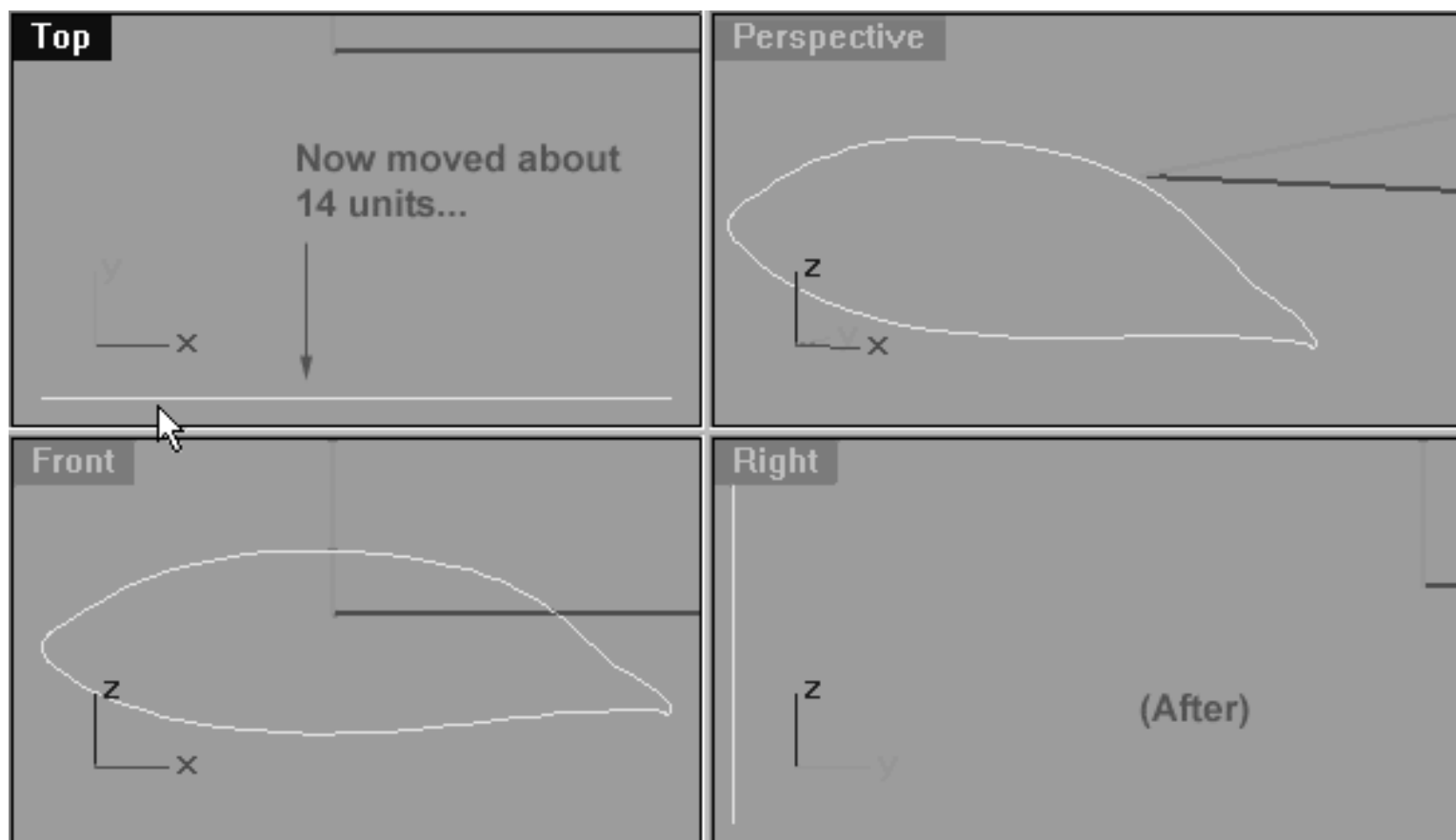
This screenshot of the **Front Viewport** shows a detailed view of point placement in the **right** corner of the eye.

Now lets translate the curve along the Y axis...

- Turn off any points currently displayed on the new curve.
- Minimise the **Front Viewport**. Now working in the **Top Viewport**, first zoom it out a bit and then select the curve and whilst holding down the **Shift Key**, move it downward along the Y axis roughly about 14 units.



This **All Viewport** screenshot shows the curve prior to being moved downward along the Y axis roughly about 14 units.



This **All Viewport** screenshot shows the curve after being moved downward along the Y axis roughly about 14 units.



**View an example movie**

**Create the 1st Eyelid Curve** [Click Here](#)

## Editing the 1st Eyelid Curve Upper Row

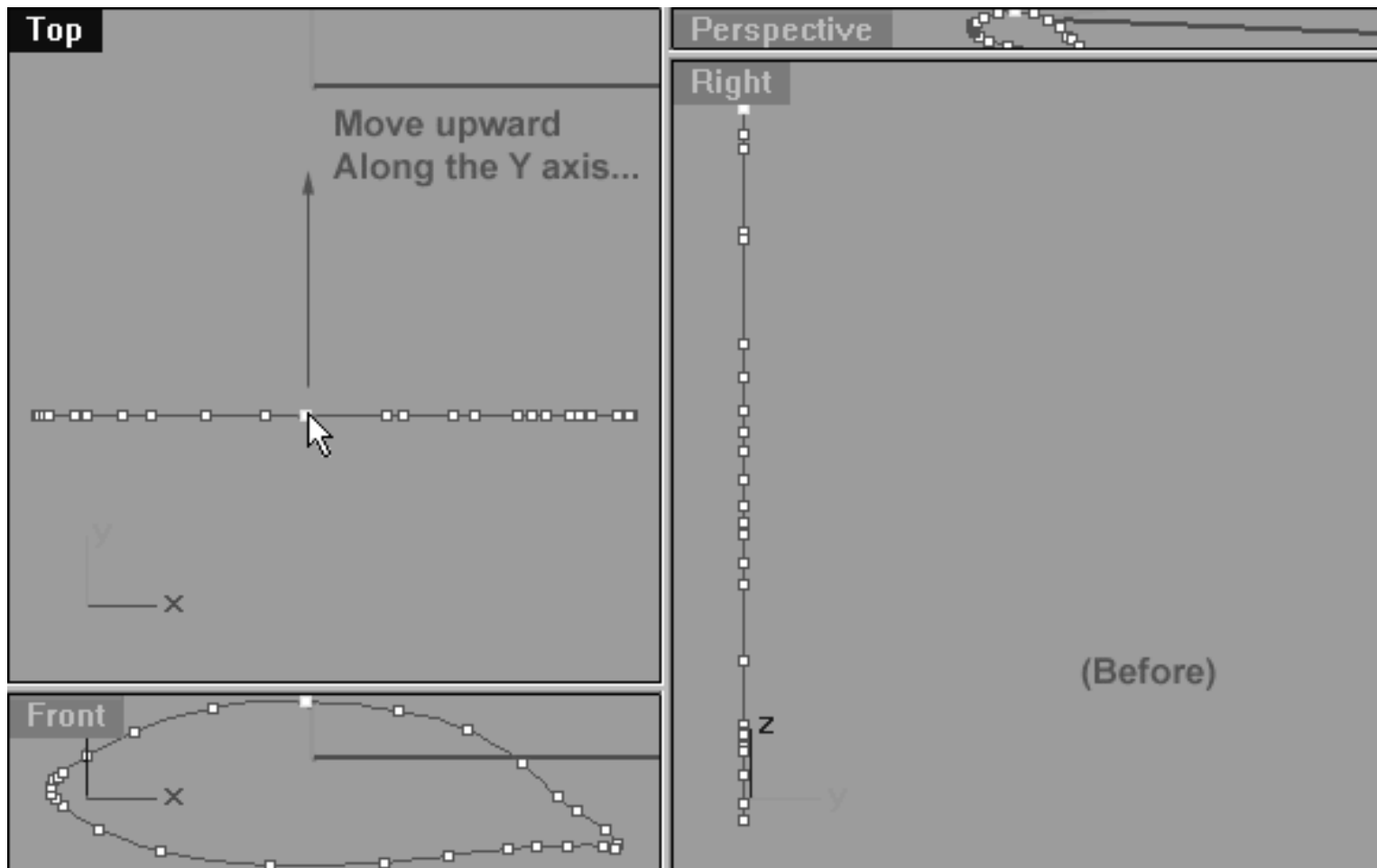
From this point forward it will be very important that you work systematically in the Top, Front and Right Viewports. Remember with each and every point that you move and refine from now on to watch closely what is happening in all of the views. As a point of fact, this is something that you should have been doing all along anyway, it's just particularly crucial that you do so now.

- Resize the **Top** and **Right Viewports**.
- Select the curve and display its edit points -- if you've not done so already.
- In the **Front Viewport** locate the point at the **12 o'clock** position and select it. (The idea is that you select the points in the front viewport (because it's easier) and move them in the top viewport.) Next, switch to the **Top Viewport** and now whilst holding down the **Shift Key** move the point upward along the **Y** axis just a bit (roughly about 0.793 units). Once done, continue working in a clockwise manner (as seen from the front view) and repeat this procedure with the following **7** points, moving each one a bit further along the **Y** axis so that a gentle arcing shape is produced.
- Below is a table showing the approximate units each of the points should be moved along the **Y** axis. \*Note this is only an approximation and your actual results may vary.

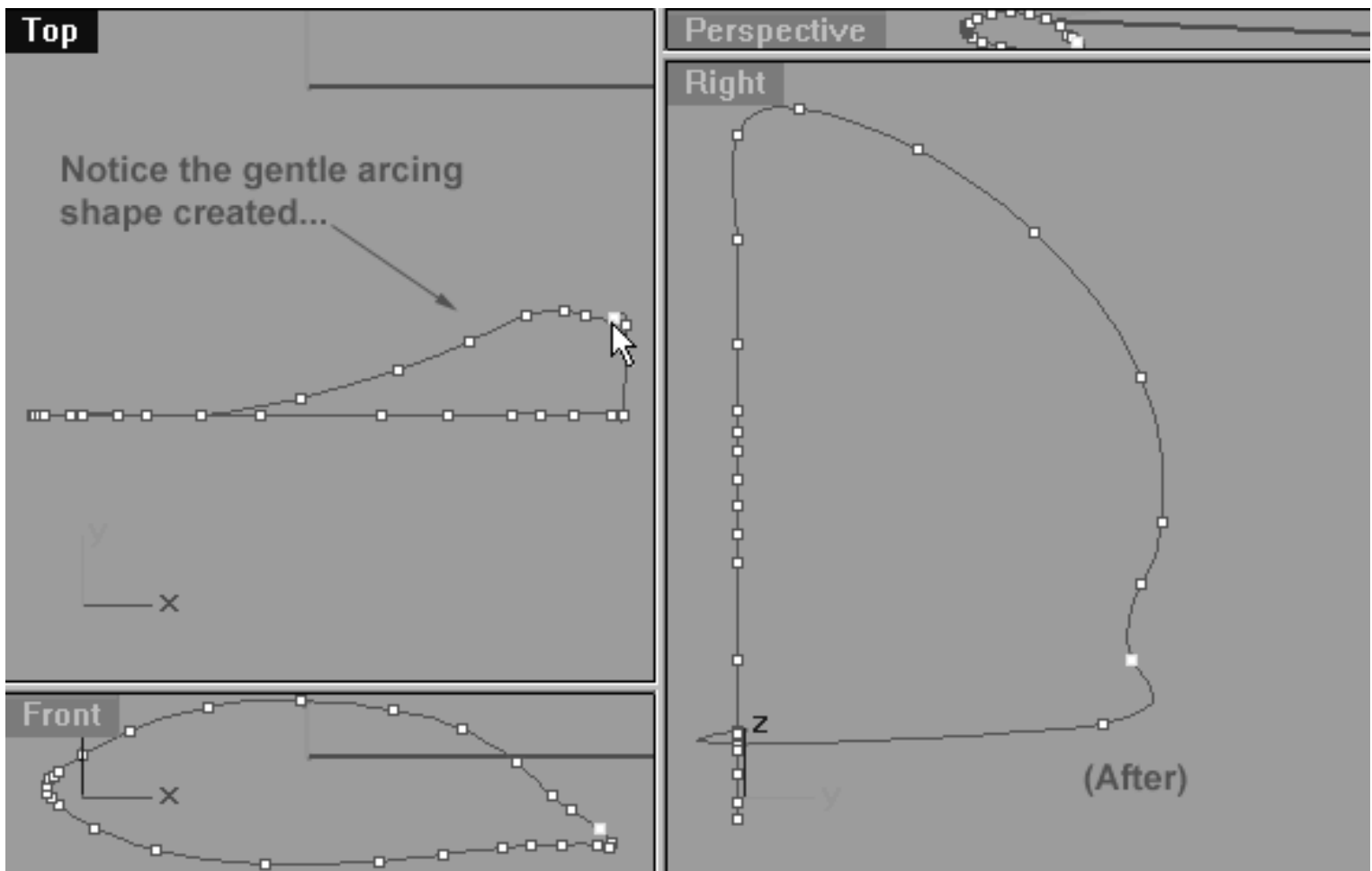
Helper Table:

Point	Approximate Units Moved
at 12 o'clock (1st point)	0.793
2nd Point	1.979
3rd Point	3.415
4th Point	4.289
5th Point	4.351
6th Point	4.289
7th Point	3.976
8th Point	3.714

See the following screenshots:



This **All Viewport** screenshot shows the curve prior to any editing taking place on the upper row. Notice that the point at the 12 o'clock position has been selected and is now ready to be moved upward along the Y axis.



*This **All Viewport** screenshot shows the curve after editing has taken place on the upper row. Notice that a total of 8 points have now been moved and observe the gentle arcing shape that has been created by doing so.*

## Editing the 1st Eyelid Curve Lower Row

Now let's move the points on the lower row...

- In the **Top Viewport** select the point at roughly the **6 o'clock** position (as seen from the front view) on the lower row (check the screenshot to make sure you pick the correct point). Once again, while holding down the **Shift Key** move the point upward along the **Y axis** roughly 2.698 units (see the screenshot below). **Tip** -- you will want to move the point ahead of the points on the upper row of the curve.
- Once done, continue working in an anti-clockwise manner and repeat the procedure with the remaining **6 points**. **Tip** -- Just like the first point that you moved on the lower row (at roughly 6pm) the next point you move should also be placed just slightly ahead of the points on the upper row of the curve as well. However, all the remaining points should lie on pretty much on the same arc as that of the lower row when seen from the **Top Viewport** (see the after screenshot below).

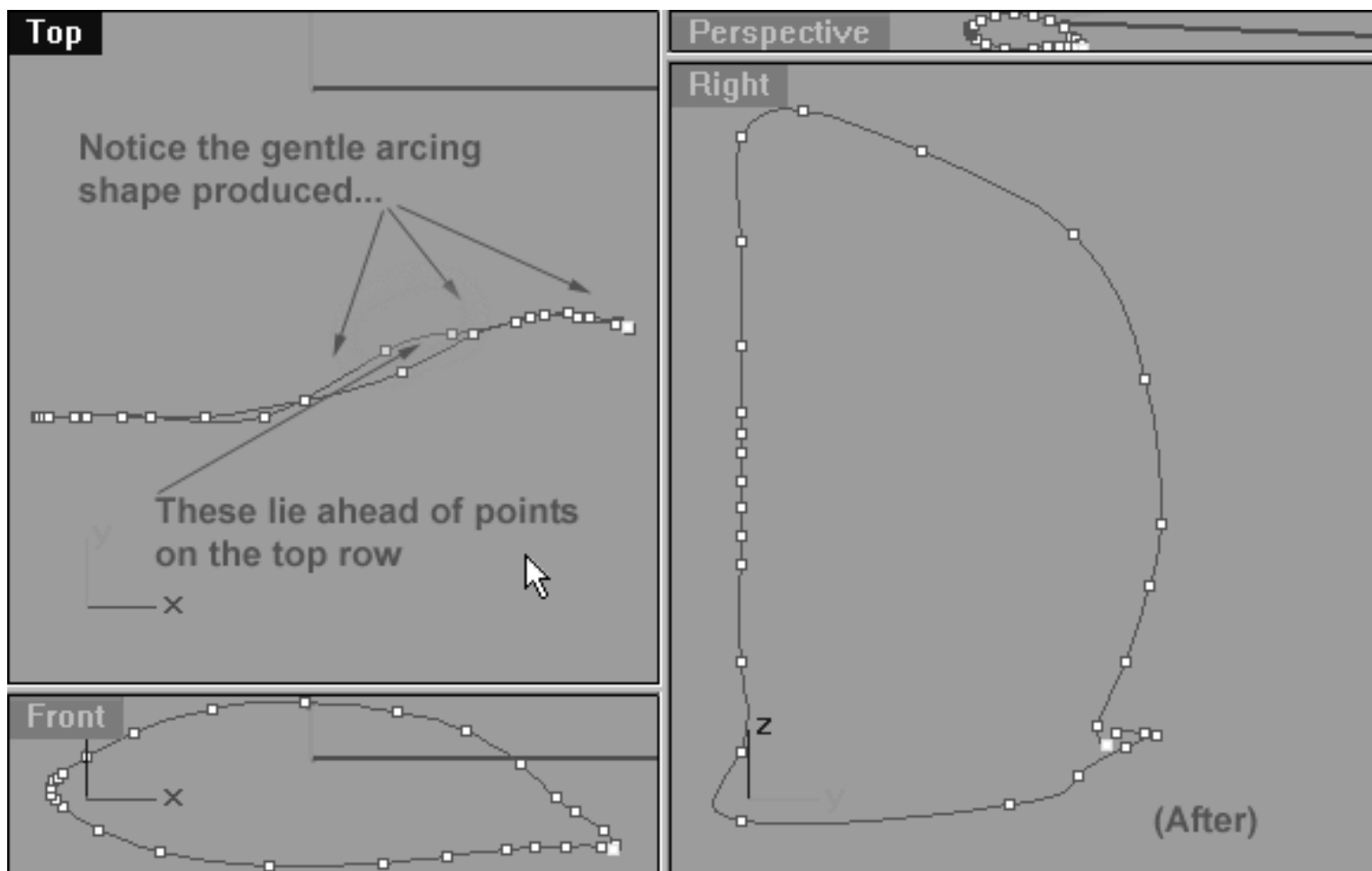




This **All Viewport** screenshot shows the curve prior to any editing taking place on the lower row. Notice that the point at roughly the **6 o'clock** position has been selected and is now ready to be moved upward slightly along the **Y** axis.

Helper Table:

Point	Approximate Units Moved
at 6 o'clock (1st point)	2.698
2nd point	3.392
3rd point	3.992
4th point	4.150
5th point	4.118
6th point	3.771
7th point	3.613



This **All Viewport** screenshot shows the curve after editing has taken place on the lower row. Notice that a total of 7 points have now been moved on the lower row. Observe that when seen from the Top Viewport the point at the 6 pm position and the point following it in an anti-clockwise direction lie ahead of the points on the upper row.



**View an example movie**

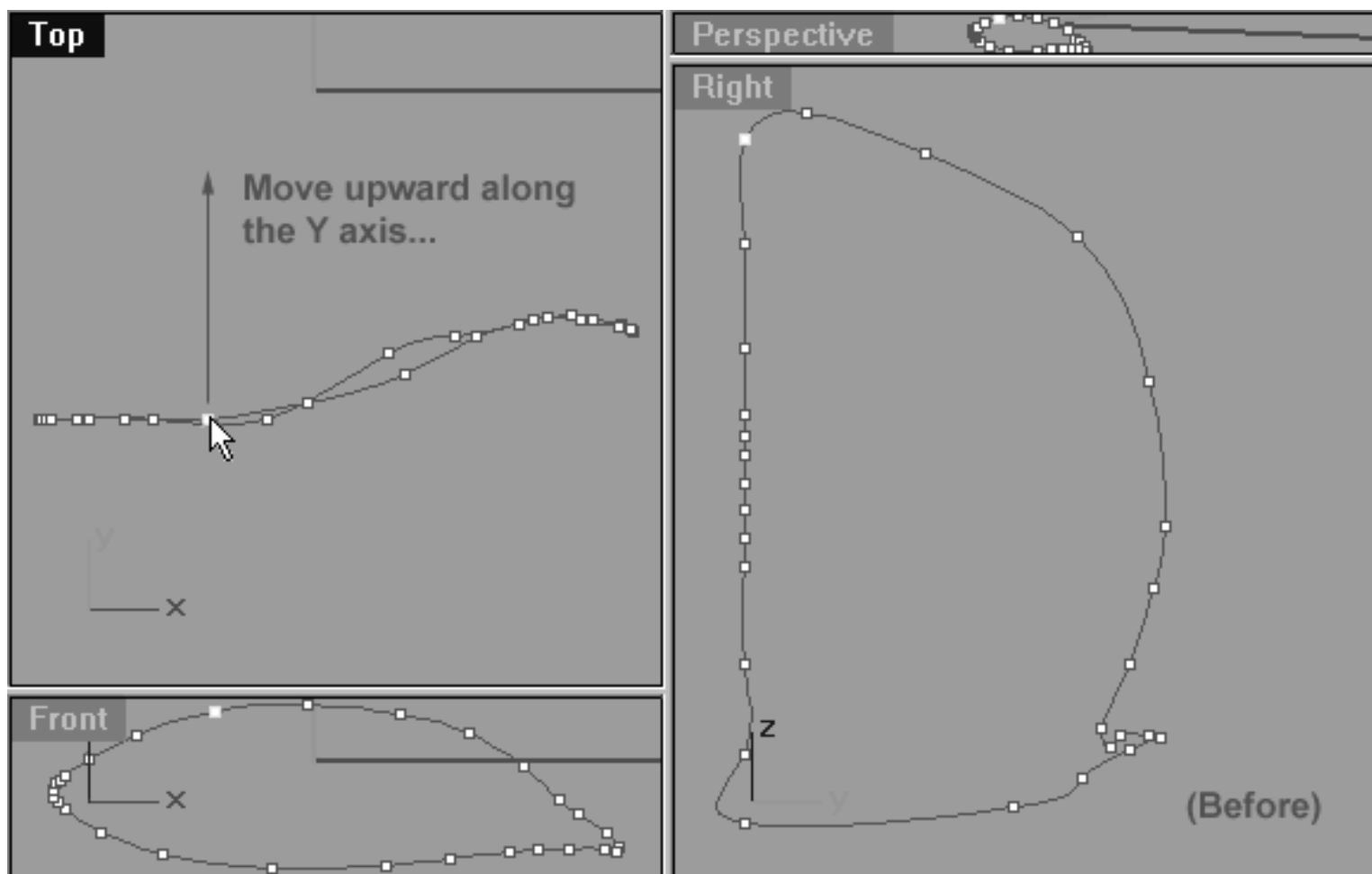
**Editing the 1st Eyelid Curve, Pt. 2** [Click Here](#)

## Editing the 1st Eyelid Curve Upper Row -- (2)

Well done! We will now concentrate on the upper row of the curve again, only this time on the opposite side.

- In the **Front Viewport** select the point at the 11 o'clock position on the upper row of the curve (as seen from front view). Switch to the **Top Viewport** and then whilst holding down the **Shift** key move the selected point upward along the **Y** axis roughly 1.220 units.

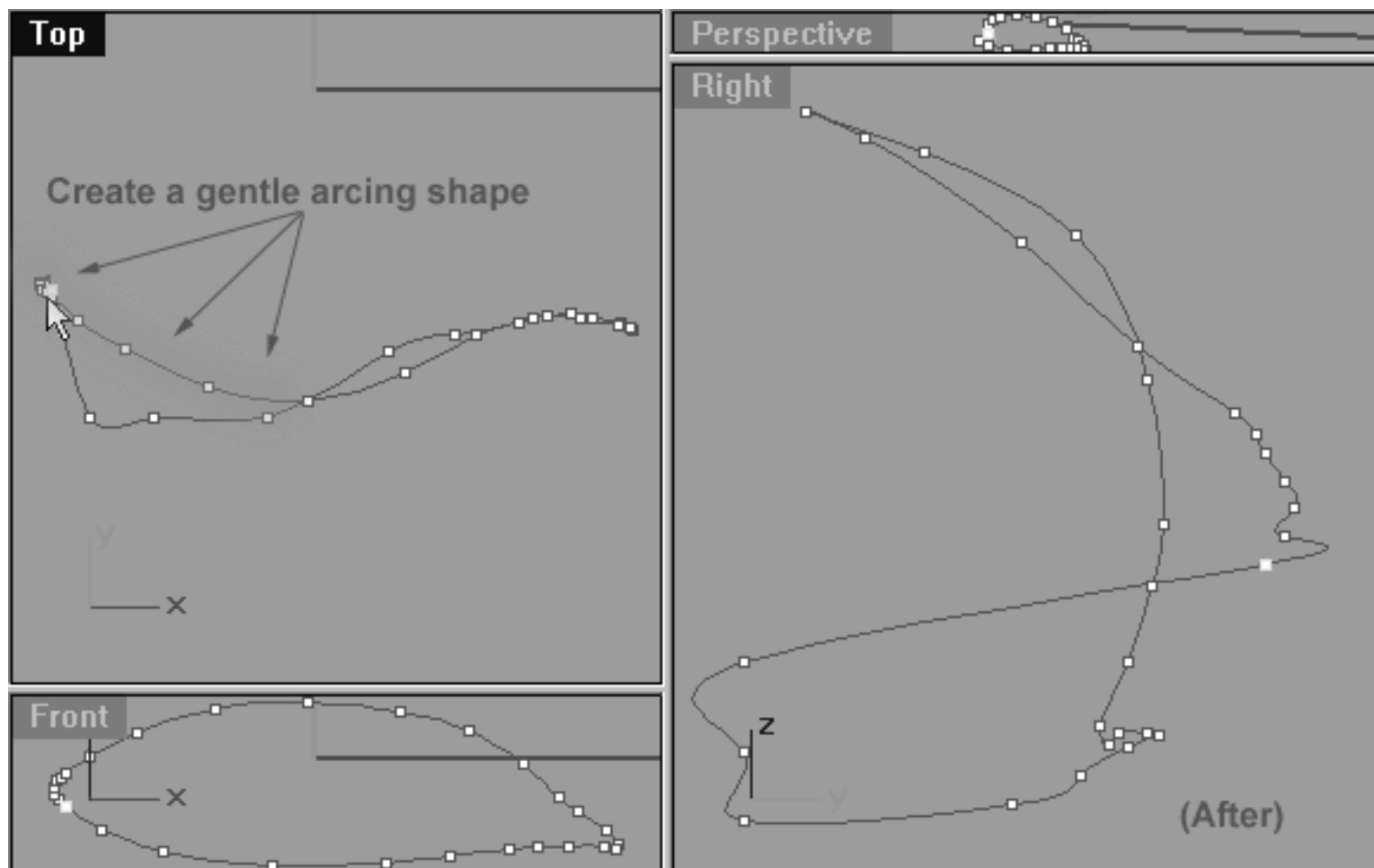
- Continue working anti-clockwise along the upper row of the curve (as seen from front view) selecting the points in the **Front** (preferred) or **Top Viewport** and then whilst holding down the **Shift key** moving them upward along the **Y** axis in the top viewport until a gentle arcing shape is created (see the screenshot below entitled: After). **Note\*** -- as you work your way into the corner the points really bunch up. It's a good idea to zoom in tightly so that you can make sure you're selecting the points on the upper row and not the lower. If however you do happen to pick a lower row corner point and move it don't worry, it's quite all right you haven't messed anything up.



This **All Viewport** screenshot shows the curve prior to any editing taking place on the upper row. Notice that the point at roughly the 11 o'clock position has been selected and is now ready to be moved upward slightly along the **Y** axis.

Helper Table:

Point	Approximate Units Moved
at 11 o'clock (1st point)	1.220
2nd point	2.896
3rd point	4.243
4th point	5.425
5th point	5.640
6th point	5.768
7th point (corner)	5.853



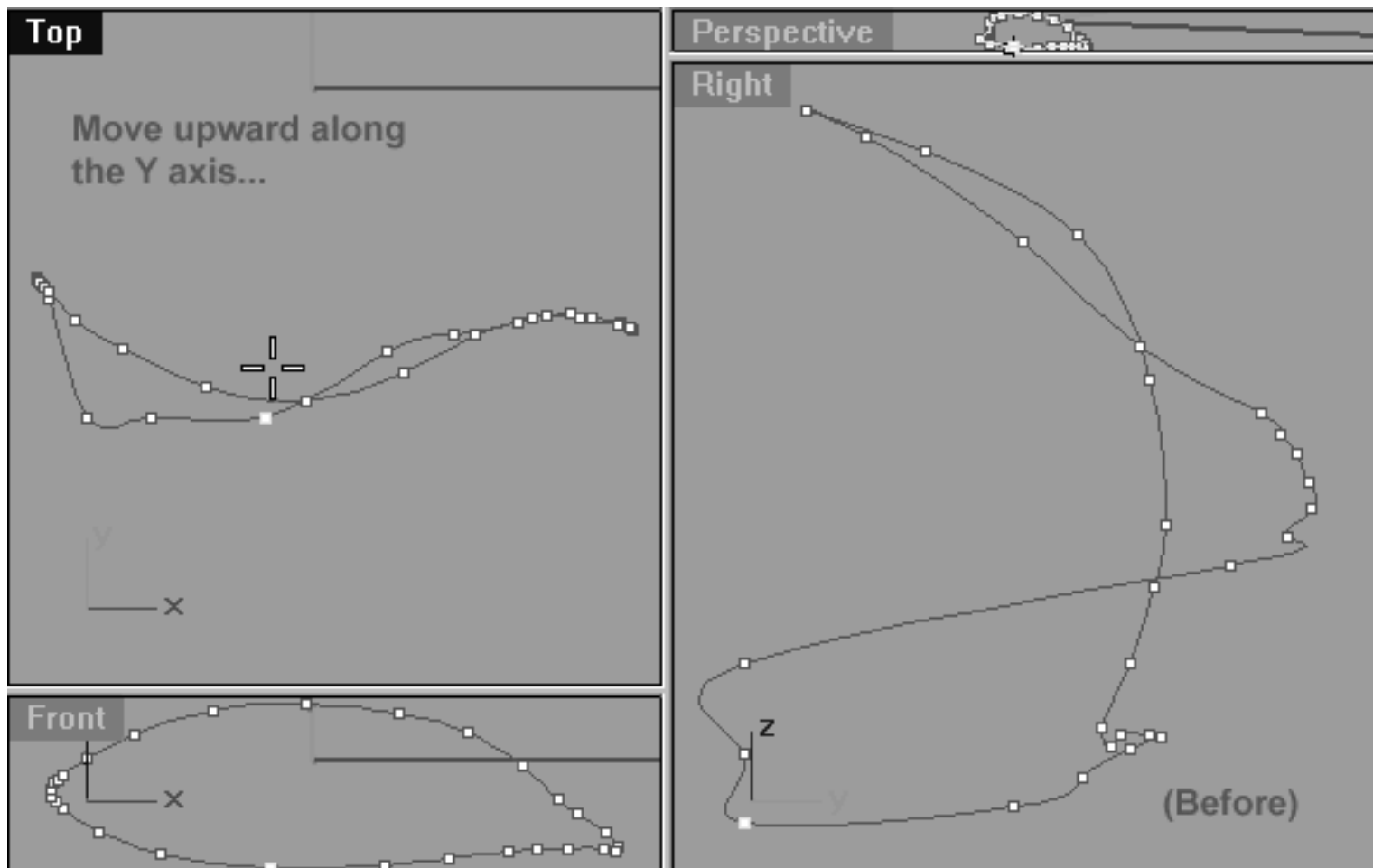
This **All Viewport** screenshot shows the curve after editing has taken place on the upper row. Notice that all of the points have now been moved on the upper row. As you can see, I've mistakenly selected and moved a couple of points in the corner of the curve that belong on the lower row. Not to worry, this is not a big deal, we can sort that mistake out later.

## Editing the 1st Eyelid Curve Lower Row -- (2)

All that really remains for us to do now is to sort out the points on the lower row of the curve.

- In the **Top Viewport** select the point at roughly the 6 o'clock position (as viewed from the Front). Once done, switch into the **Top Viewport**, hold the **Shift Key** and move the point upward along the **Y** axis roughly 2.059 units. **\*Hint** -- you should move the point so that it rests ahead of the points on the upper row (as viewed from the Top).
- Next, working in a clockwise manner (as viewed from the Front) select the next point, again moving it upward along the **Y** axis roughly 2.122 units. **\*Hint** -- this point should rest parallel with the upper row of points.

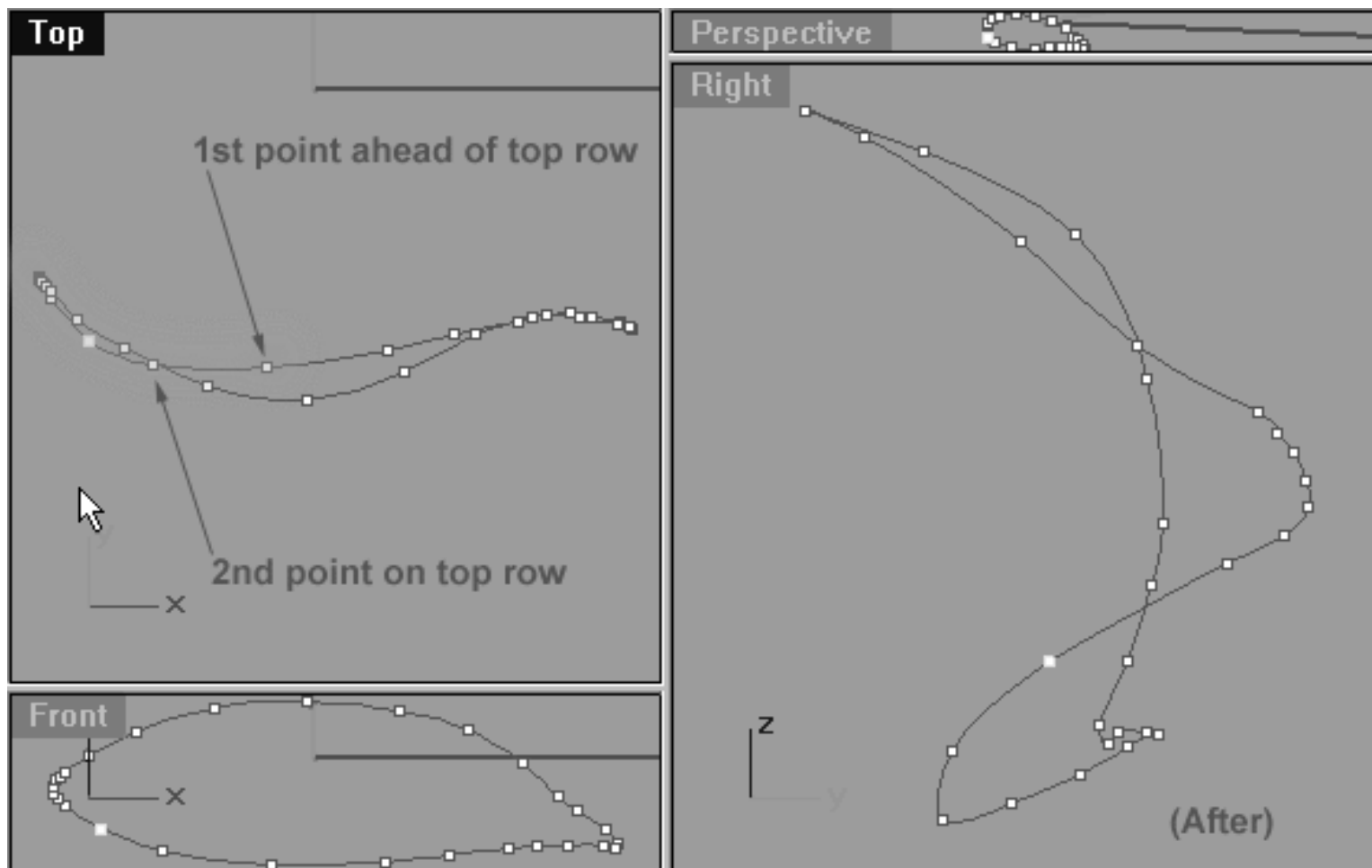
- Now continue the procedure for all the points that remain on the lower row. **\*Hint** -- the remaining points on the lower row should be moved so that they rest roughly on top of or just ever so slightly ahead of the the points on the upper row when viewed from the **Top**.
- Confused? See the screenshots below:



This **All Viewport** screenshot shows the curve prior to any editing taking place on the lower row. Notice that the point at roughly the 6 o'clock position has been selected and is now ready to be moved upward slightly along the Y axis.

Helper Table:

Point	Approximate Units Moved
At 6 o'clock (1st point)	2.059
2nd point	2.122
3rd point	3.308
4th point	4.965
5th point	5.659
6th point	5.879



*This **All Viewport** screenshot shows the curve after editing has taken place on the lower row. Notice that all of the points have now been moved on the lower row and a gentle "S" shape has now been produced when viewed from above.*

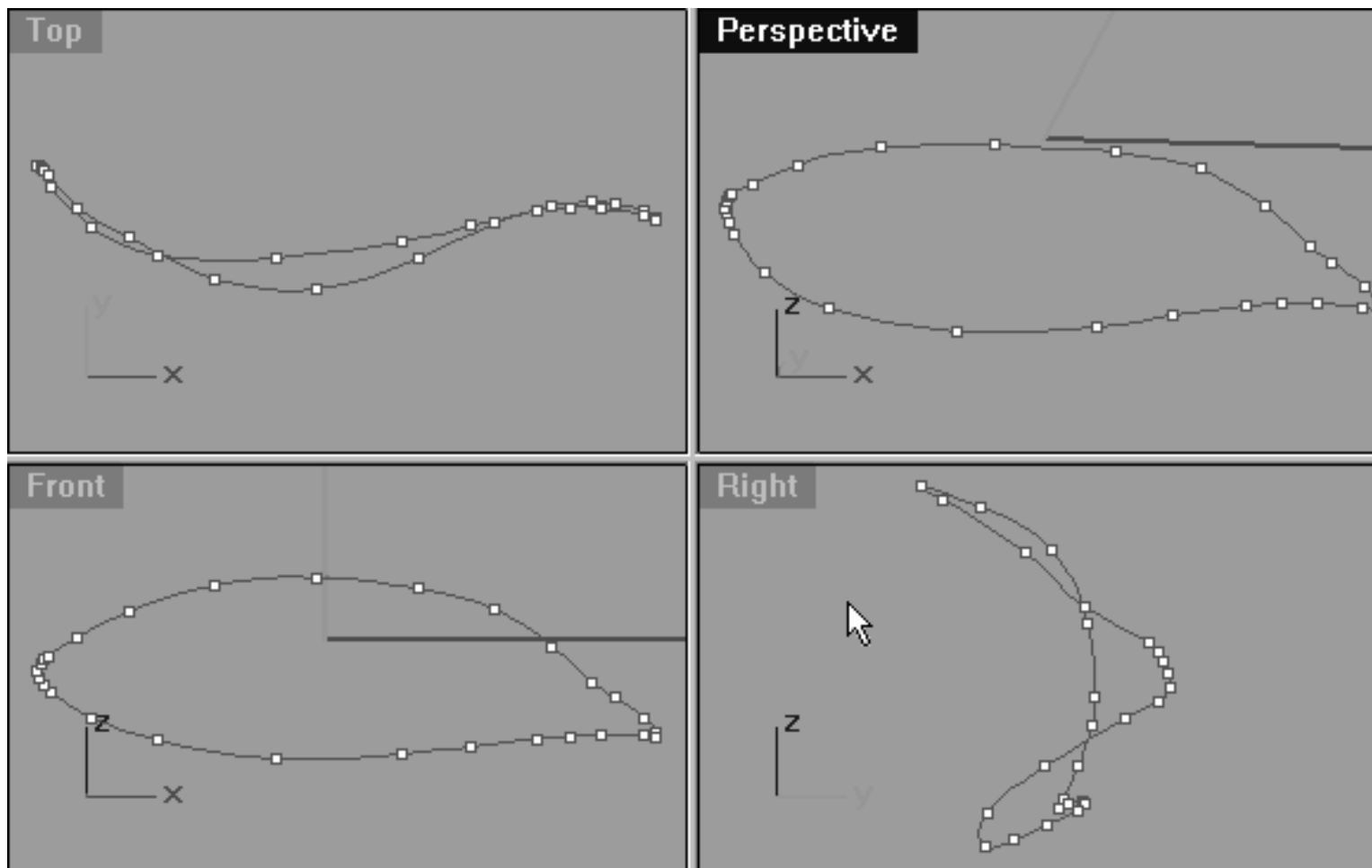


**View an example movie**

**Editing the 1st Eyelid Curve, Pt. 3** [Click Here](#)

Congratulations! The 1st Eyelid curve has now been successfully completed. Resize/Restore your viewports to a normal 4 view pattern. Once you've done so your monitor should now resemble something like the screenshot below...





*This **All Viewport** screenshot shows the completed 1st eyelid curve.*

It's really important that you take some time to carefully study the points along with their placement and relationships in the **TOP** and **RIGHT** views. It is crucial that at the end of this exercise you've managed to create a gentle "S" shaped arc like that shown in the **TOP** view.

## Cheat

Last but not least if you're still having trouble and can't seem to figure out how to produce this curve then we've provided an easy cheat for you. If you happen to fall into this category then Open the Edit Layers dialogue box and turn **ON** the layer entitled: **Eyelid\_guide\_01**, then press **OK** to **Exit**. Then in **Any Viewport** select the **Eyelid\_guide\_01** curve and display its edit points. Once done, reopen the Edit Layers dialogue box and set the **Eyelid\_guide\_01** layer to **LOCK**, press **OK** to **Exit**. You can now compare what you've done against what I've done and refine the specific areas where you've gone off track. You can then turn on the **Osnaps, Point** and snap each of the points on the curve you've created to those of the guide curve. Please don't use this cheat unless you absolutely can't figure out how to produce this curve on your own. Cheats are nothing more than a crutch and by using them without a really good reason you'll be sidestepping an important part of the learning process. Of course, if by studying the guide curve and comparing it to what you've done you're able to find your mistakes and understand why you made them then so much the better.

# Shutting Down the Scene

- Save the file.
- Unhide any objects that may no longer be visible. Type the command: Show at the command line and press Enter.
- Confirm that no Osnaps are currently active, disable any that are.
- Hide any edit points that are currently displayed.
- Open the Edit Layers Dialogue box and locate the layer entitled **SCENE START UP**. Make it the currently active layer by clicking in the "check" field -- a check mark should appear in the column, when it has press **APPLY**. Once done, the layer entitled **SCENE START UP** should now have become the active layer and should be **ON**.
- Turn **ON** the layer entitled: Photopoints.
- Turn **OFF** the layers entitled: **Eyelid\_guide\_01** and **Eyelid Curves** and press **APPLY**.
- All other layers should be **OFF** -- press **OK** to Exit.
- Perform a Zoom Extents All.
- **SAVE YOUR WORK..!**

---

Go to the [NEXT LESSON](#)

RETURN to the Top of Page -- [Click Here](#)

Written by Joseph R. Saltzman.

Co-produced in association with Steven Ståhlberg

©1998-1999 Cinemagic Productions Limited. All Rights Reserved.

Duplication of this document including images and text by any means is expressly forbidden without prior written consent of Cinemagic Productions Limited.

Web Site: <http://www.cmagic.co.uk> Telephone: +44 (0)1753 733 190 Fax: +44 (0)1753 736 619 email: [cmagic@cmagic.co.uk](mailto:cmagic@cmagic.co.uk)

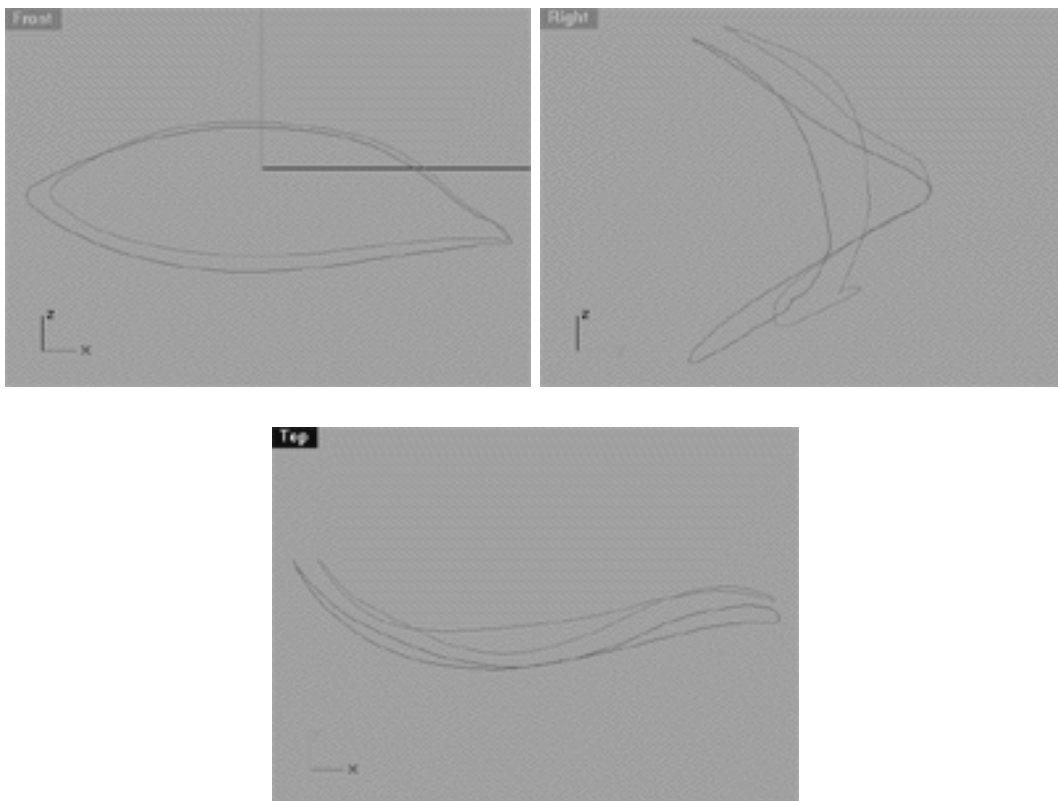
**RETURN** to previous page -- [Click Here](#)

**GOTO** the [NEXT LESSON](#)



## CREATING THE 2ND EYELID CURVE

(Part One of Two)





---

## Contents:

- [Scene Setup](#)
- [Creating the 2nd Eyelid Curve](#)
- [Create a Cross Section](#)
- [Example Movie -- Create the 2nd Eyelid Curve](#)
- [Editing the 2nd Eyelid Curve](#)
- [Move Those Points -- Upper Right \(1\)](#)

- [Move Those Points -- Lower Right \(1\)](#)
  - [Example Movie -- Editing the 2nd Eyelid Curve, Pt. 2](#)
  - [The Ever Expanding Curve -- Lower Right Side](#)
  - [Refinement -- Upper Left](#)
  - [Refinement -- Lower Left](#)
  - [Example Movie -- Editing the 2nd Eyelid Curve, Pt. 3](#)
- 

## Scene Setup

- If you've not done so already start a Rhinoceros session by **double clicking** on the desktop icon  the application will begin.
- Choose File, Open from the menu bar and double click on **START\_A.3DM** in the file list, it will load and open.
- Confirm at the Lower Status Bar the currently active layer is entitled SCENE START UP. If it is active proceed to the next step, if it's not then make it active by left clicking on the layer box, highlighting the correct layer and clicking on it.
- Again, at the Layers Box on the Lower Status Bar this time right click on the box, the Edit Layers Dialogue box will open. Confirm the following switches have been enabled or disabled:
  - The Layer entitled Eyelid\_Curves should be ON.
  - The Layer entitled SCENE START UP should be ON.
  - All other layers should be set to OFF.
- When you've finished making your changes ( if any ) click on OK.
- Confirm that the grid display in the viewports has been disabled, if not turn it off now.
- Confirm that no Osnaps are currently enabled, if any are disable them.
- Confirm that no edit points are currently displayed, if any are hide them.
- Confirm that you can see the background image in the Front and Right viewports.
- Zoom out all the viewports by selecting the Zoom Extents/Zoom Extents All Views icon  or by typing **ZoomExtentsAll** at the command line and pressing ENTER.

# Creating the 2nd Eyelid Curve

We can now create the 2nd Eyelid curve from a copy of 1st Eyelid curve that we made in the last lesson that will be edited to suit our purposes.

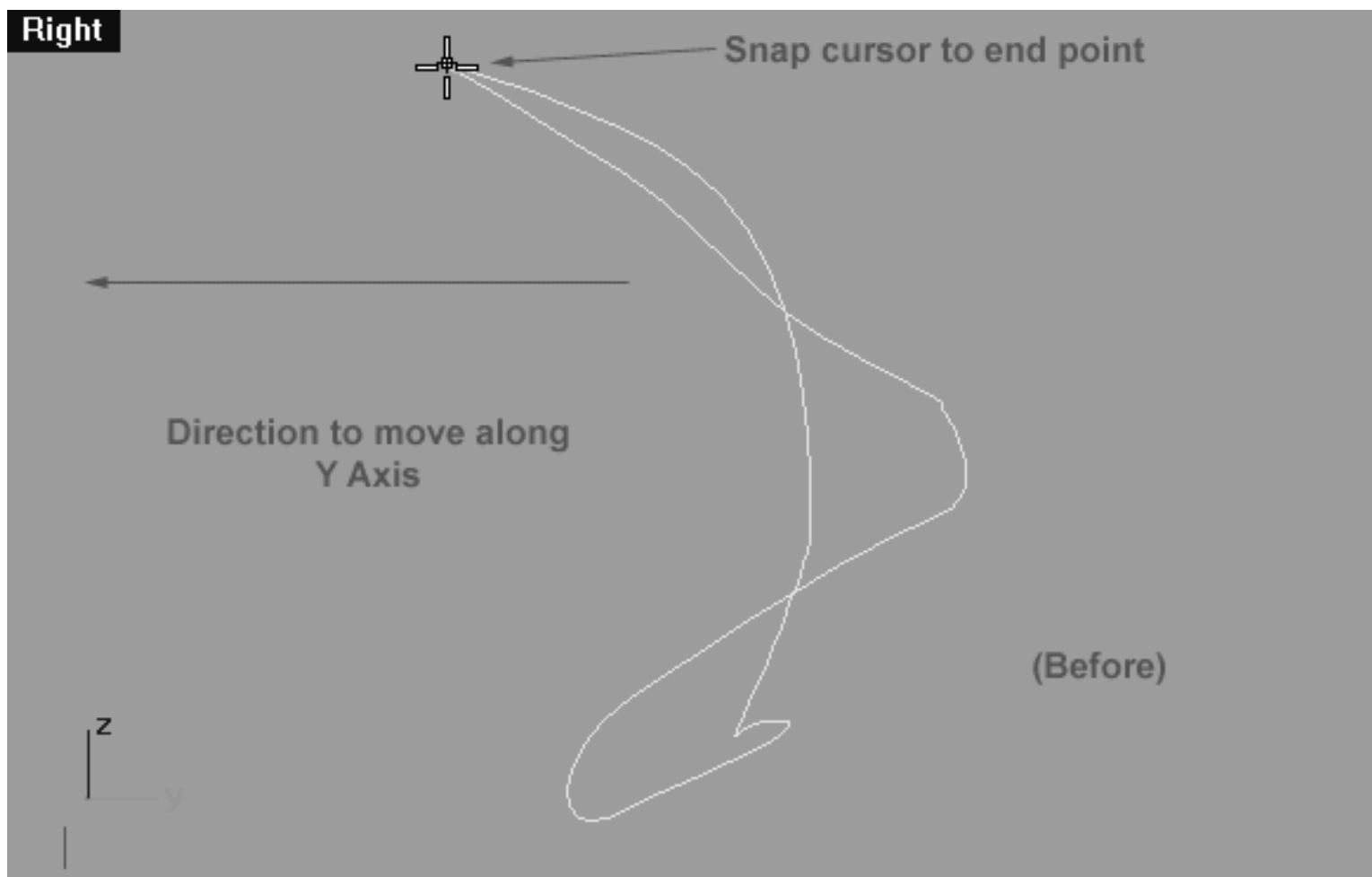
- Open the Edit Layers dialogue box, create a new layer entitled: Eyelid\_02, set the layer colour to a bright magenta and make it the active layer.
- Maximise the **Right Viewport** and select the 1st Eyelid Curve by left clicking on it -- it will highlight.



- From the toolbar choose the Copy Icon or type: Copy at the command line.
- The system will respond with the following prompt at the command line: **Point to copy from (Vertical InPlace):**
- Type **IN** at the command line and press **ENTER** to complete the operation. A duplicate of the curve has now been created.
- Activate Osnaps / End.

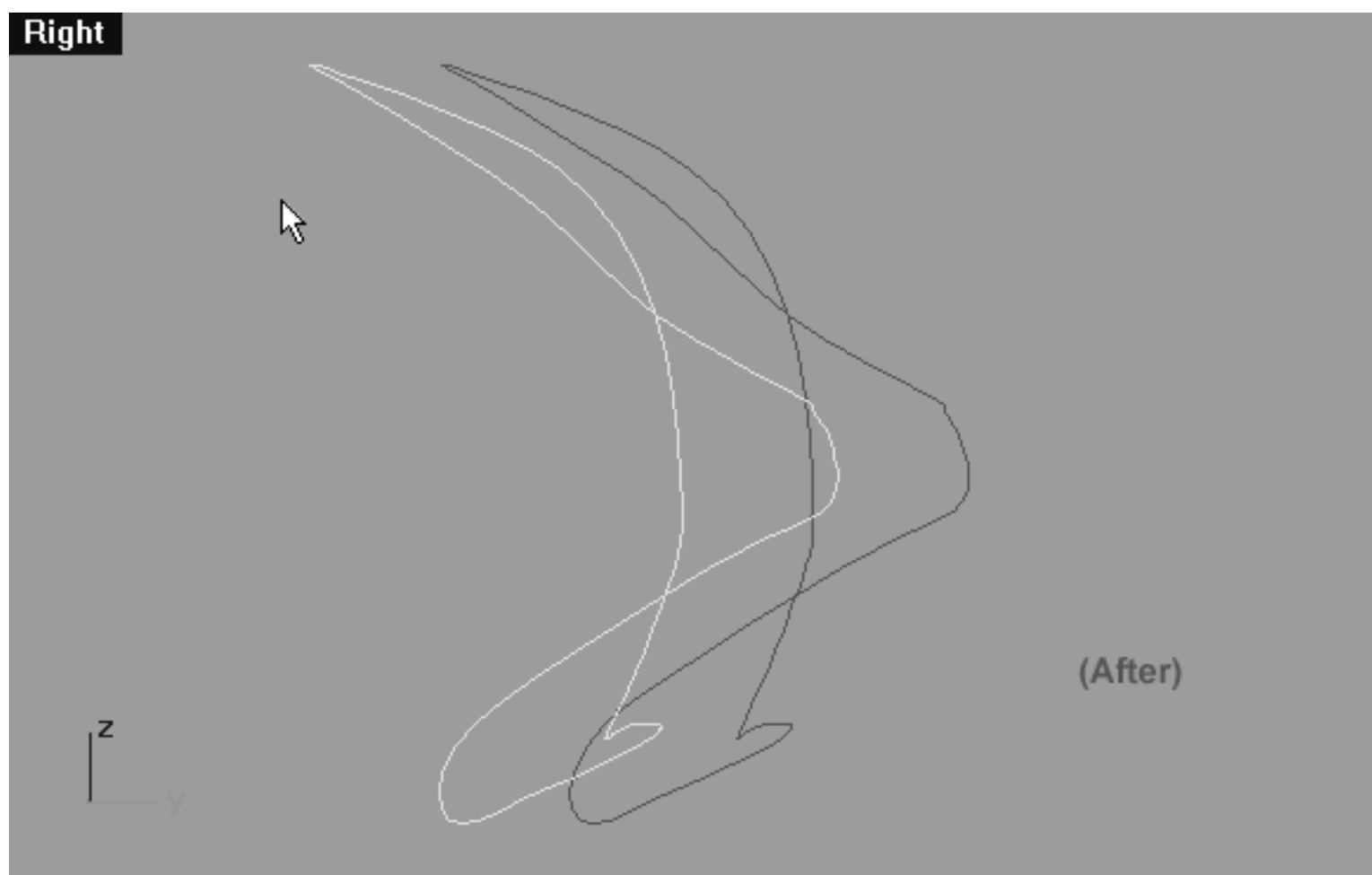


- From the toolbar choose the Move Icon and snap your cursor to the end point of the highlighted curve. Once done hold down the Shift Key and move the object about **1.228** units along the Y axis (see the screenshots below).





*This screenshot of the **Right Viewport** shows the duplicate of the 1st eyelid curve prior to being moved along the Y axis.*

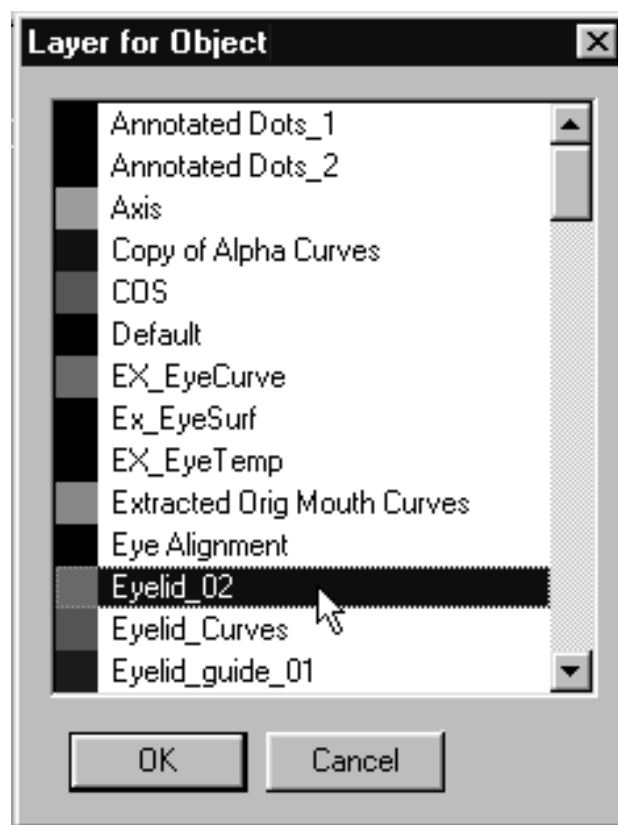




*This screenshot of the **Right Viewport** shows the duplicate of the 1st eyelid curve after to being moved along the *Y* axis about 1.228 units.*

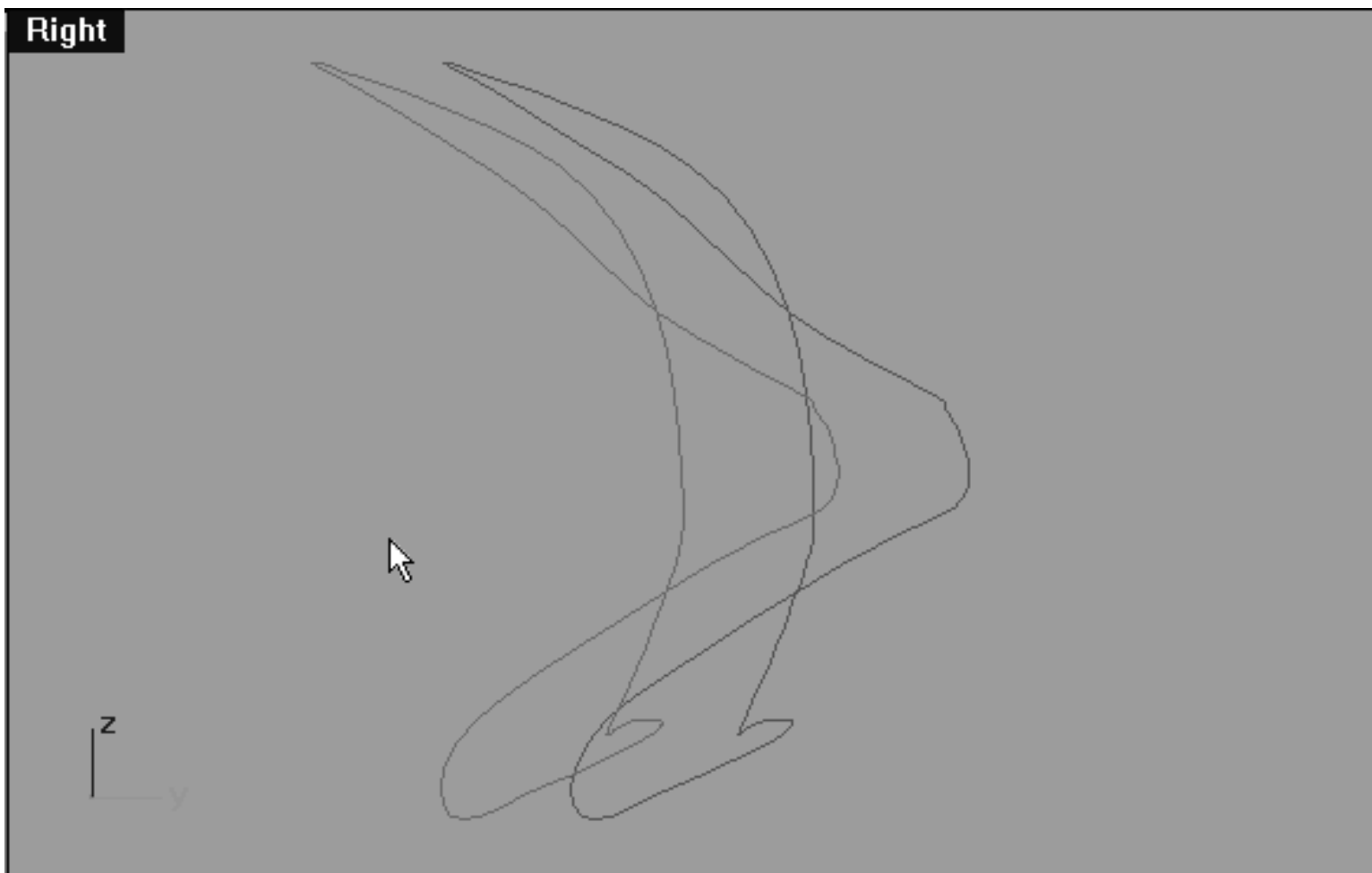
- Disable any currently active Osnaps.
- Now be certain to assign the newly duplicated and moved curve to the currently active layer, in this case (Eyelid\_02). With the moved curve still selected, choose from the toolbar the Edit

Layers Icon  and then select the change layers icon  from the fly out, the Layer for Object dialogue will appear as in the screenshot below:



*This screenshot shows the Layer for Object dialogue box.*


- Locate the layer entitled: Eyelid\_02 in the list, highlight it and then either double click on it or press OK to complete the operation. Once done, the copied curve should turn magenta thus indicating it is now on the correct layer as in the screenshot below.



This **Right Viewport** screenshot shows the duplicated and moved curve has now been assigned to the correct layer (*Eyelid\_02*).

## Create a Cross Section

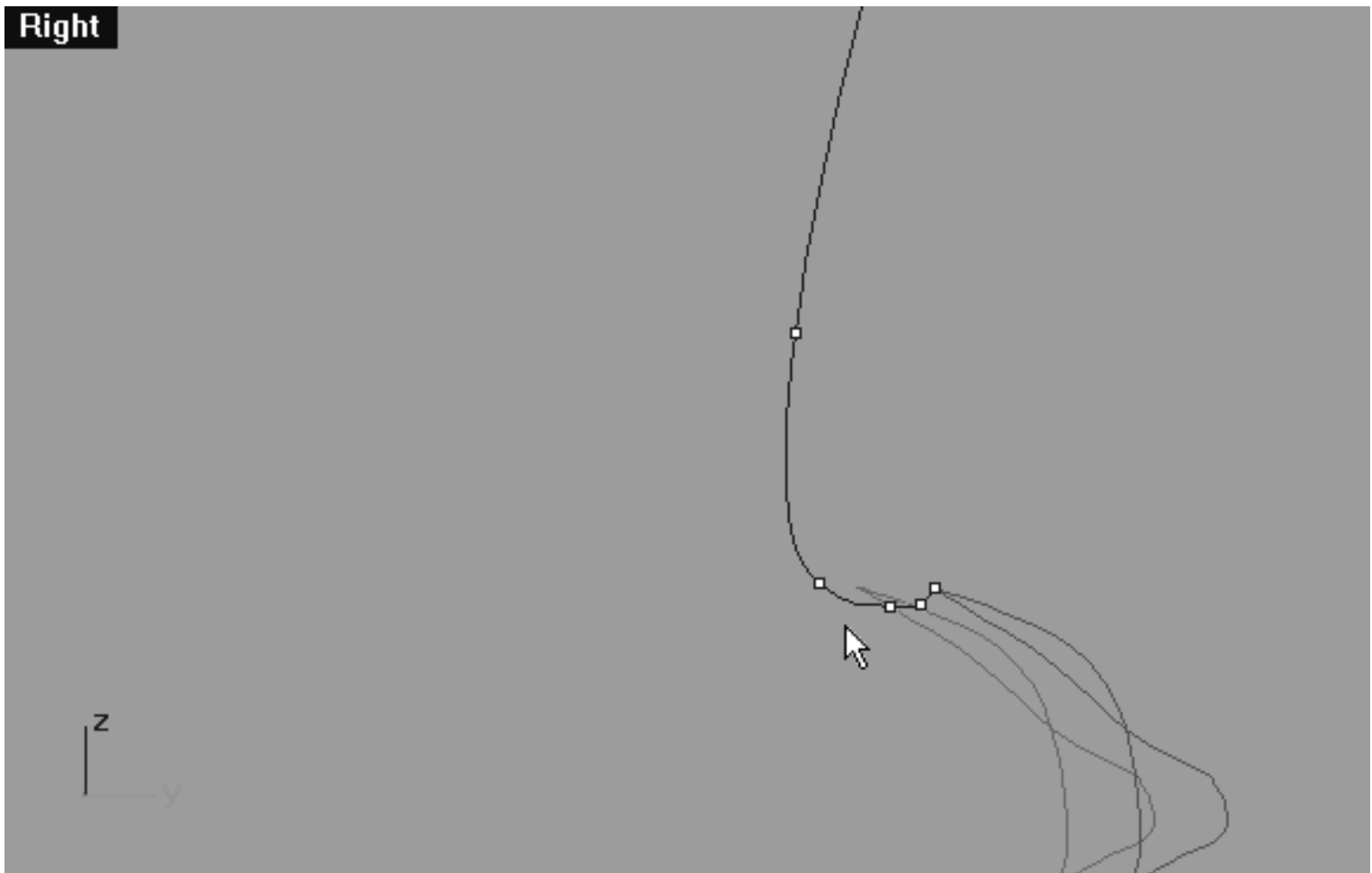
- Open the Edit Layers dialogue, create a new layer entitled: Eyelid\_Xsection, set the colour to blue and make it the active layer.
- Turn on the layer entitled: Eyelid\_Xsection\_GUIDE, press OK to complete the operation and Exit.
- Select the Eyelid\_Xsection\_GUIDE -- it will highlight, then display its edit points.
- Open the Edit Layers dialogue, locate the layer entitled Eyelid\_Xsection\_GUIDE and LOCK the layer, then press OK to Exit.
- Zoom out the Right Viewport quite a bit, you're going to need some extra room to draw the curve.

- We will now draw a gently sloping "L" shape that will represent the upper eyelid cross section which will be used as a guide for both purposes of visual reference and snapping later on. This new cross section curve will consist of total of exactly **8** points. To do this choose the Control Point Curve icon  from the toolbar or type: Curve at the command line and press Enter.
- Now draw the curve as in the screenshot below using the Eyelid\_Xsection\_GUIDE as a template to help you create a good shape. Remember to pay close attention the placement of points and overall shape of this curve -- it's important.
- When you've finished placing the 8th and final point press ENTER to complete the operation.
- Of course, because this is a control point curve you're now going to have to refine the points a bit in order to make the shape of the new curve match that of the guide. To do this, select the new curve that you just drew -- it will highlight, then display its edit points. Now move the points into alignment with those of the guide curve, zooming the view as required. When you've finished your monitor should look like the screenshots below:





*This **Right Viewport** screenshot shows the cross section curve after being drawn with its edit points displayed -- your curve should look like this.*

Right



This **Right Viewport** screenshot shows a detailed view the cross section end. Pay particular attention the placement of points in this area.

- Let's be absolutely certain to assign the newly created cross section curve to the currently active layer, which in this case is (Eyelid\_Xsection). Select the curve -- it will highlight. Next, choose from the toolbar the Edit Layers Icon  and then select the change layers icon  from the fly out, the Layer for Object dialogue will appear.
- Locate the layer entitled: Eyelid\_Xsection in the list, highlight it and then either double click on it or press OK to complete the operation. Once done, the copied curve should turn blue thus indicating it is now on the correct layer.
- Now before we proceed any further let's reset the active layer back once again to (Eyelid\_02). To do this, left click on the Layer Info window at the lower status bar. Find the Eyelid\_02 layer in the list, highlight it and left click to complete the operation. The layer entitled Eyelid\_02 should now appear in the layer info window at the lower status bar.
- Open the Edit Layers dialogue box, locate the layer entitled: Eyelid\_Xsection\_GUIDE and turn it OFF, press OK to Exit.
- Confused, then why not watch the movie below...





**View an example movie**

**Creating the 2nd Eyelid Curve** [Click Here](#)

---

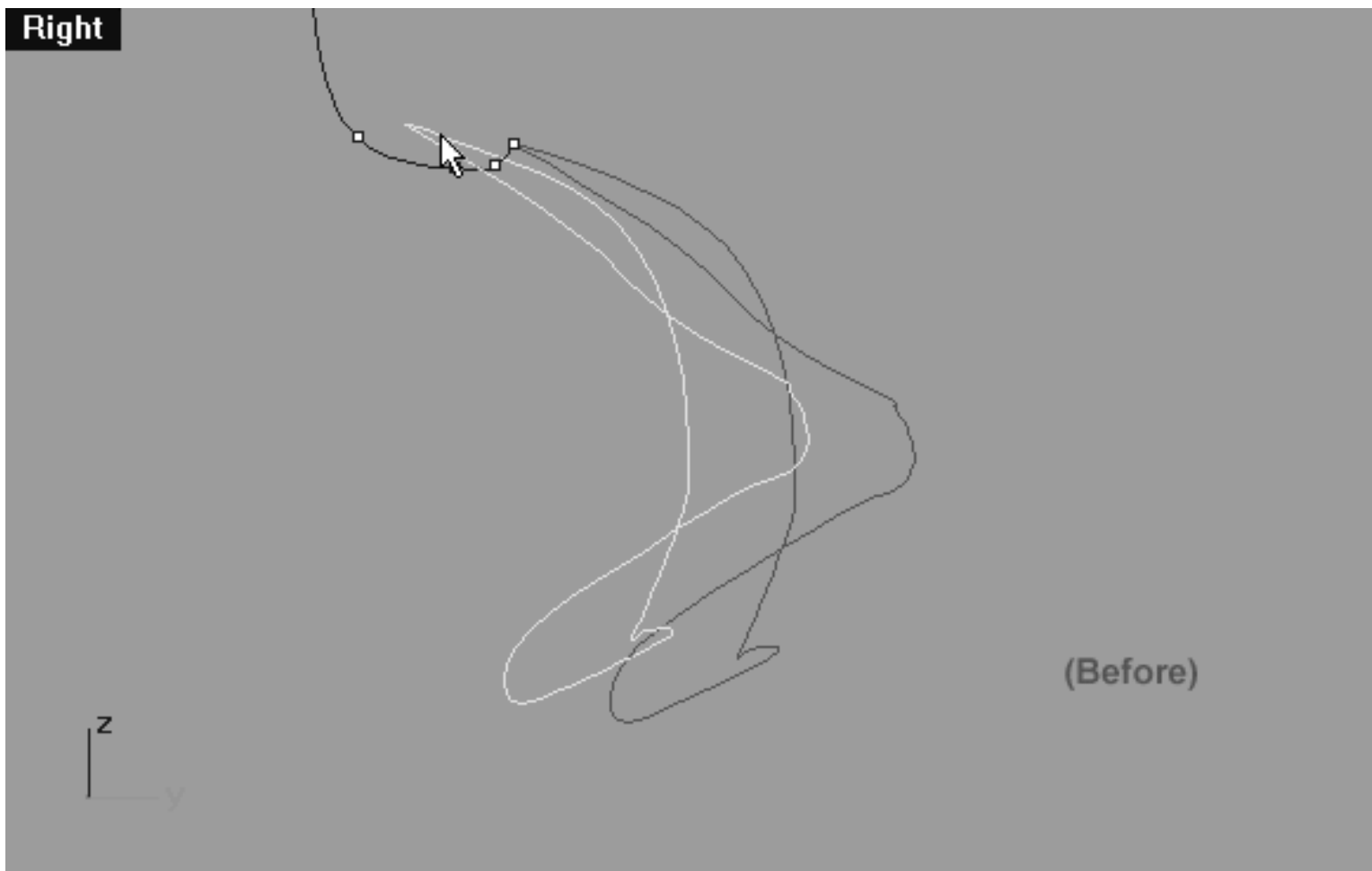
## Editing the 2nd Eyelid Curve

- Maximise the **Right Viewport** if you've not done so already.
- Select the Cross Section curve by left clicking on it -- it will highlight. Display its edit points by choosing Edit Point On/Off icon  from the toolbar or by typing EditPtOn at the command line and pressing Enter.
- Enable Osnaps End / Point.
- Select the new curve by left clicking on it -- it will highlight.
- From the toolbar choose the Move Icon  and snap your cursor to the end point of the highlighted curve. Once done, move the entire object and snap it to the **3rd** point on the cross section curve.
- Once done, disable any currently active Osnaps.

See the screenshots below:



Right



This **Right Viewport** screenshot shows the curve prior to being snapped to the 3rd point on the cross section curve.



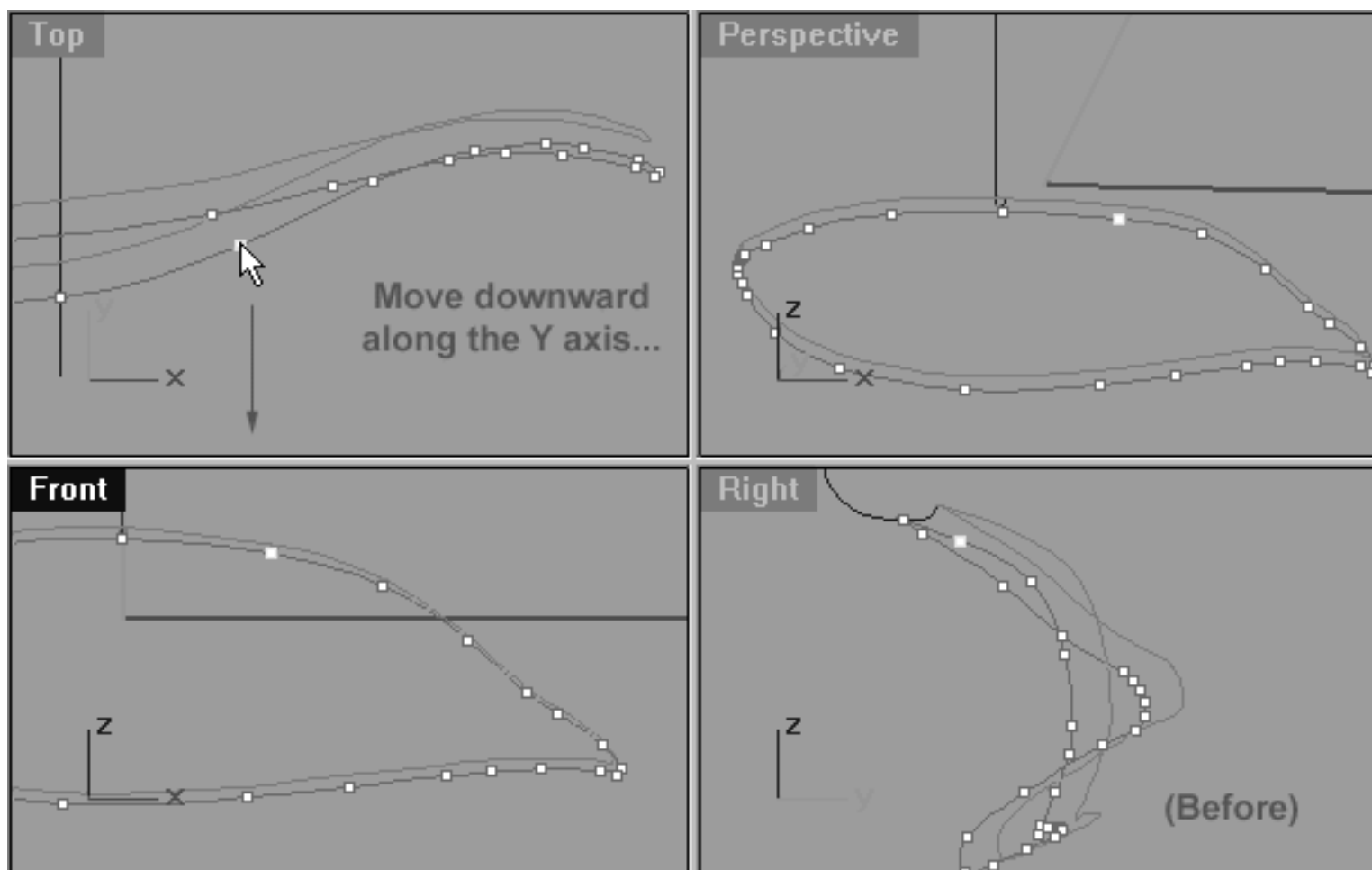
This **Right Viewport** screenshot shows the curve after being snapped to the 3rd point on the cross section curve.

## Move Those Points -- Upper Right (1)

Now let's start moving some points...

- Minimise the **Right Viewport**.
- In Any Viewport, select the 1st Eyelid Curve by left clicking on it -- it will highlight. Once done, LOCK the object by typing LOCK at the command line and pressing Enter. This will prevent the 1st eyelid curve from being damaged.
- Open the Edit Layers dialogue box, locate the layer entitled: (Eyelid\_Xsection) and turn it OFF, press OK to Exit.
- Select the 2nd Eyelid Curve -- it will highlight, and display it edit points.
- In the **Front Viewport** select the point at roughly the **1 o'clock** position on the upper row -- it will highlight.

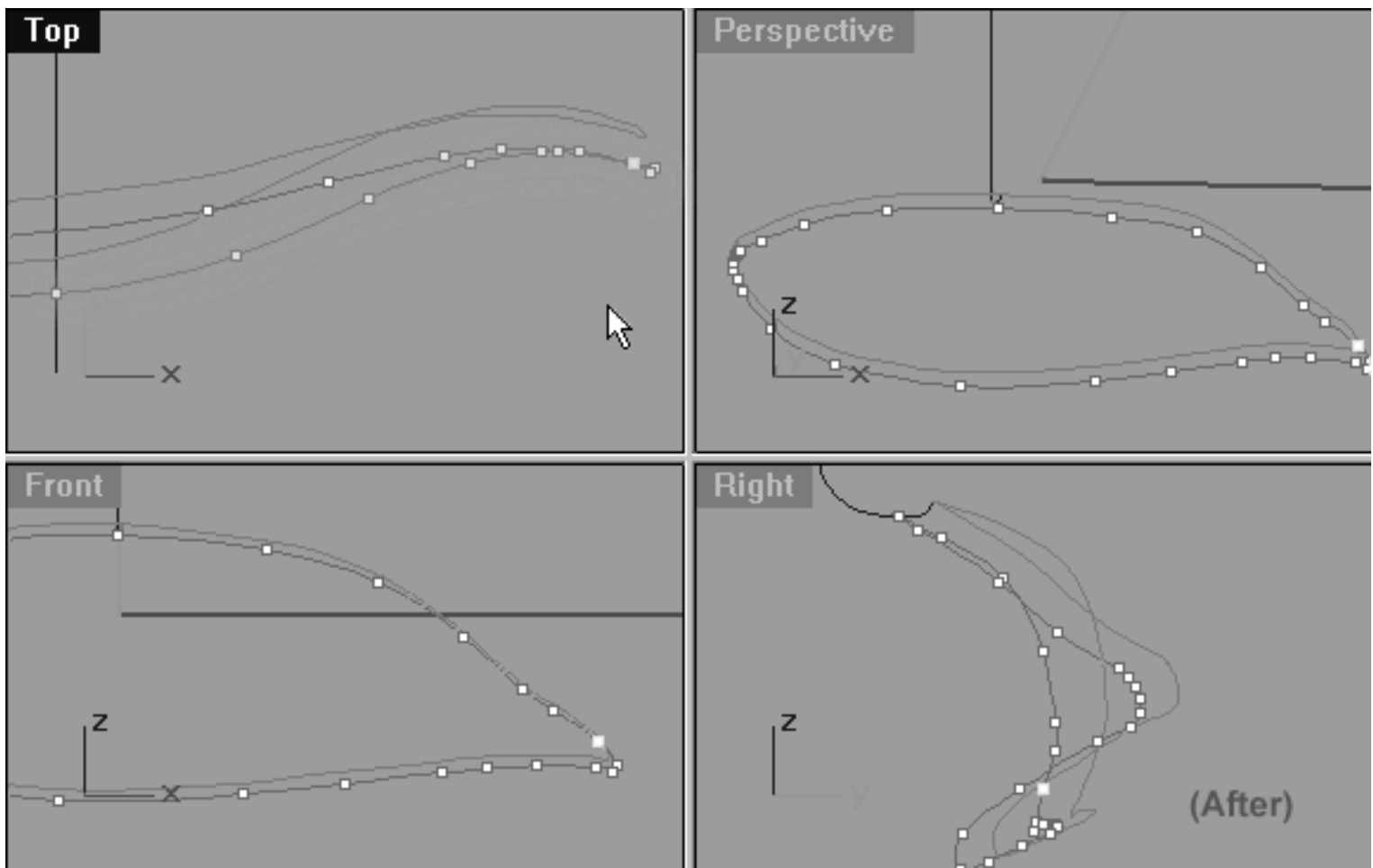
- Now move your cursor into the **Top Viewport** and while holding down the Shift Key move the point downward along the Y axis approximately 0.313 units.
- Working in a clockwise manner (as viewed from the front) repeat this procedure with the following 5 upper row points. Your aim should again be to create a gentle arcing shape -- see the screenshots below.



This **All Viewport** screenshot shows the 2nd Eyelid Curve (Eyelid\_02) prior to any editing taking place on the upper row. Notice that the point at roughly the 1 o'clock position has been selected and is now ready to be moved downward slightly along the Y axis.

### Helper Table:

Point	Approximate Units Moved
at 1 o'clock (1st point)	0.313
2nd point	0.479
3rd point	0.403
4th point	0.252
5th point	0.106
6th point	Nil

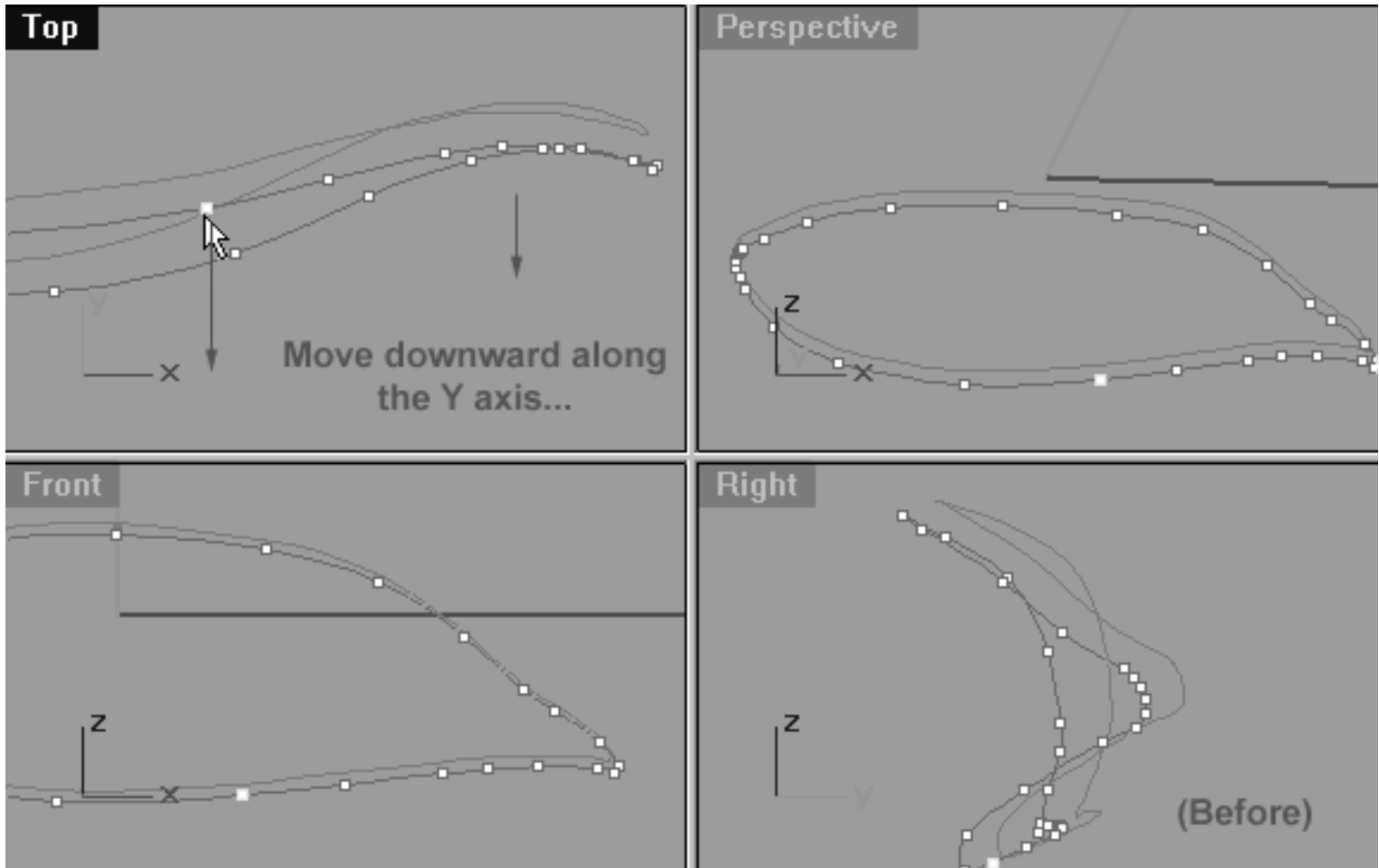


This **All Viewport** screenshot shows the 2nd Eyelid Curve (Eyelid\_02) after editing has taken place on the upper row. Notice that a total of 6 points have now been moved on the upper row. Observe that when seen from the Top Viewport the points near the 12 to 2 o'clock position have been opened out a bit while those following in a clockwise direction near the corner lie just ahead or on those of the lower row.

## Move Those Points -- Lower Right (1)

Now let's sort out the points on the lower row...

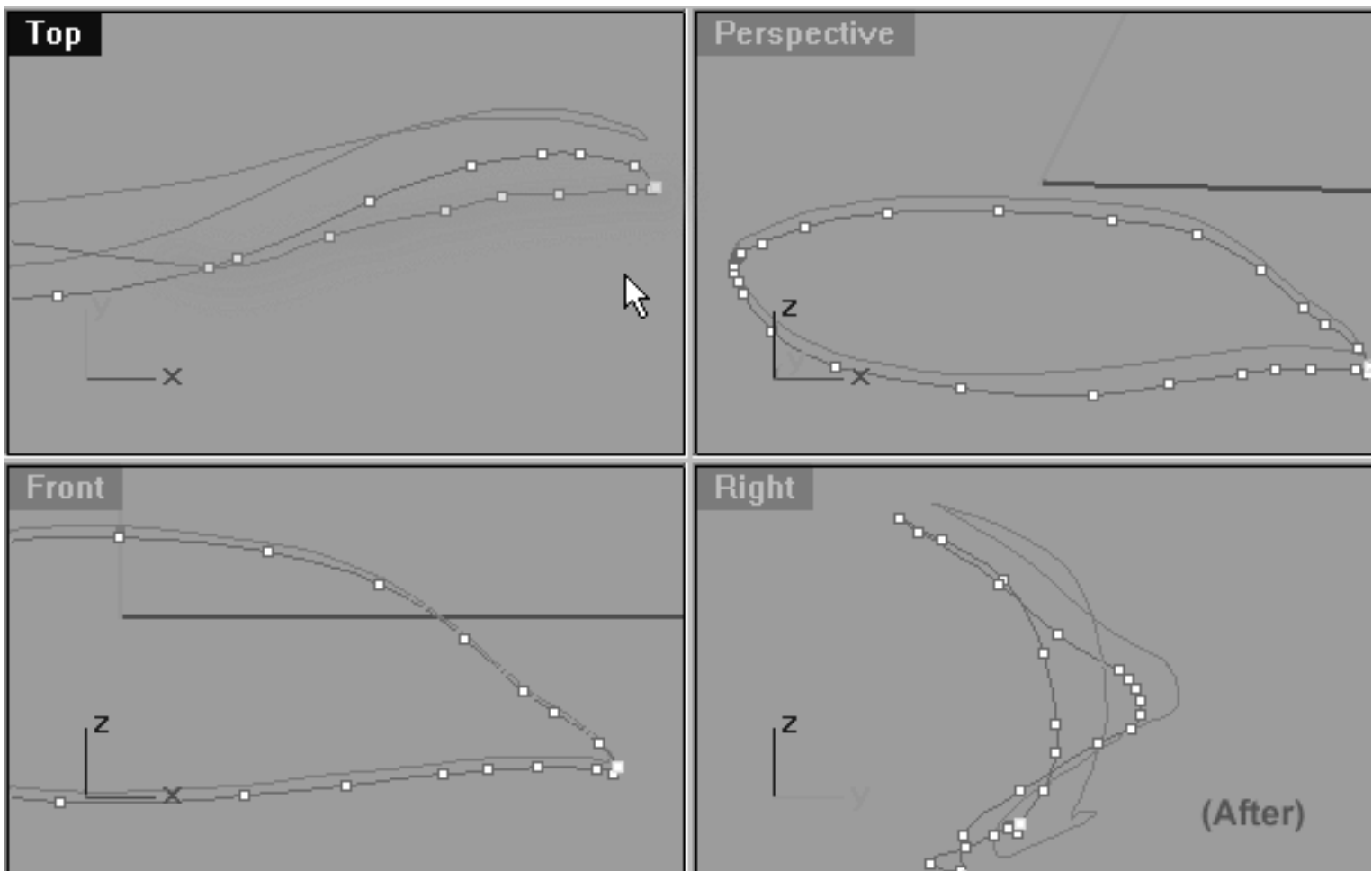
- In the **Front Viewport** select the point at roughly the **5 o'clock** position on the lower row -- it will highlight. WARNING --Be certain that you pick the correct point (see the screenshot below).
- Now move your cursor into the **Top Viewport** and while holding down the Shift Key move the point downward along the Y axis, roughly about 1.250 units until it lies directly upon the curve of the upper row.
- Once done, continue working in a anti-clockwise manner (as viewed from the front) repeat this procedure, only this time moving the following 7 lower row points further forward of those on the upper row. Your aim should again be open out the curve a bit and to create a shape similar to the screenshots below.



*This **All Viewport** screenshot shows the 2nd Eyelid Curve (Eyelid\_02) prior to any editing taking place on the lower row. Notice that the point at roughly the 5 o'clock position has been selected and is now ready to be moved downward slightly along the Y axis.*

**Helper Table:**

Point	Approximate Units Moved
at 5 o'clock (1st point)	1.250
2nd point	1.283
3rd point	1.202
4th point	1.095
5th point	0.921
6th point	0.573
7th point	0.368
8th point	0.170



This **All Viewport** screenshot shows the 2nd Eyelid Curve (Eyelid\_02) after editing has taken place on the lower row. Notice that a total of 8 points have now been moved on the lower row. Observe that when seen from the Top Viewport the point at the 5 o'clock position has been placed directly at the intersection of the upper row while those following in an anti-clockwise direction near the corner lie ahead of the upper row.



**View an example movie**

**Editing the 2nd Eyelid Curve, Pt. 2** [Click Here](#)

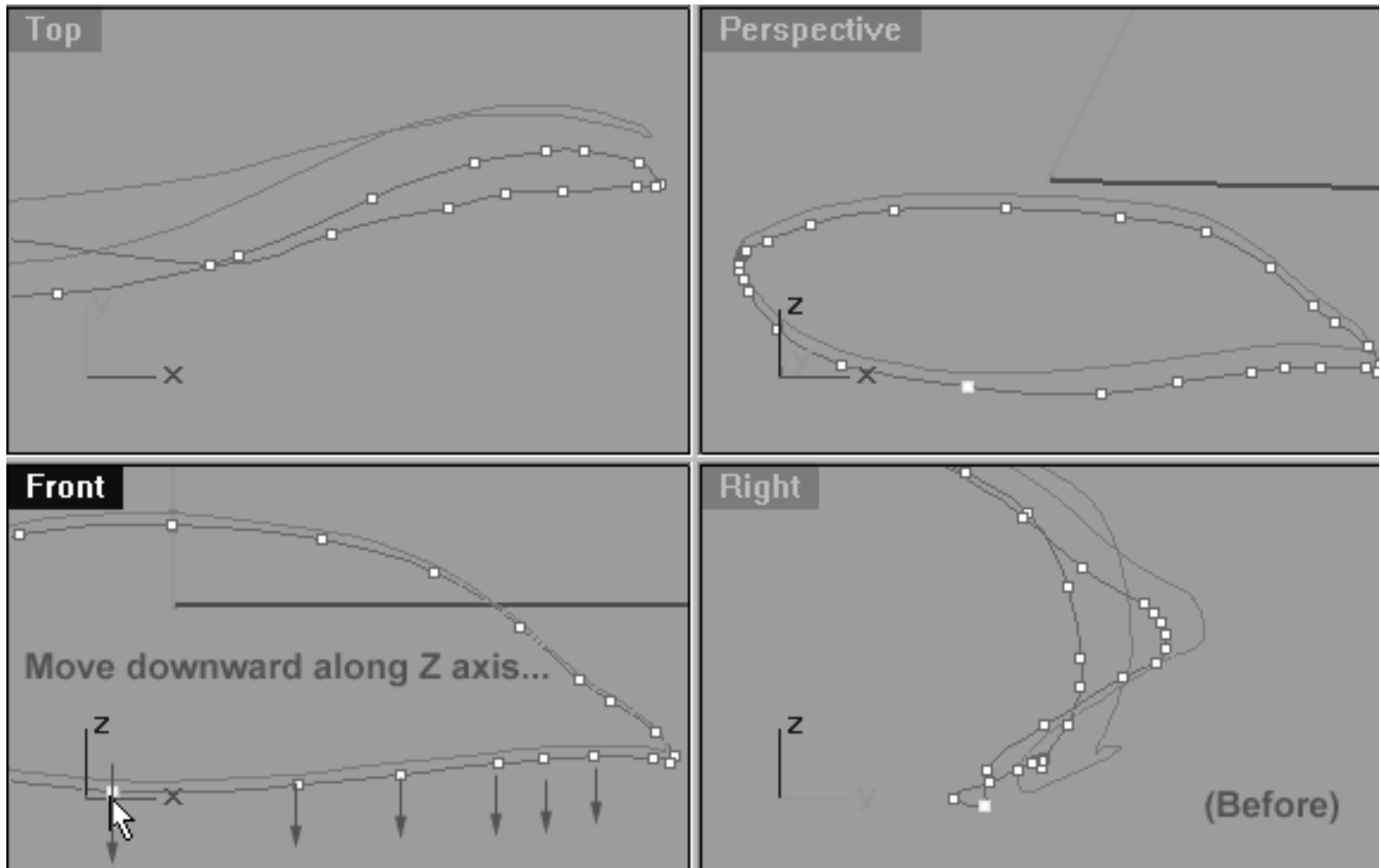
## The Ever Expanding Curve Lower Right Side

Well done. We will now concentrate on the lower row of the curve yet again.

- In the **Front Viewport** select the point at the 6 o'clock position on the lower row of the curve and whilst holding down the Shift key move it downward along the Z axis roughly 0.611 units.



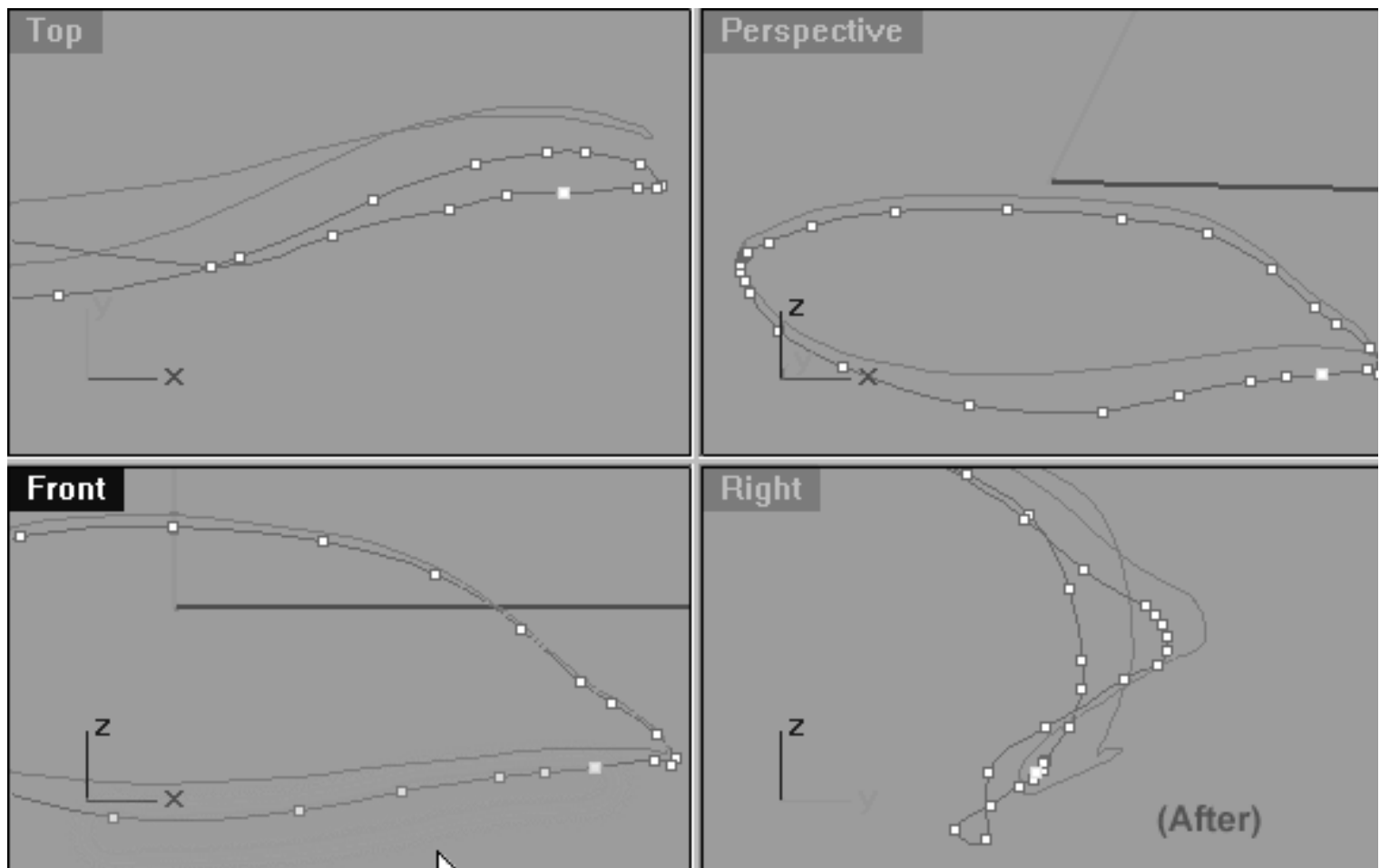
- Continue working anti-clockwise along the lower row of the curve, selecting the following 5 points in the **Front Viewport** and then moving them downward along the Z axis whilst holding down the Shift key until a gentle arcing shape is created. What you want to achieve by doing this is to make the curve a bit larger and open it up a somewhat.



This **All Viewport** screenshot shows the 2nd Eyelid Curve (Eyelid\_02) prior to any editing taking place on the lower row. Notice that the point at roughly the 6 o'clock position has been selected and is now ready to be moved downward slightly along the Z axis.

### Helper Table:

Point	Approximate Units Moved
at 6 o'clock (1st point)	0.611
2nd point	0.451
3rd point	0.266
4th point	0.177
5th point	0.172
6th point	0.092



This **All Viewport** screenshot shows the 2nd Eyelid Curve (Eyelid\_02) after editing has taken place on the lower row. Notice that 6 points have now been moved downward along the Z axis on the lower row and the shape has been opened up slightly.

## Refinement -- Upper Left

Now we will turn our attention to the opposite side -- this time it's the upper row.

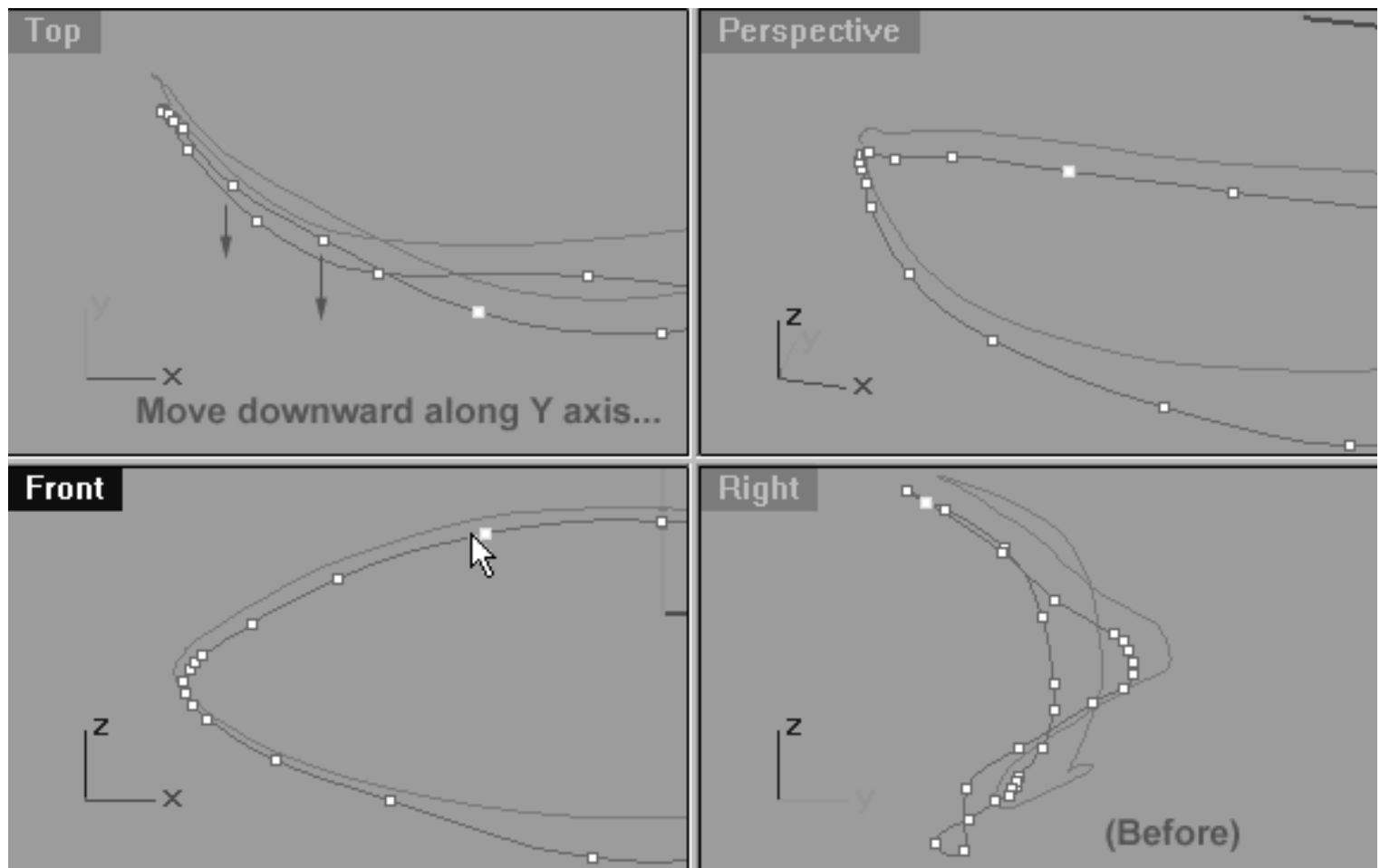
- Pan the **Front Viewport** so that the points located between 12 o'clock and furthestmost point on the left side of the curve are clearly visible.
- In the **Front Viewport** select the point at the 11 o'clock position on the upper row of the curve. Now in the **Top Viewport** move it downward slightly along the Y axis roughly about 0.050 units -- only a tiny amount.
- Working anti-clockwise, repeat this procedure with the next 2 points. \*Hint -- you should move a bit further downward along the Y axis with each successive point (well, more or less).

At this stage it would be a very good idea to Zoom in very tightly on the corner points in both the Top and Front Viewports. On this side the points bunch up in the corner making editing very difficult -- trust me, it helps to be able to see what you're doing..!

Once again, it's quite possible that you may pick a lower row corner point when you intended to only pick an upper one. Don't worry too much, just try and get them lined up as well as you can. If you do make a few mistakes just look at what you've done in the Right Viewport and try and get everything so that it is aligned very well there. We will continue to refine this area a bit more later anyway, so just try and do as best you can. That said, it's better if you pick carefully and don't make mistakes in the first place, so do take your time.

- You should continue working anti-clockwise into the corner until such time as all of the points on the upper row have been moved.

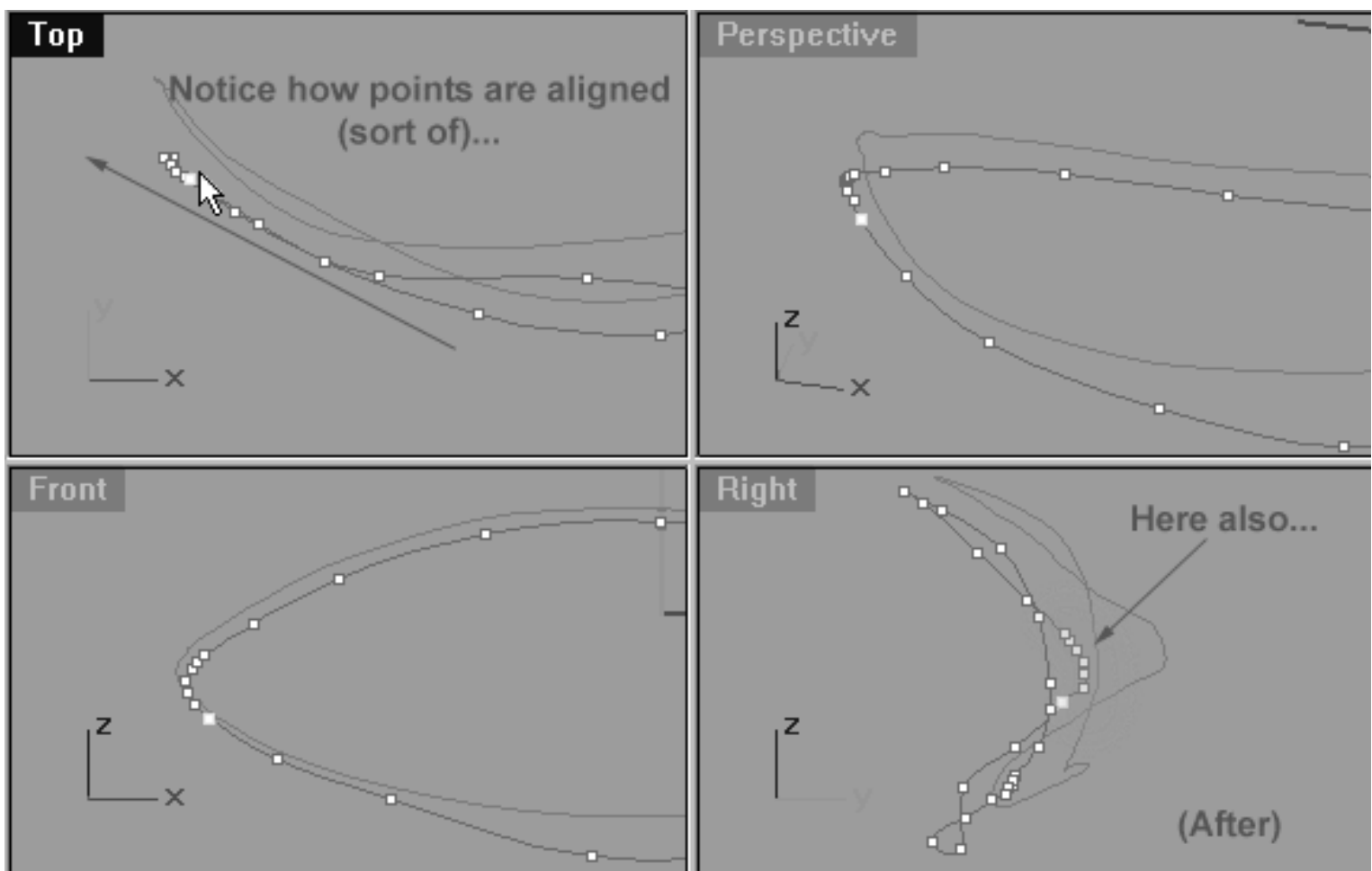
Take a look at the screenshots below...



This **All Viewport** screenshot shows the 2nd Eyelid Curve (Eyelid\_02) prior to any editing taking place on the upper row. Notice that the point at roughly the 11 o'clock position has been selected and is now ready to be moved downward slightly along the Y axis.

**Helper Table:**

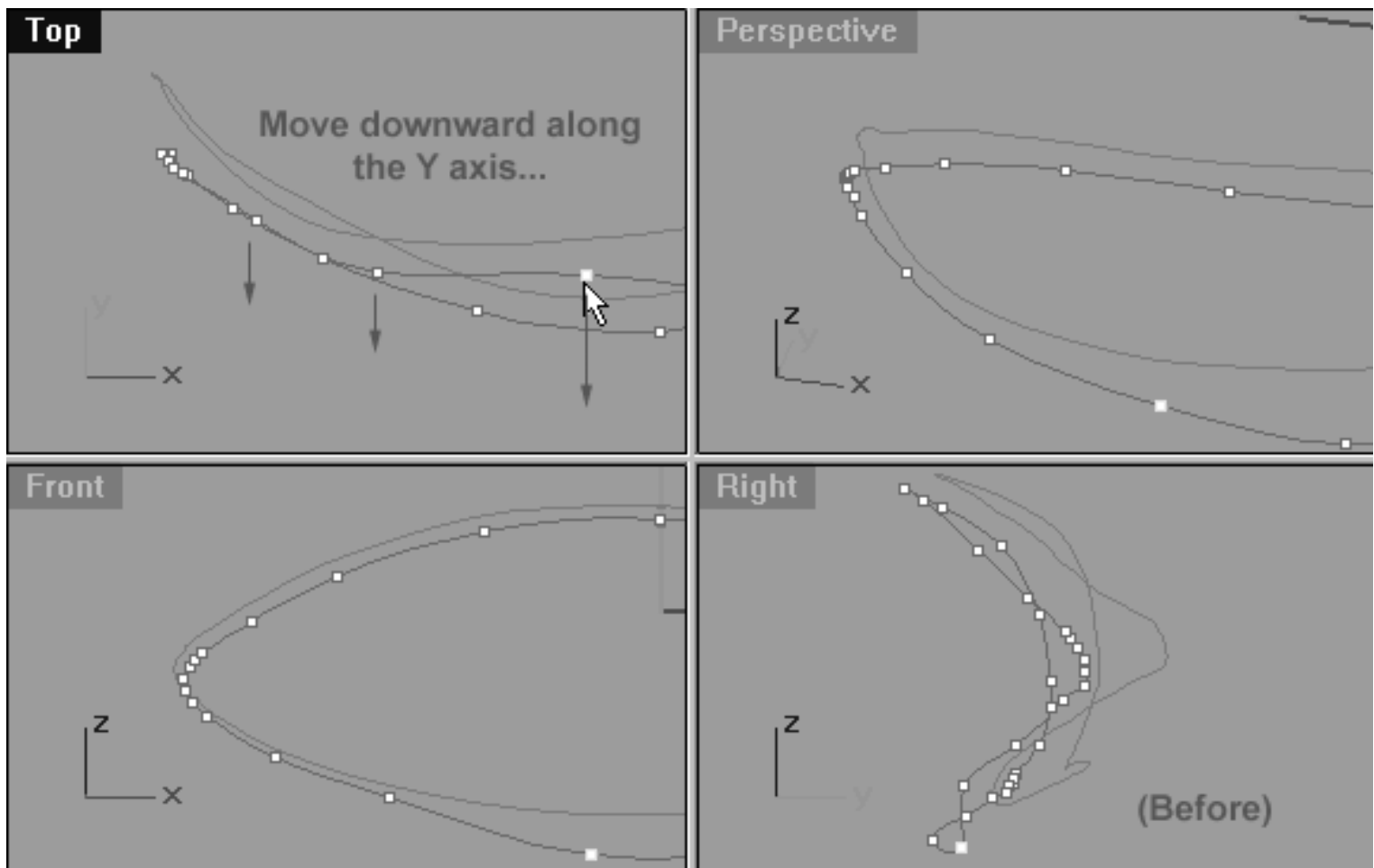
Point	Approximate Units Moved
at 11 o'clock (1st point)	0.050 (trace)
2nd point	0.466
3rd point	0.582
4th point	1.022
5th point	1.081
6th point	1.110
7th point (corner)	1.025



This **All Viewport** screenshot shows the 2nd Eyelid Curve (Eyelid\_02) after editing has taken place on the upper row. Notice that all points have now been moved downward slightly along the Y axis in the Top Viewport. When viewed from the Top Viewport, you can sort of see that the points are in a logical alignment on a slight angle. Study this image carefully and compare it with the (before) screenshot as these relationships are quite important. Observe the Right Viewport, do you see how the corner points have moved along the Y axis in this view? You may have noticed that I've made several errors and moved a few of the points on the lower row in the corner. This is not really anything to worry about as we will continue to refine this area during the next few steps anyway.

# Refinement -- Lower Left

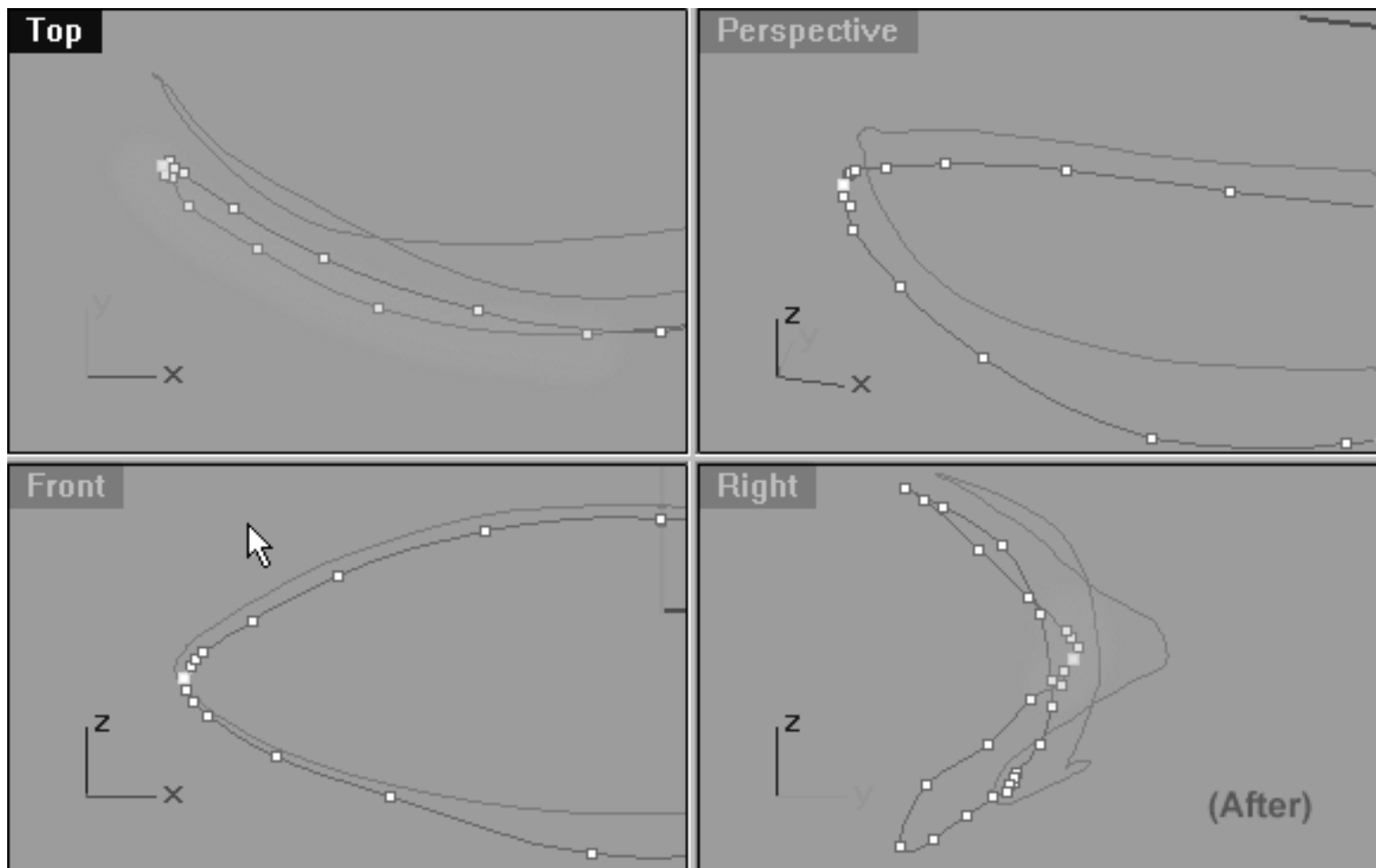
- In the **Front Viewport** select the point at roughly the 6 o'clock position. Once done, move your cursor into the **Top Viewport**, hold the Shift Key and move the selected point downward along the Y axis roughly 1.412 units. **\*Hint** -- you should move the point so that it rests just a hair ahead of the points on the upper row when viewed from the Top.
- Next, working in a clockwise manner (as seen from the front view) select the next point, again moving it downward along the Y axis. **\*Hint** -- this point should rest well ahead of the upper row of points.
- Now continue the procedure for all the points that remain on the lower row.
- Confused? See the screenshots below:



*This **All Viewport** screenshot shows the 2nd Eyelid Curve (Eyelid\_02) prior to any editing taking place on the lower row. Notice that the point at roughly the 6 o'clock position has been selected and is now ready to be moved downward along the Y axis.*

**Helper Table:**

Point	Approximate Units Moved
at 6 o'clock (1st point)	1.412
2nd point	0.734
3rd point	0.659
4th point	1.143
5th point	1.475
6th point	1.559



This **All Viewport** screenshot shows the curve after editing has taken place on the lower row. Notice that all of the points have now been moved on the lower row and for the most part they are just slightly forward of those on the upper row when viewed from the Top Viewport. \*Hint-- don't forget to watch what is happening in the Right Viewport as well and pay particular attention to the corner points.





**View an example movie**

**Editing the 2nd Eyelid Curve, Pt. 3** [Click Here](#)

---

Go to the [NEXT PART OF THIS LESSON](#)

RETURN to the Top of Page -- [Click Here](#)

Written by Joseph R. Saltzman.

Co-produced in association with Steven Ståhlberg

©1998-1999 Cinemagic Productions Limited. All Rights Reserved.

Duplication of this document including images and text by any means is expressly forbidden without prior written consent of Cinemagic Productions Limited.

Web Site: <http://www.cmagic.co.uk> Telephone: +44 (0)1753 733 190 Fax: +44 (0)1753 736 619 email: [cmagic@cmagic.co.uk](mailto:cmagic@cmagic.co.uk)

# MOVIE EDITING THE 2ND EYELID CURVE PART ONE

To **PLAY** the example movie, double click below:

To **RETURN** to the tutorial -- [click here](#).

# MOVIE EDITING THE 2ND EYELID CURVE PART TWO

To **PLAY** the example movie, double click below:

To **RETURN** to the tutorial -- [click here](#).

# MOVIE EDITING THE 2ND EYELID CURVE PART THREE

To **PLAY** the example movie, double click below:

To **RETURN** to the tutorial -- [click here](#).

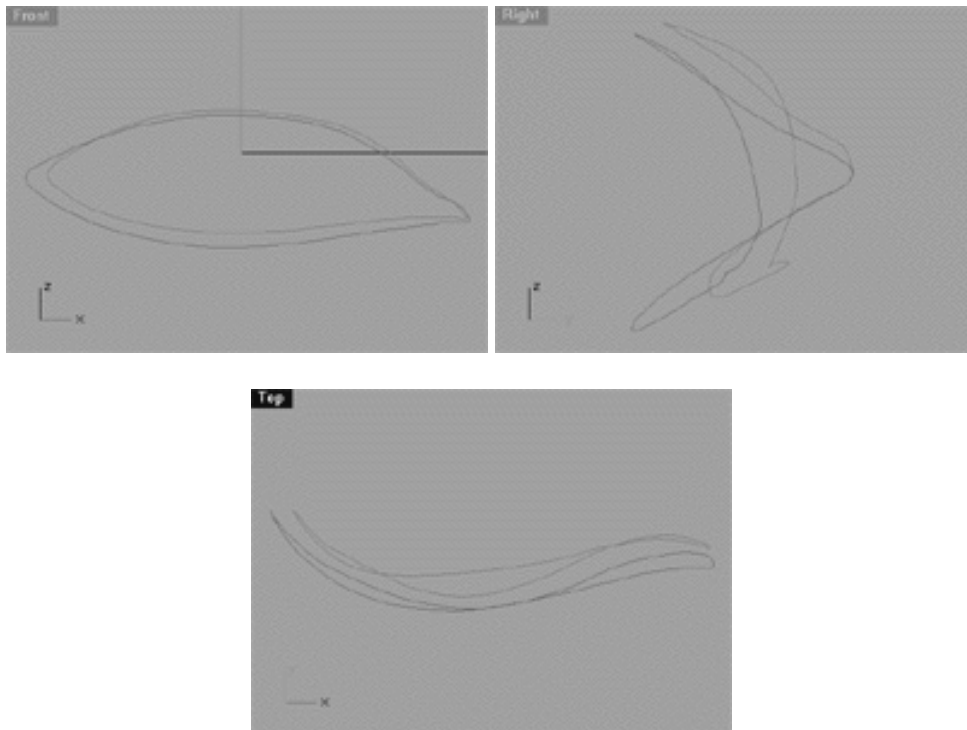
**RETURN** to previous page -- [Click Here](#)

**GOTO** the [NEXT LESSON](#)



## CREATING THE 2ND EYELID CURVE

(Part 2 of 2)



---

### Contents:

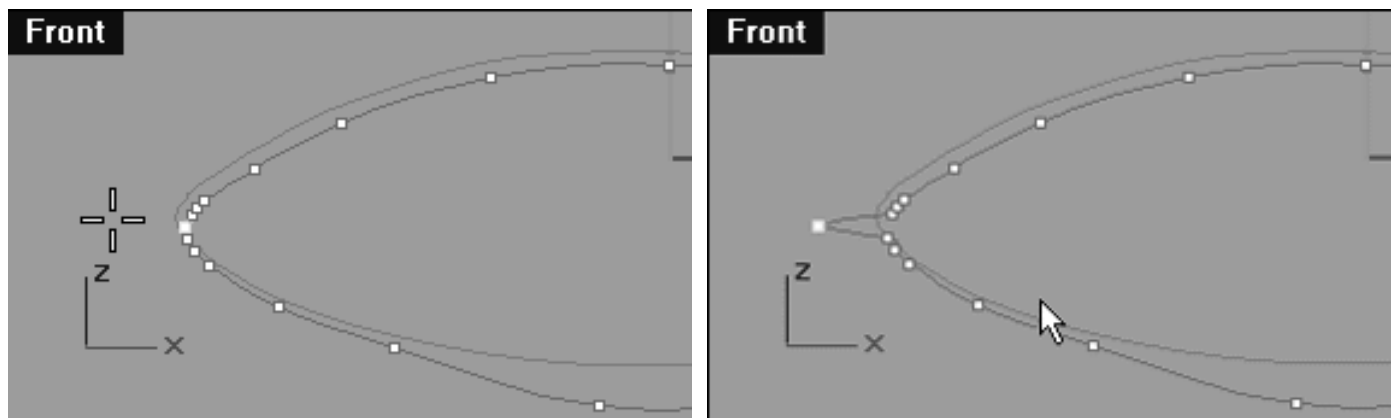
- [Widening the Corner -- Left Side](#)
- [Hi Ho -- The Lower Row](#)
- [Oh No -- It's the Upper Row](#)
- [Spaced Out On The Lower Row](#)
- [Get Back](#)
- [Example Movie -- Editing the 2nd Eyelid Curve, Pt. 4](#)
- [Example Movie -- Editing the 2nd Eyelid Curve, Pt. 5](#)
- [Refinement -- Lower Row, Right Side](#)
- [Refinement -- Upper Row, Right Side](#)

- [Refinement -- Corner Area, Right Side](#)
- [Example Movie -- Editing the 2nd Eyelid Curve, Pt. 6](#)
- [Tweaking in the Top View](#)
- [Tweaking the Lower Row](#)
- [Snap It Up](#)
- [Shutting Down the Scene](#)

## Widening the Corner Left Side

Still remaining on this side of the curve our task will now be to enlarge the shape and refine the placement of the points, needless to say this is where things get considerably more complex.

- In the **Front Viewport** select the cornermost point and move it outward exactly 2.512 units along the X axis \*WARNING, be very careful when selecting the cornermost point and make certain that you've picked the correct one. To do this, start with the point at the 12 o'clock position and count it as number 1, then, continue anti-clockwise until you've reached the **8th** point -- this is the corner point.(see the screenshots below):



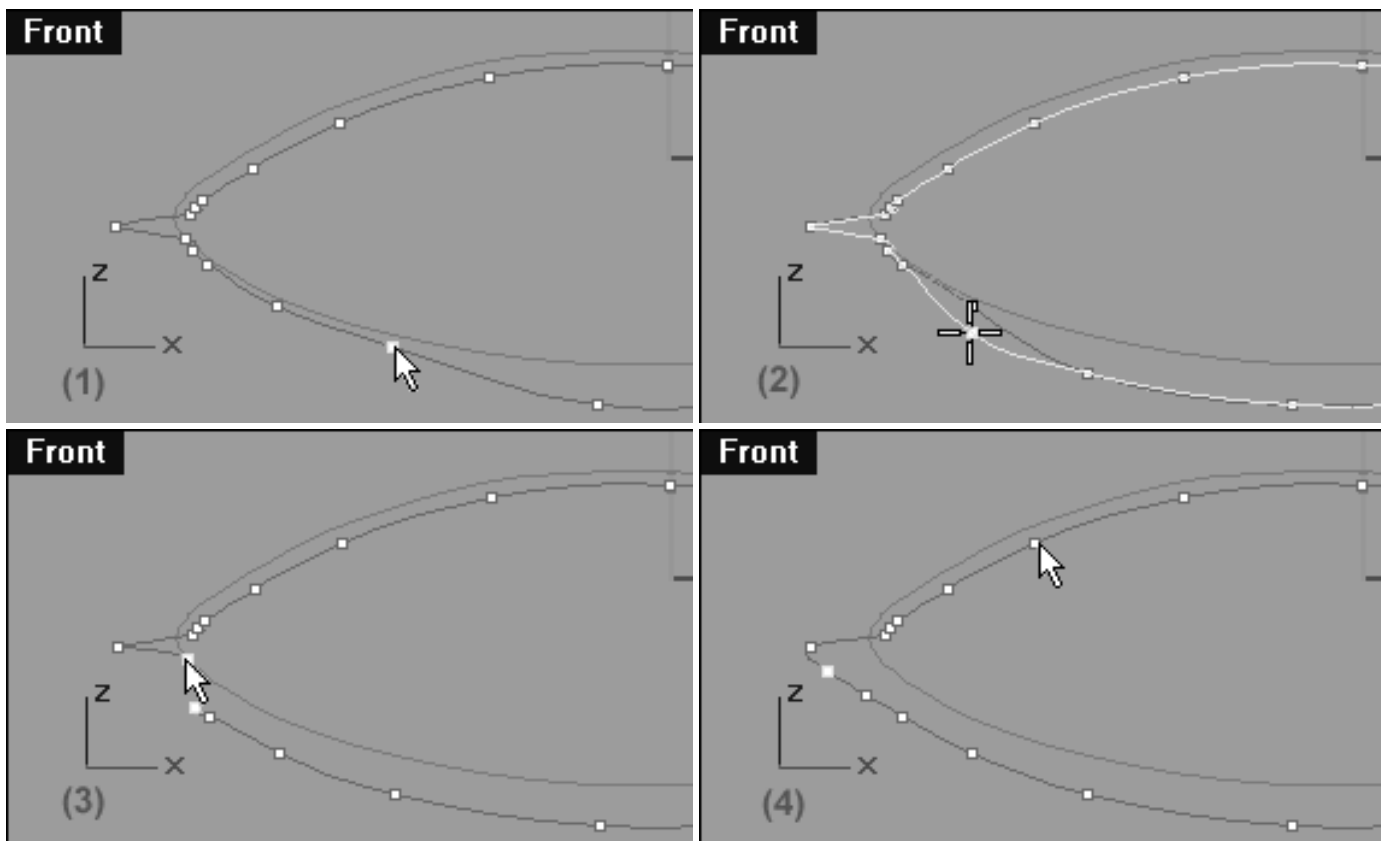
*Above screenshots: Left = Before / Right = After*

## Hi Ho -- The Lower Row

Right then now that's done, let's work refining the lower row first...

- Next, starting with the point at the 7 o'clock position, select it and then move it downward roughly 0.557 units along Z axis (see screenshot (1) below).
- Continue working in a clockwise manner into the corner repeating the operation on the following points (see the screenshots (2, 3 & 4 below).





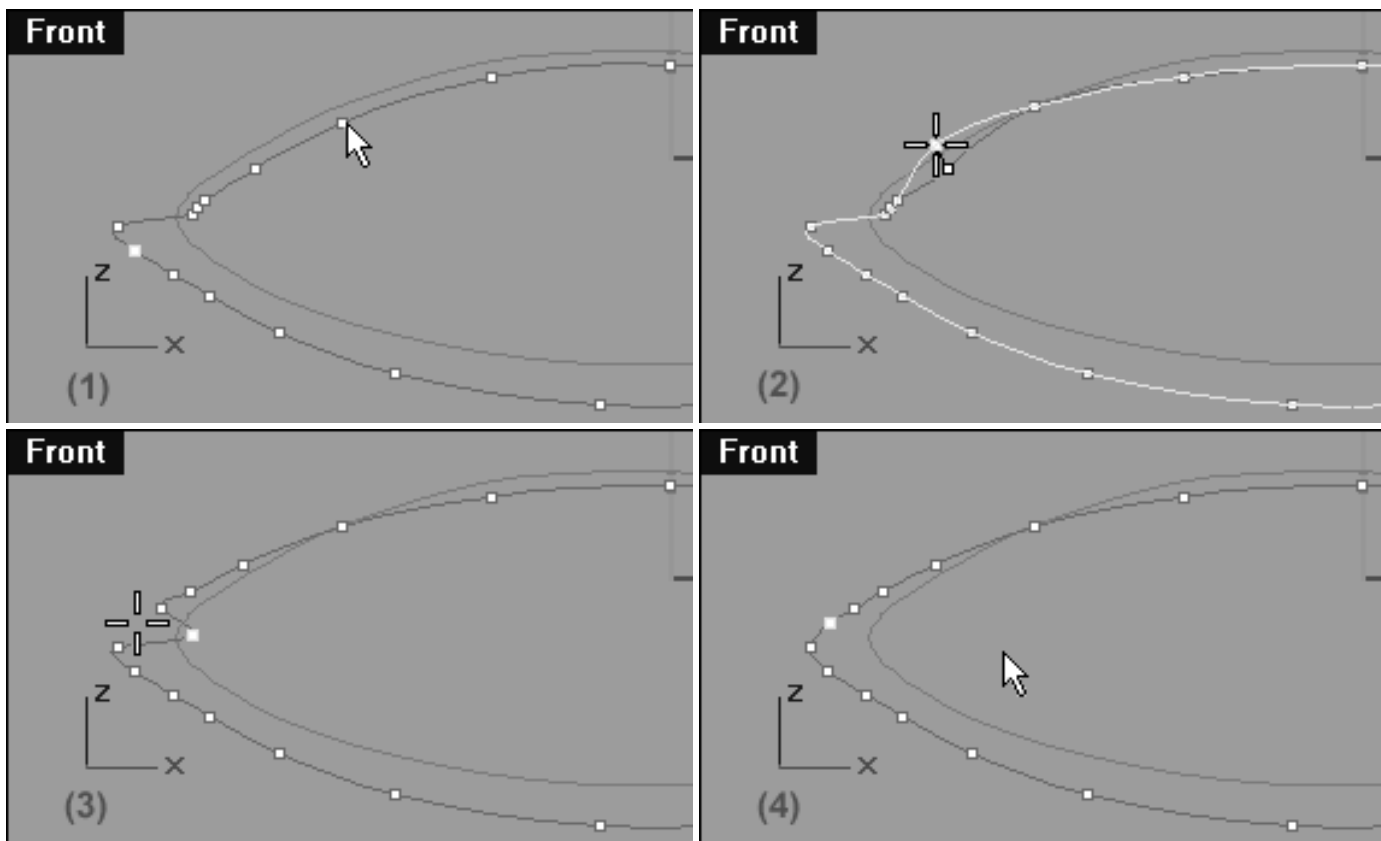
### Helper Table:

Point	Approximate Units Moved
at 7 o'clock (1st point)	0.557
2nd point	0.654
3rd point	0.872
4th point	0.978
5th point	1.167

## Oh No -- It's the Upper Row

Okay, now let's see about refining the upper row...

- Working anti-clockwise and starting with the 1st point from the 12 o'clock position move it **down** along the Z axis by roughly 0.096 and along the X axis about 0.683 units.
- Again, continue working in an anti-clockwise manner into the corner repeating the operation on the points shown (see screenshots 1, 2, 3 & 4 below).

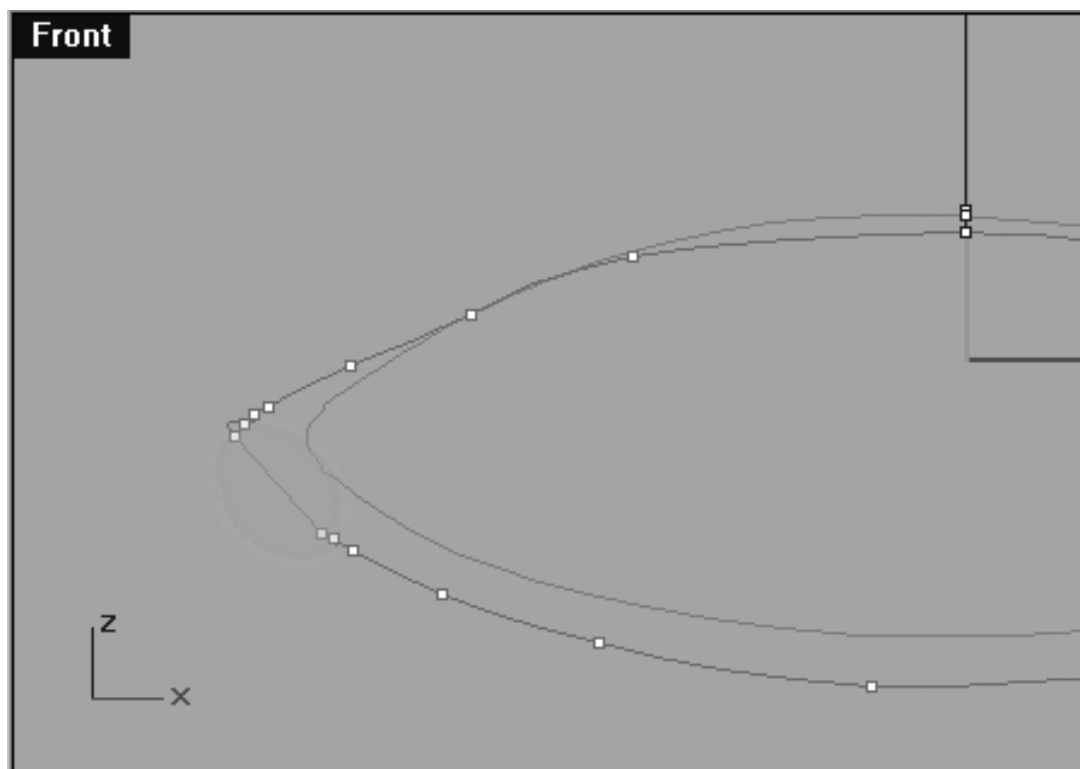


### Helper Table:

Point	Approximate Units Moved
1st point from 12 o'clock position	X = 0.683 (to left) Z = 0.096 (down)
Next point anti-clockwise	X = 1.022 (to left) Z = 0.056 (down)
Next point anti-clockwise	X = 1.120 (to left) Z = 0.098 ( up )
Next point anti-clockwise	X = 1.396 (to left) Z = 0.148 ( up )
Next point anti-clockwise	X = 1.458 (to left) Z = 0.168 ( up )
Next point anti-clockwise	X = 1.492 (to left) Z = 0.204 ( up )
Next point anti-clockwise (corner point)	X = 1.017 (to right) Z = 0.268 ( up )

## Spaced Out On The Lower Row

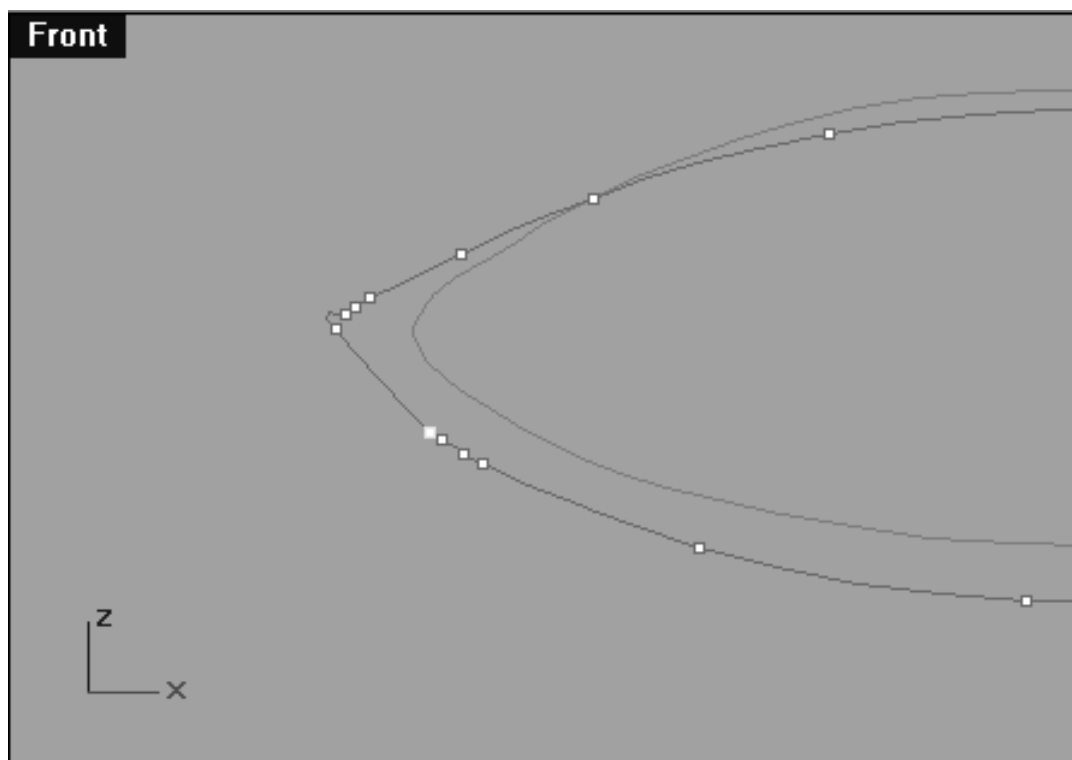
If you now have a look in your Front Viewport you may notice that the points on the lower row are not spaced very well. This is especially true for the points near the corner. Observe the screenshot below, I've marked a particular problem area with an orange highlight. We've got to do something about that huge gap, so it's time to slide some points.



This **Front Viewport** screenshot shows the problematic area (highlighted in orange).

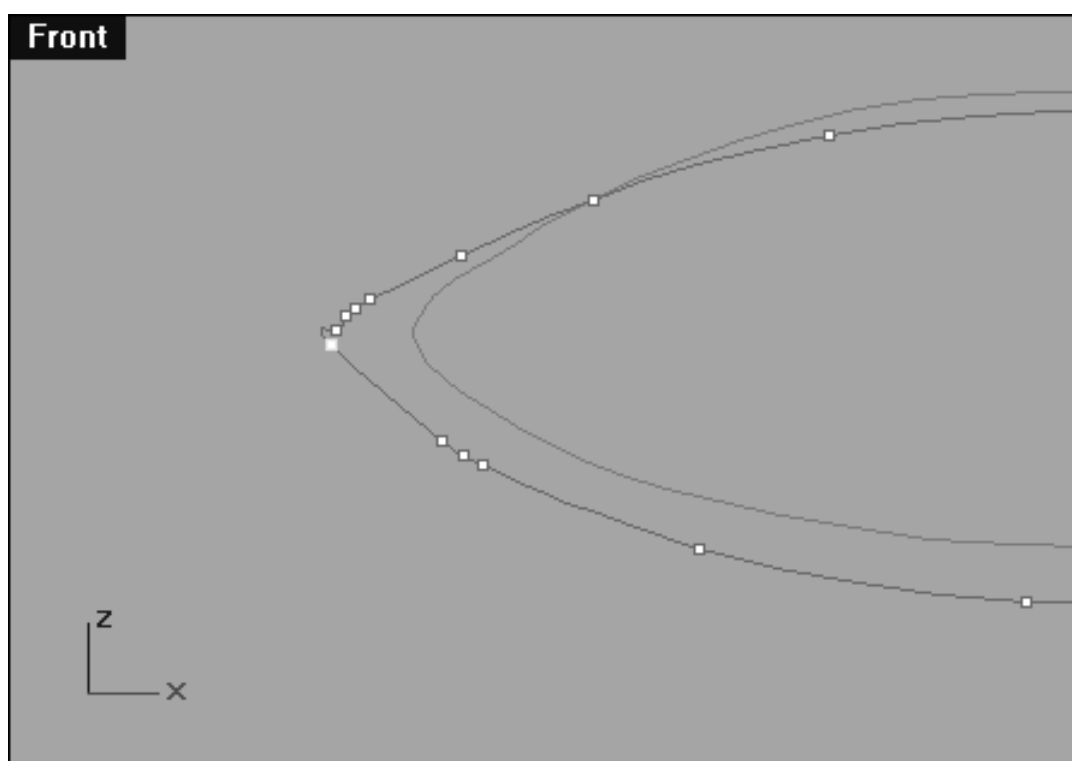
No adjustment is needed with the point at 6 pm. So then, let's start with the point at roughly 7 o'clock.

- Select the point at roughly 7 pm on the lower row, then whilst holding down the shift key move it to the left along the X axis roughly 0.515 units.
- Now working clockwise move on to the next point. This time, slide it **along the vector of the curve** towards the corner by roughly 1.446 units -- do NOT hold down the shift key when doing this!
- Next, starting at the point at roughly the 6pm position on the lower row, work clockwise and select the point just before the large gap as in the screenshot below.



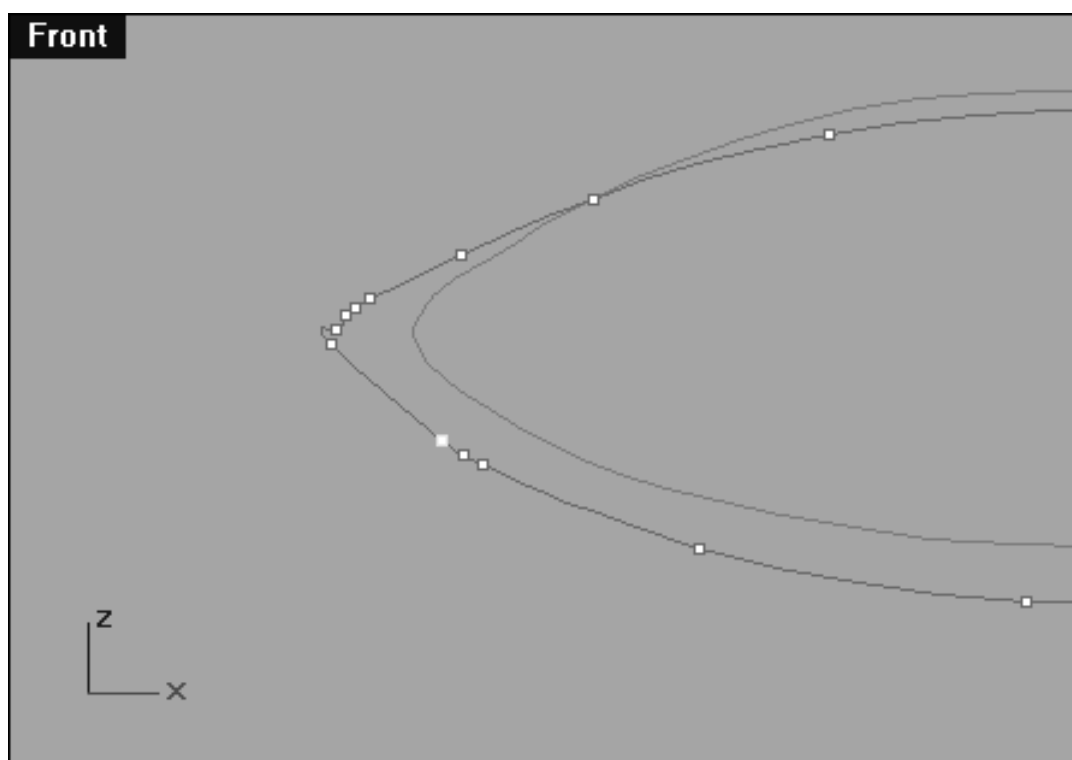
This **Front Viewport** screenshot shows the point just before the large gap has been selected and prior to being moved.

- Now, move the point so that it is slightly below that of the corner point and also slightly further outward to the left along the X axis as in the screenshot below:



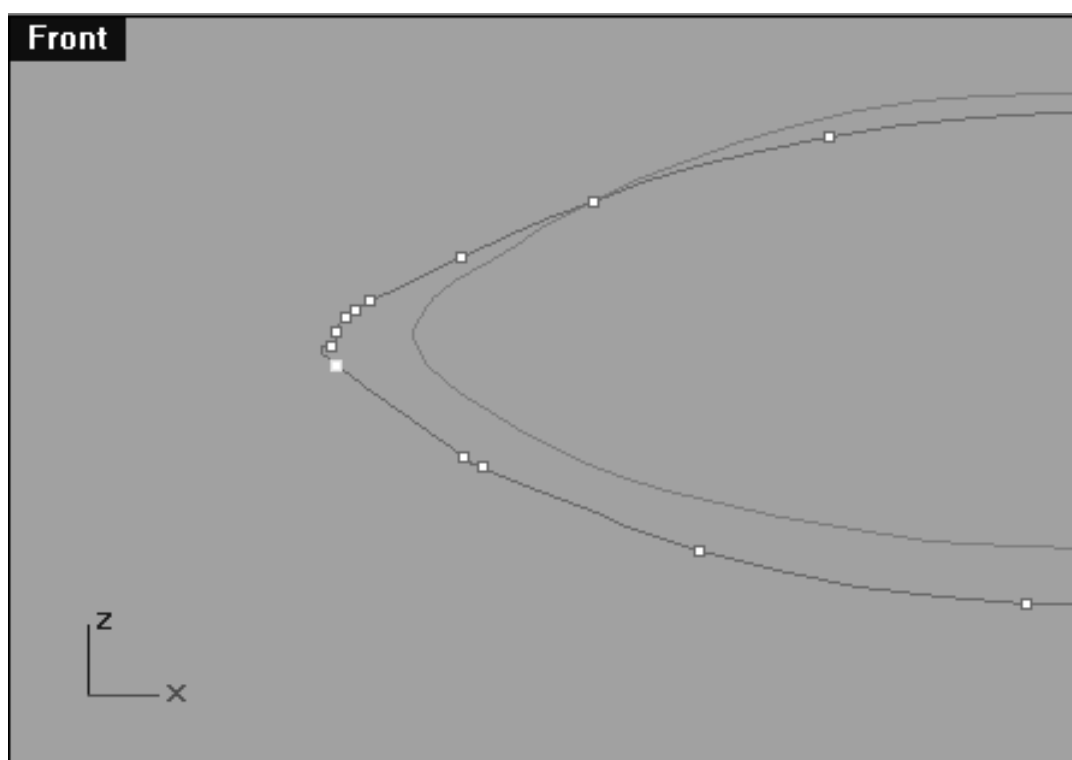
This **Front Viewport** screenshot shows the point just before the large gap has now been moved just below that of the corner point. Observe how it is located just slightly outward to the left along the X axis.

- Once again, select the point just before the large gap as in the screenshot below.



This **Front Viewport** screenshot shows the point just before the large gap has been selected and prior to being moved.

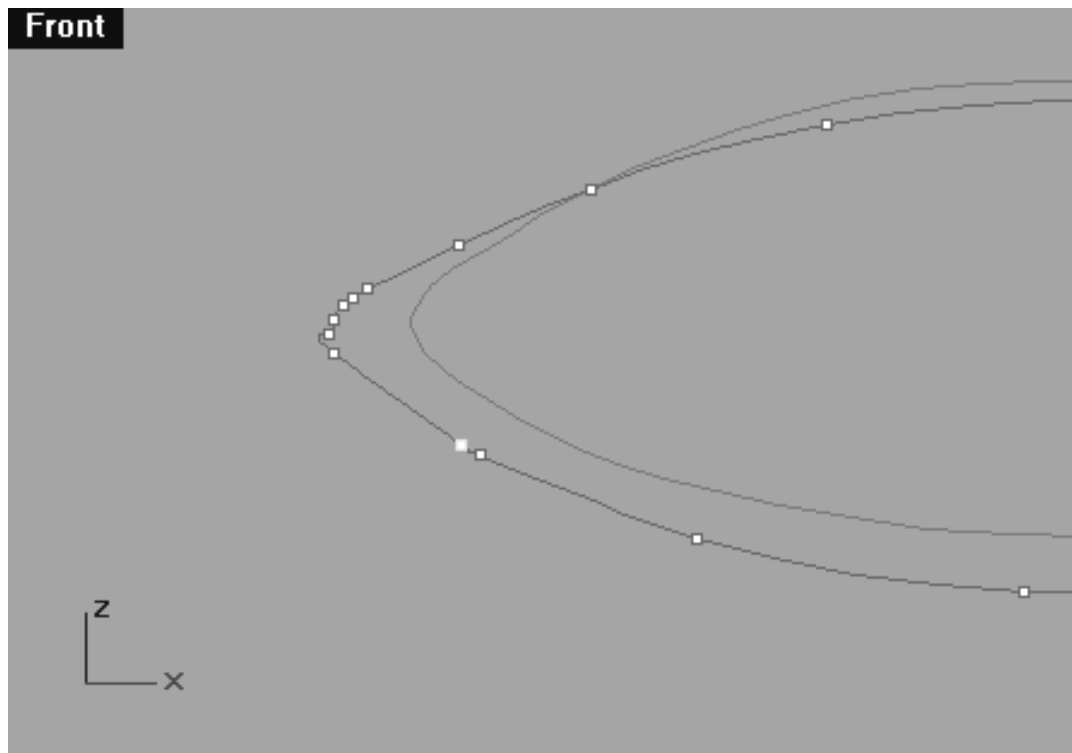
- Now slide the point clockwise along the vector of the curve until it's located just below that of the previous point you placed, see the screenshot below:



This **Front Viewport** screenshot shows the point just before the large gap has now been slid clockwise along the vector of the curve and is now located just below that of the point placed previously.

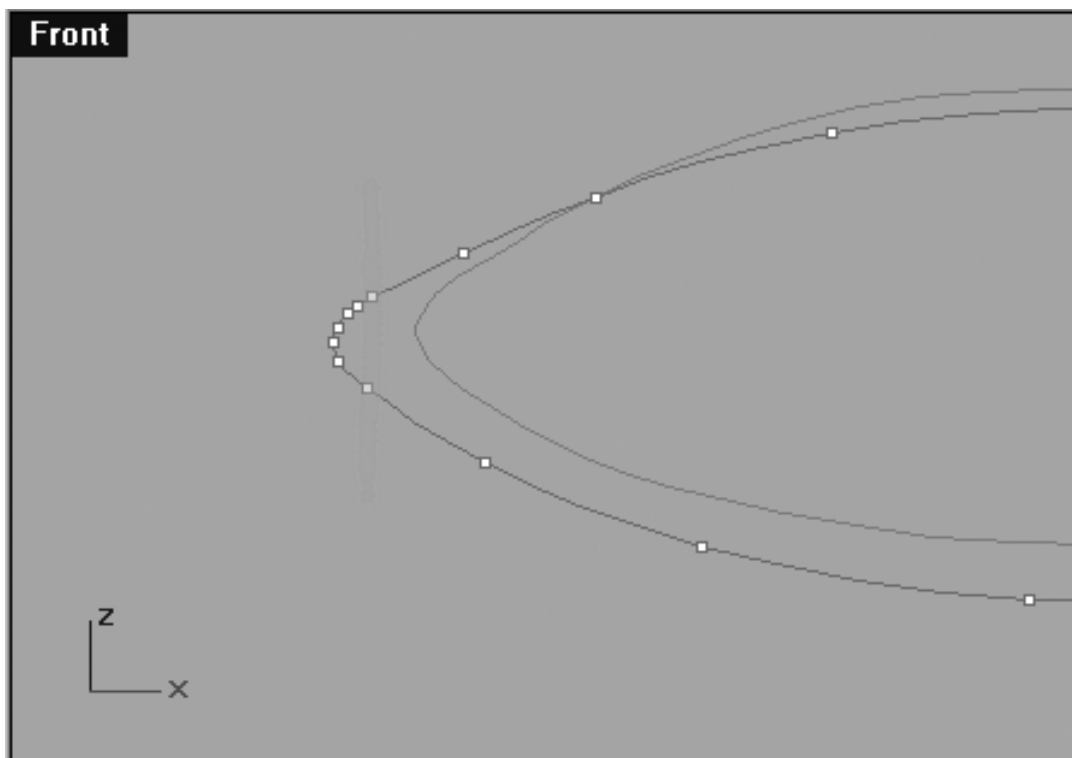
Great news, only one more point to go -- let's move it!

- Once again, select the point just before the large gap as in the screenshot below.



This **Front Viewport** screenshot shows the point just before the large gap has been selected and prior to being moved.

- Now slide the point clockwise along the vector of the curve until it's located parallel with that of the point on the upper row shown in the screenshot below:

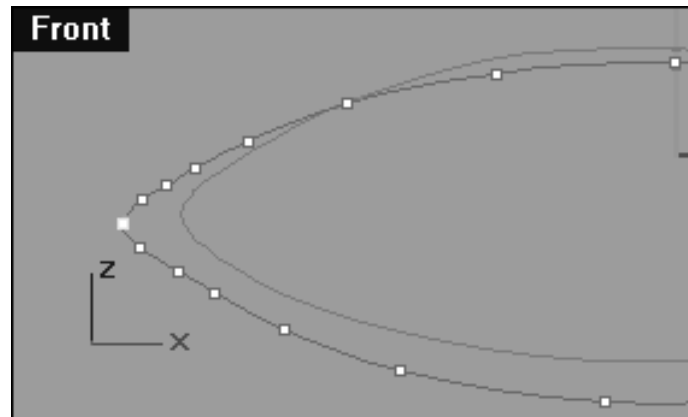


This **Front Viewport** screenshot shows the point just before the large gap has now been slid clockwise along the vector of the curve and is now located parallel with that of the point highlighted (in **orange**) on the upper row.

# Get Back

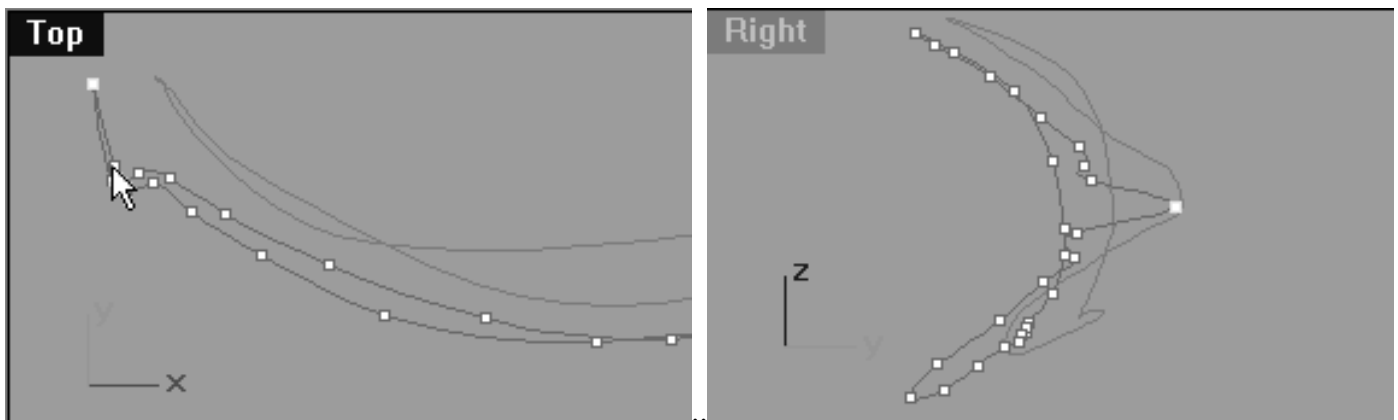
Now that we've got the width of the curve pretty much sorted out, now it is time for us concentrate on establishing the correct depth. Obviously the place to start is with the corner point, so let's get started.

- In the **Front Viewport** select the cornermost point (remember that's the **8th** point!) -- see the screenshot below:



*This **Front Viewport** screenshots shows the point you should select.*

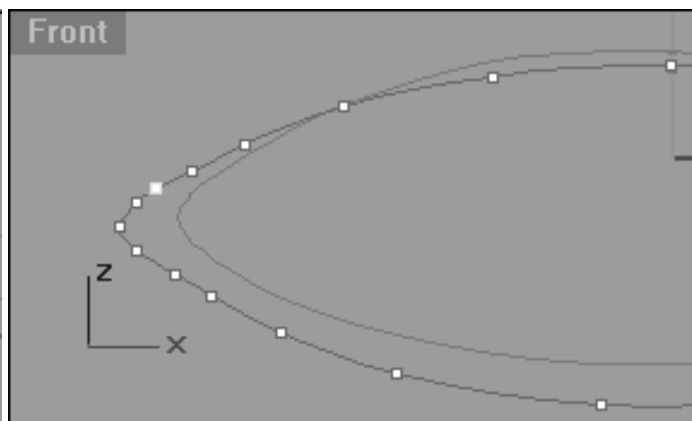
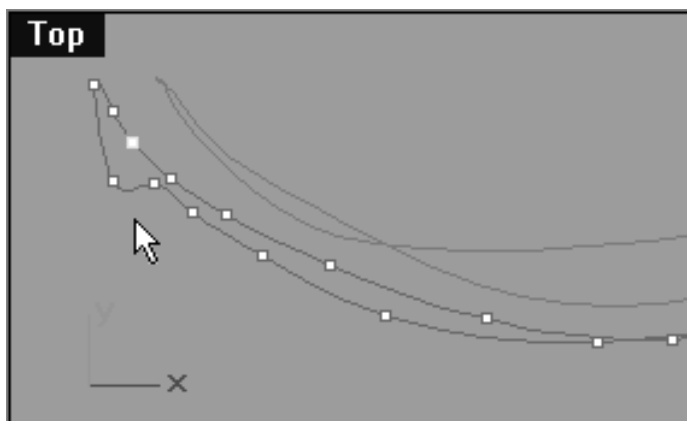
- With the point selected, in the **Top Viewport** whilst holding down the Shift key move the point backward along the Y axis roughly 1.758 units -- see the screenshot below:



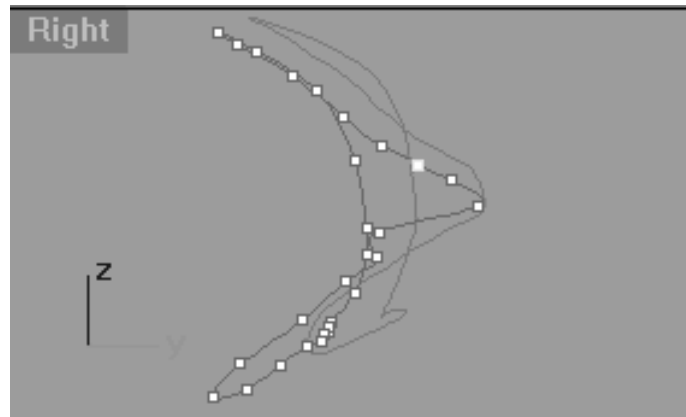
*Above screenshots: Left = View from Top / Right = View from Right*

- In the Top Viewport, concentrate on the upper row and continue to work in a clockwise manner, moving the next couple of points backward along the Y axis, a nice arc should begin to form when viewed from the Top -- see screenshots below:





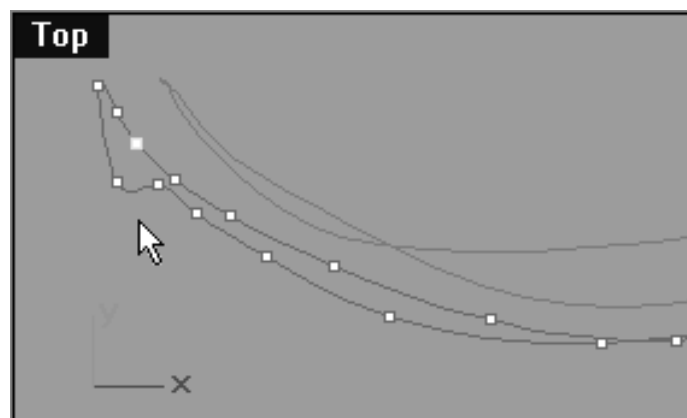
*View from top -- with points moved View from Front -- with points moved.*



*View from Right -- with points moved.*

### Helper Table:

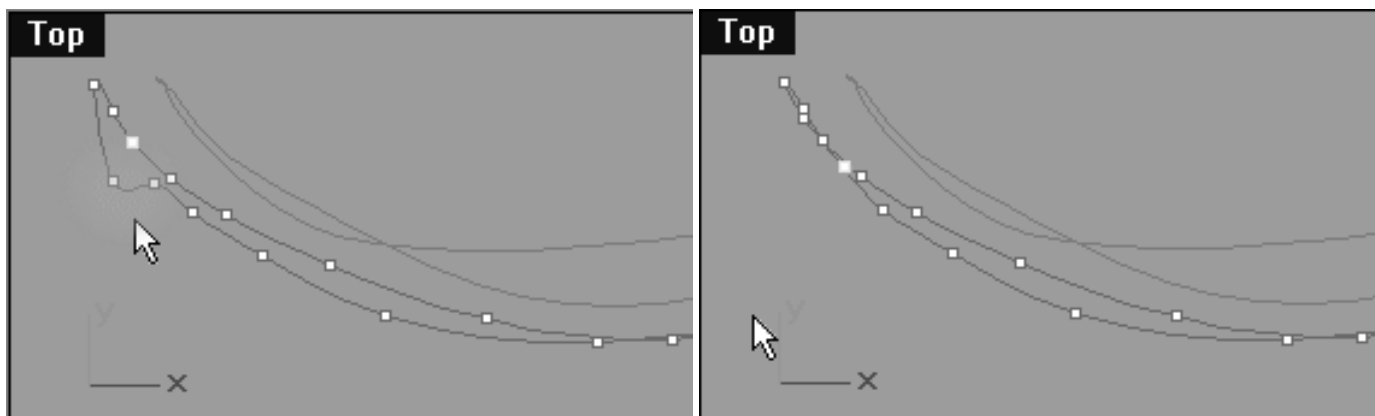
Point	Approximate Units Moved
Corner	Y = 1.758
Next point (working clockwise)	Y = 1.647
Next point (working clockwise)	Y = 1.474
Next point (working clockwise)	Y = 1.318
Next point (working clockwise)	Y = 0.763
Next point (working clockwise)	Y = 0.503
Next point (working clockwise)	Y = 0.152
12 o'clock	Nil



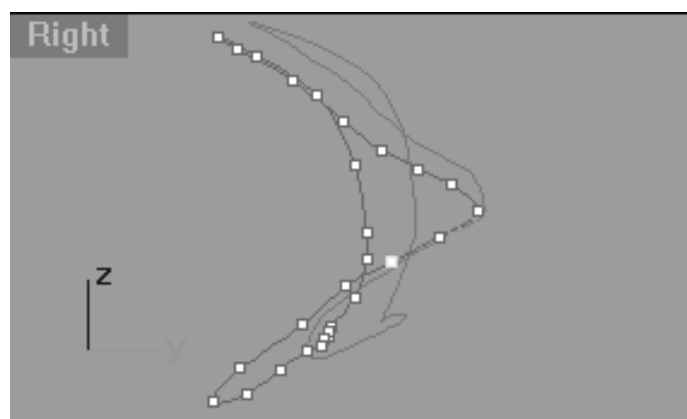
*Looking at the screenshot of the **Top Viewport** above you can clearly see that although the upper row of the curve is now displaying a nice arc shape there are however still a few points on the lower row that require refinement.*

Let's sort them out now...

- In the **Top Viewport** locate the points that require refinement on the lower row, they are pretty darn easy to spot. **WARNING** -- you don't want to move the corner point itself (i.e. the one we moved earlier) but rather the point on the *lower row* **nearest** the corner, just look at the Top & Front view and it's easy to figure out which one needs to be selected. With the correct point now selected, in the Top Viewport, hold down the Shift key and move the point upward along the Y axis roughly 2.373 units. Once done, continue working anti-clockwise on an incremental basis, moving each of them along the Y axis until they are forward of those on the upper row -- see screenshots below:



*(Before) Move points highlighted in green (After) Points now moved into place*



*(After) Points now moved into place*

### Helper Table:

Point	Approximate Units Moved
Point nearest corner on lower row	Y = 2.373
Next point (working anti-clockwise)	Y = 2.230
Next point (working anti-clockwise)	Y = 1.720
Next point (working anti-clockwise)	Y = 0.758

Confused..? Don't be, watch the movies and see how it's done...



**View an example movie**

**Edit the 2nd Eyelid Curve, Pt. 4 [Click Here](#)**

---



**View an example movie**

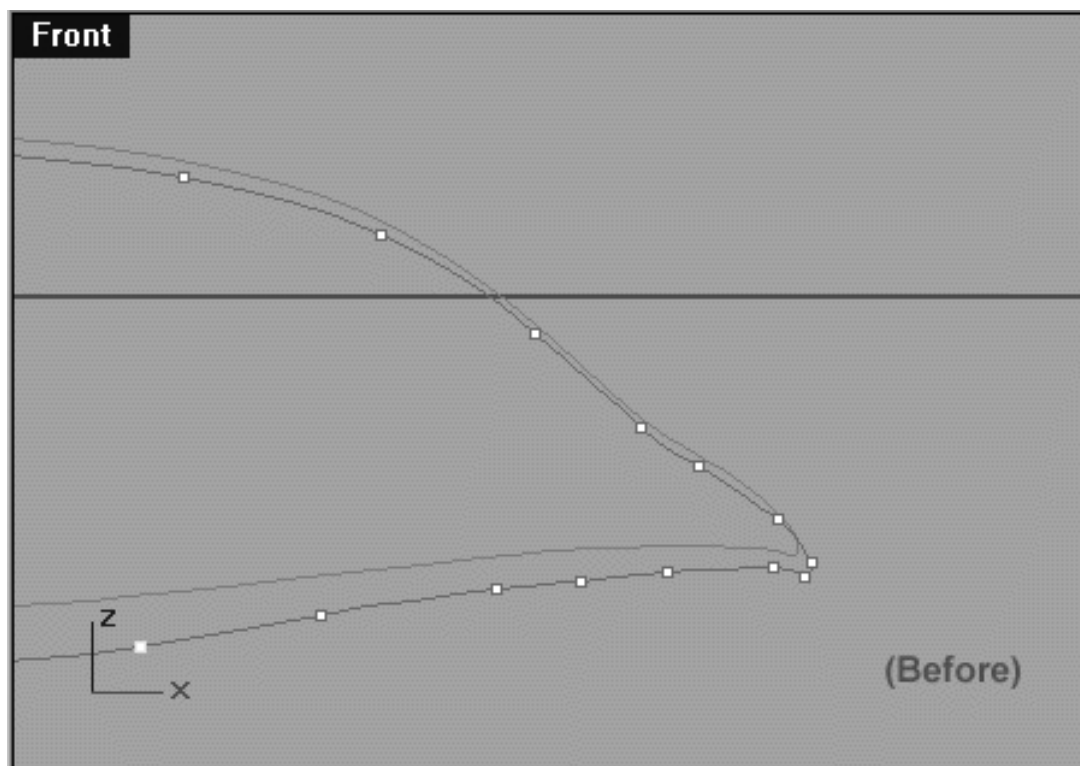
**Editing the 2nd Eyelid Curve, Pt. 5 [Click Here](#)**

---

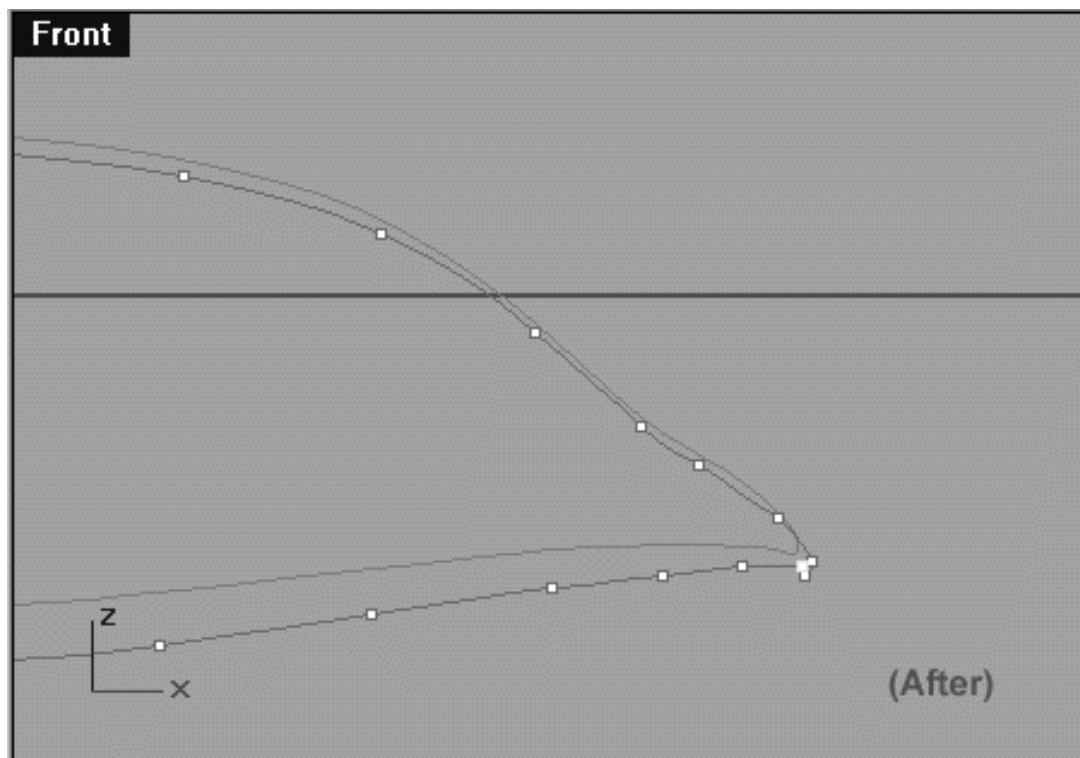
## Refinement Lower Row, Right Side

At long last we've reached the stage where the editing of the curve is almost complete, don't worry things can only get better.

- Pan the **Front Viewport** so that the right side of the curve can be clearly seen.
- Start by selecting the point at roughly the 5 o'clock position on the lower row. Once done, hold down the Shift key and move the point along the X axis roughly 0.315 units in an anti-clockwise direction toward the corner of the eye.
- Continue working in an anti-clockwise manner and repeat this procedure with the following 5 points, refer to the helper table and screenshots below for the approximate distance to move each of the points.  
**WARNING** -- Keep in mind that the last 3 points in the corner will also have to be moved upward along the Z axis a bit as well -- again, refer to the helper table for more information on approximate distances.



This **Front Viewport** screenshot above shows the point at the 5 o'clock position on the lower row of the curve prior to being moved along the X axis. (Before).



This **Front Viewport** screenshot above shows the lower curve after a total of 6 points have been slid along it (After).

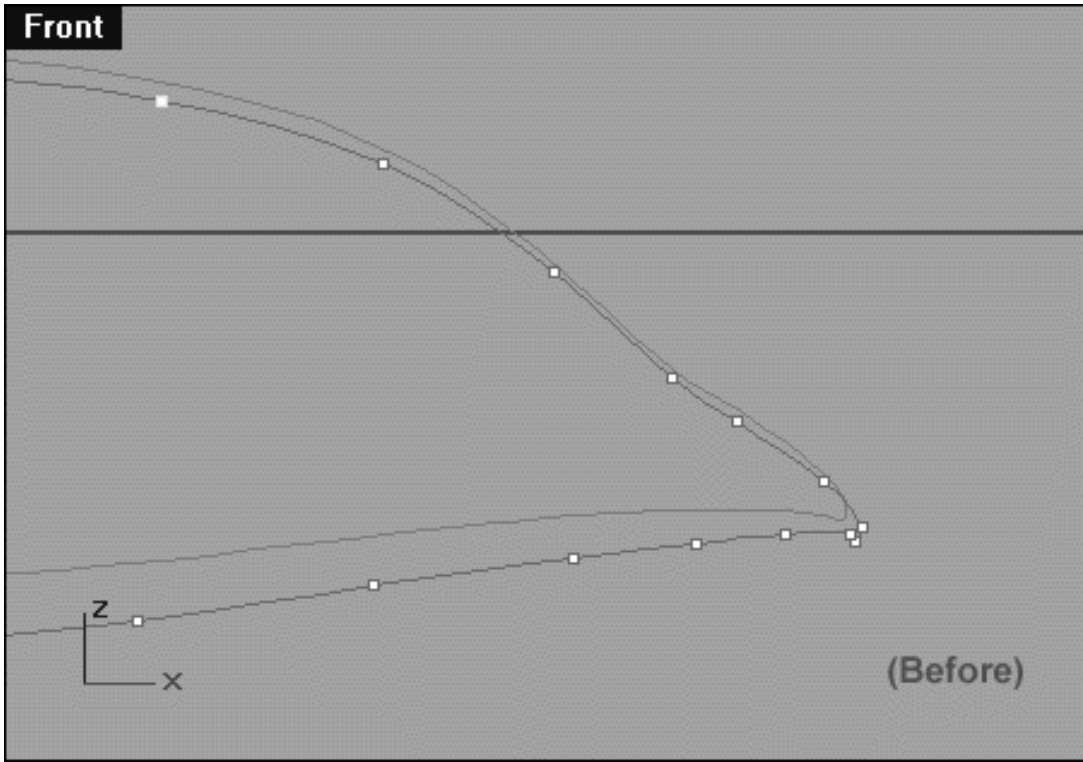
Helper Table:

Point	Approximate Units Moved
Point at 5 o'clock	X = 0.315 (to right)
Next point anti-clockwise	X = 0.794 (to right)
Next point anti-clockwise	X = 0.885 (to right)
Next point anti-clockwise	X = 1.304 (to right) Z = 0.076 ( up )
Next point anti-clockwise	X = 1.185 (to right) Z = 0.068 ( up )
Next point anti-clockwise	X = 0.446 (to right) Z = 0.056 ( up )

# Refinement Upper Row, Right Side

Now we will apply much the same technique to the points along the upper row...

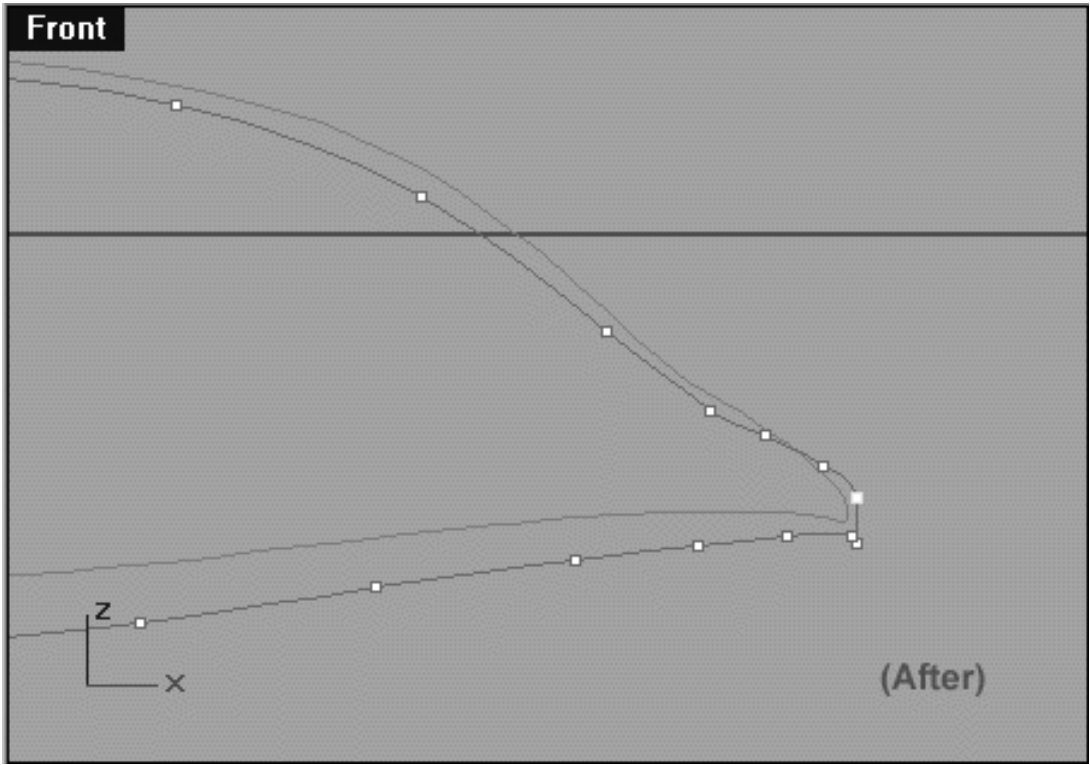
- Start by selecting the point at roughly the 1 o'clock position on the upper row. Once done, hold down the Shift key and move the point first along the X axis roughly 0.167 units in a clockwise direction toward the corner of the eye and then down roughly 0.039 units along the Z axis.
- Continue working in a clockwise manner and repeat this procedure with the following 6 points, refer to the helper table and screenshots below for the approximate distance to move each of the points. **WARNING --** Keep in mind that the last 2 points in the corner will have to be moved upward along the Z axis and along the X axis to the left rather than the right -- again, refer to the helper table for more information on approximate distances.



This **Front Viewport** screenshot above shows the point at the 1 o'clock position on the upper row of the curve prior to being moved along the X and Z axis (*Before*).

Helper Table:

Point	Approximate Units Moved
At 1 o'clock	X = 0.167 (to right) Z = 0.039 (down)
Next point clockwise	X = 0.509 (to right) Z = 0.456 (down)
Next point clockwise	X = 0.711 (to right) Z = 0.794 (down)
Next point clockwise	X = 0.507 (to right) Z = 0.423 (down)
Next point clockwise	X = 0.363 (to right) Z = 0.163 (down)
Next point clockwise	X = 0.047 (to left) Z = 0.245 (up)
Next point clockwise	X = 0.094 (to left) Z = 0.461 (up)



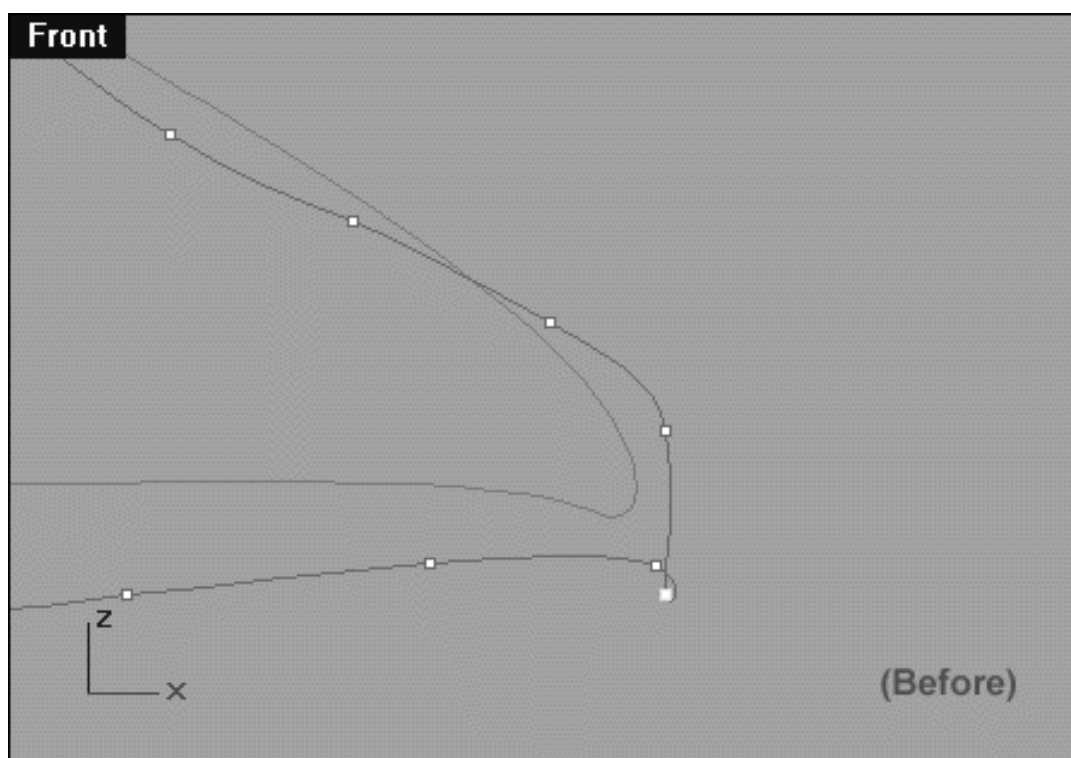
This **Front Viewport** screenshot above shows the upper curve after a total of 7 points have been moved along it (After).

## Refinement Corner Area, Right Side

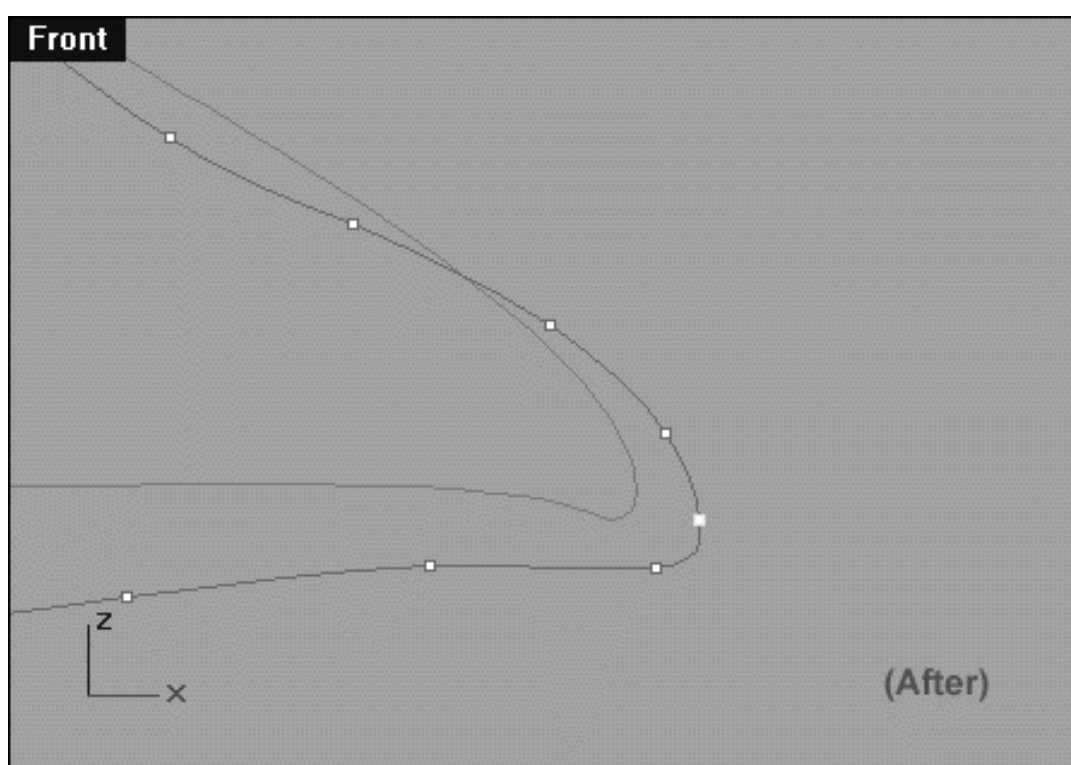
You've now reached the homeward stretch, our aim now is to refine the placement of the points in the very corner of the curve and adjust the overall shape a bit. This is the really easy bit..!

- Select the corner point. This is easy to do as it's the last point on the lower row and it's also the lowest point as well -- see the screenshot below entitled: (Before).
- Once done, while holding down the Shift key, move the point upward roughly 0.310 units along the Z axis. Then while still holding down the Shift key move the point roughly 0.139 to the right along the X axis.

- When you've finished your monitor should resemble the screenshot below entitled: (After).



This **Front Viewport** screenshot above shows the point at the corner of the curve prior to being adjusted (*Before*).



This **Front Viewport** screenshot above shows the corner of the curve after having been adjusted (*After*).

Now only a few more minor adjustments should be required -- let's perform them now.

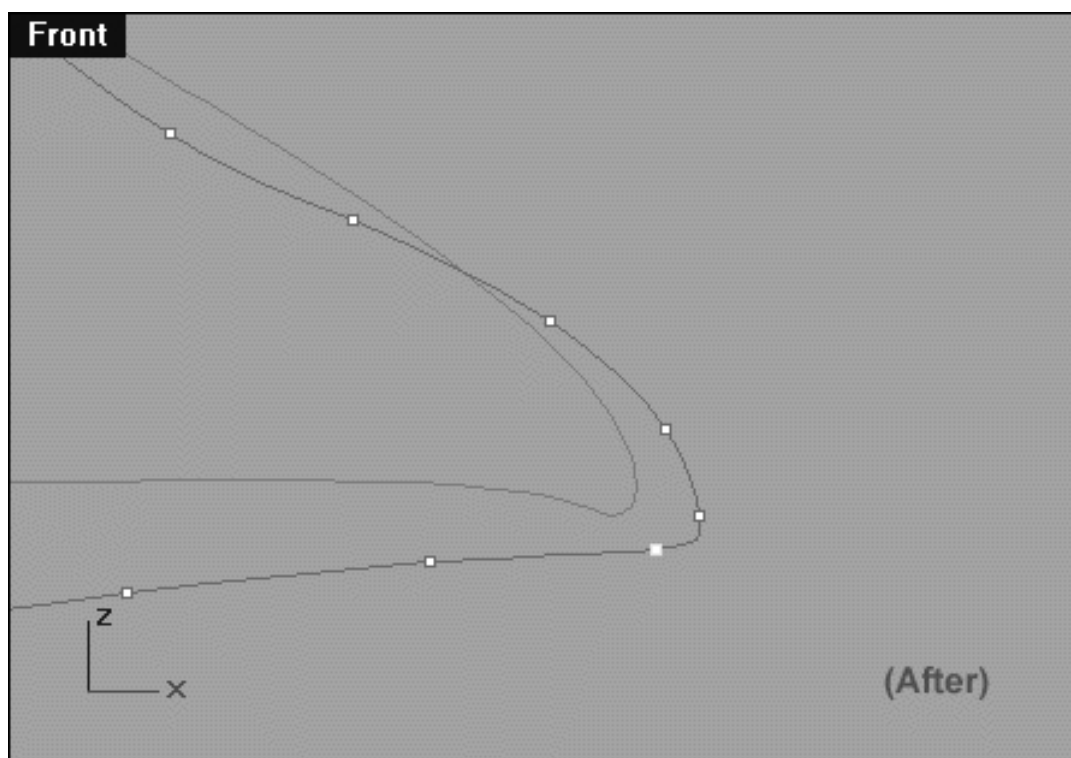
- In the **Front Viewport** select the last point on the lower row -- see the screenshot below entitled: (Before).



- Once done, whilst holding down the Shift key, move the point upward along the Z axis roughly 0.056 units -- see the screenshot below entitled: (After).



*This **Front Viewport** screenshot shows the last point on the lower row has now been selected and is ready to be moved upward along the Z axis.*



*This **Front Viewport** screenshot shows the last point on the lower row has now been moved upward along the Z axis roughly 0.056 units.*

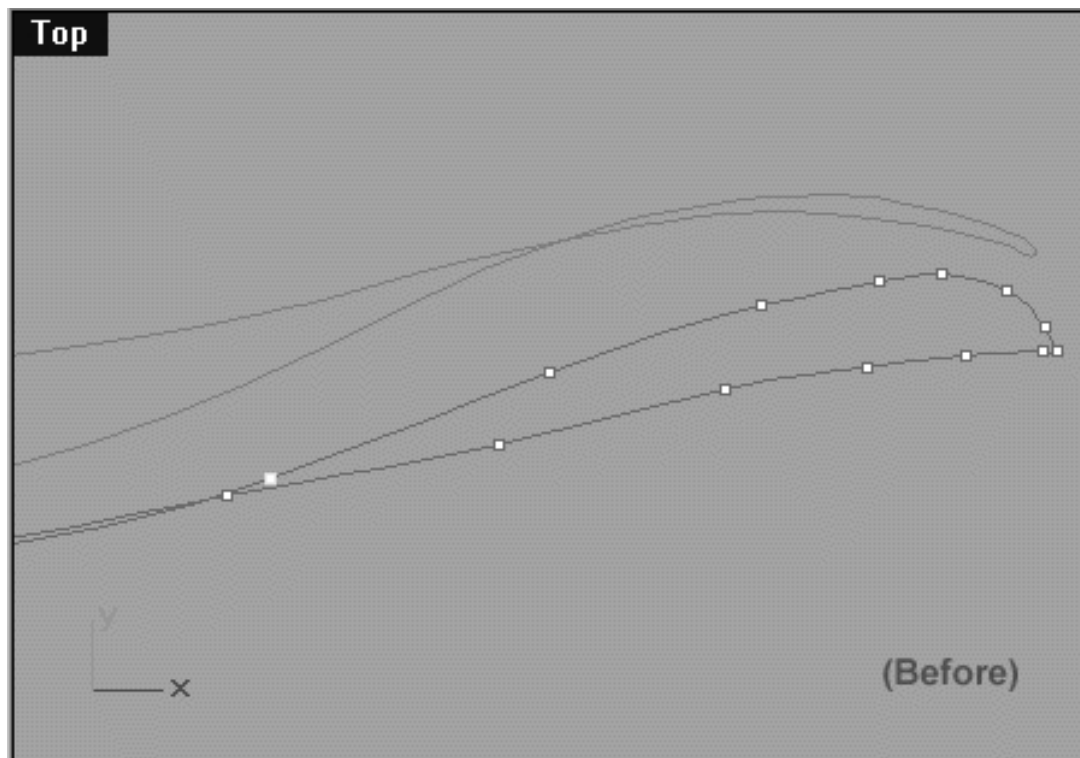


**View an example movie**

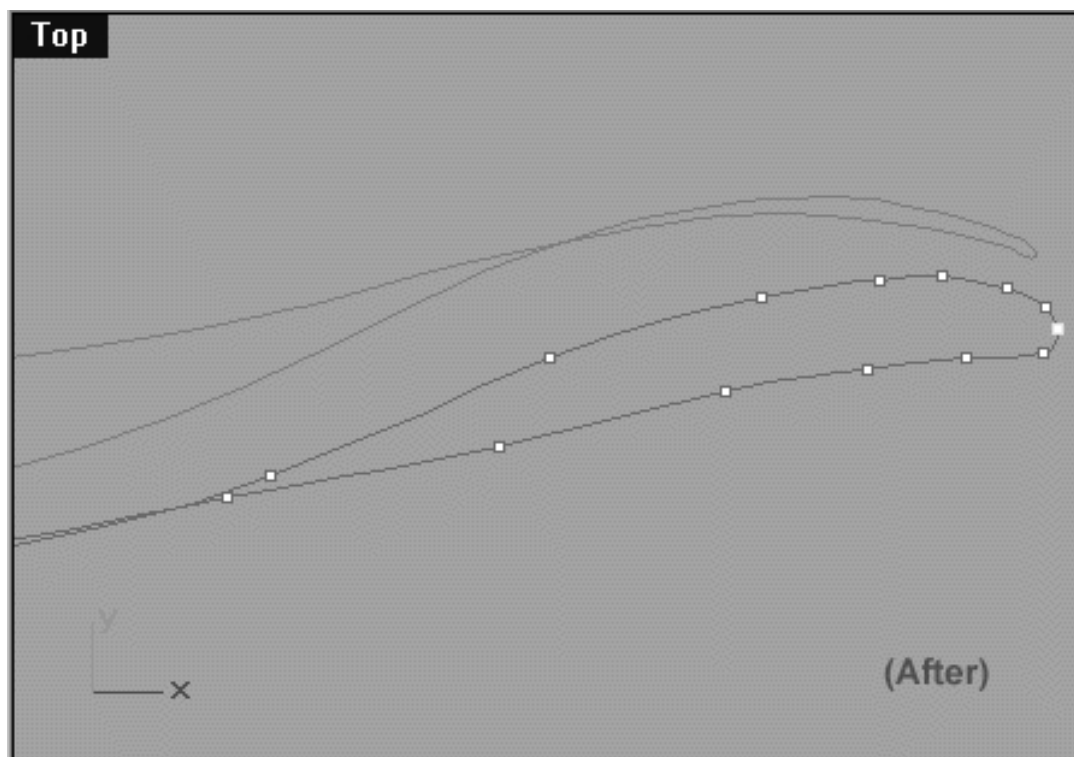
**Editing the 2nd Eyelid Curve, Pt. 6** [Click Here](#)

## Tweaking in the Top View

- In the **Front Viewport** select the point at the 1 o'clock position on the upper row. Then bring your cursor into the **Top Viewport** and whilst holding down the Shift key move the selected point roughly 0.055 units upward along the Y axis.
- Continue working in a clockwise manner (as seen from the front view) and repeat the procedure with the following 7 points. Refer to the helper table and screenshots below for the approximate distance to move each of the points.



*This **Top Viewport** screenshot shows the point at the 1 o'clock position (as seen from the front view) has now been selected and is ready to be moved upward along the Y axis.*



This **Top Viewport** screenshot shows that beginning with the point at the 1 o'clock position on the upper row (as seen from the front view) and working clockwise a total of 8 points have now been moved upward along the Y axis.

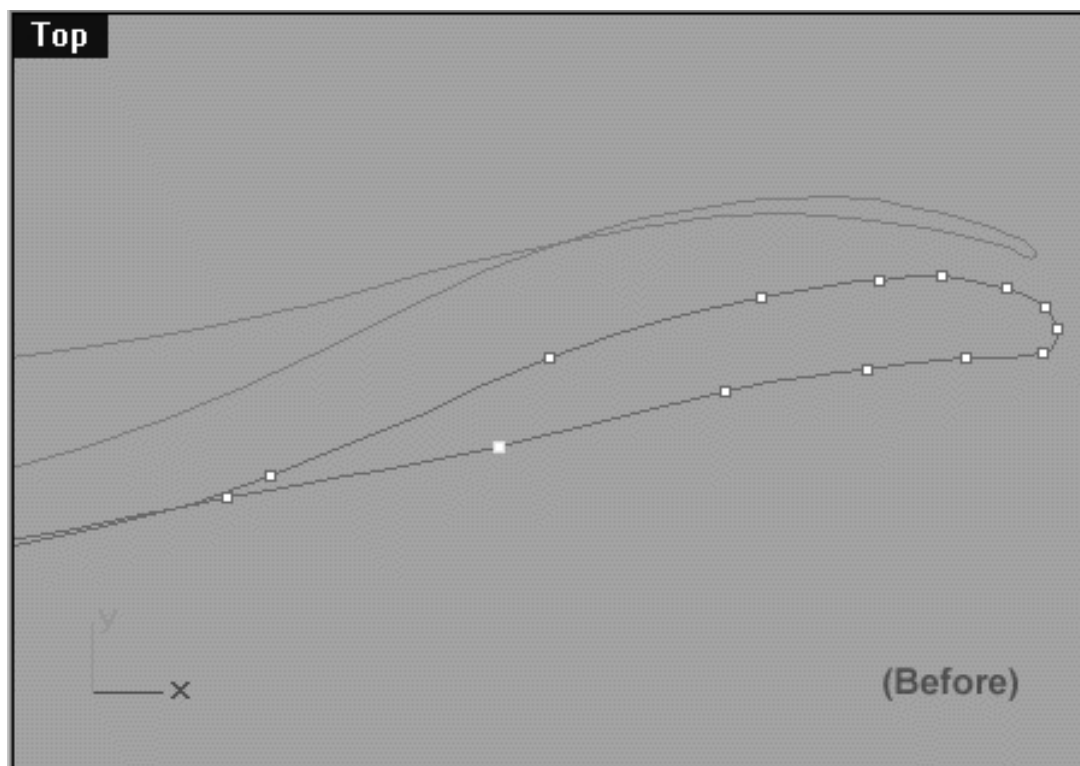
#### Helper Table:

Point	Approximate Distance Moved
at 1 o'clock	0.055
Next point (clockwise)	0.182
Next point (clockwise)	0.138
Next point (clockwise)	0.044
Next point (clockwise)	Nil
Next point (clockwise)	0.051
Next point (clockwise)	0.273
Corner	0.275

## Tweaking the Lower Row

Now we will do much the same again, only this time we will tweak the lower row.

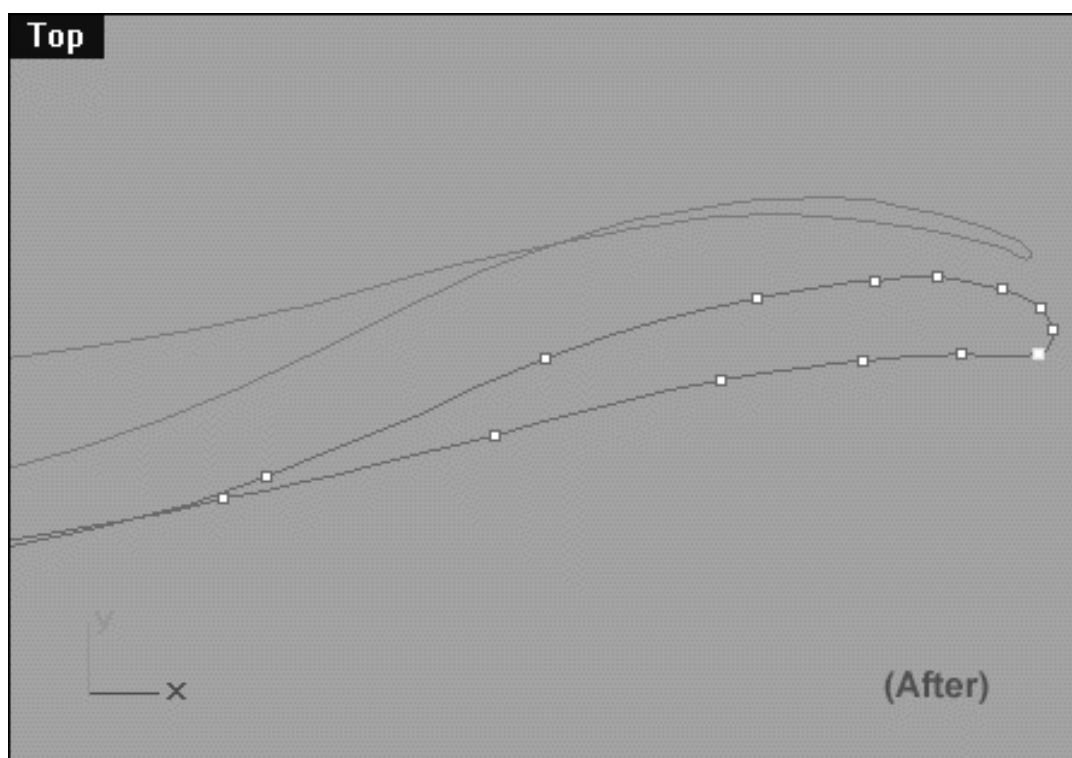
- In the **Front Viewport** select the point at the 4 o'clock position on the lower row. Then bring your cursor into the **Top Viewport** and whilst holding down the Shift key move the selected point roughly 0.146 units upward along the Y axis.
- Continue working in a anti-clockwise manner (as seen from the front view) and repeat the procedure with the following 4 points. Refer to the helper table and screenshots below for the approximate distance to move each of the points.



This **Top Viewport** screenshot shows the point at the 4 o'clock position (as seen from the front view) has now been selected and is ready to be moved upward along the *Y* axis.

#### Helper Table:

Point	Approximate Units Moved
At 4 o'clock	0.146
Next point (anti-clockwise)	0.163
Next point (anti-clockwise)	0.120
Next point (anti-clockwise)	0.058
Last point before corner	Nil



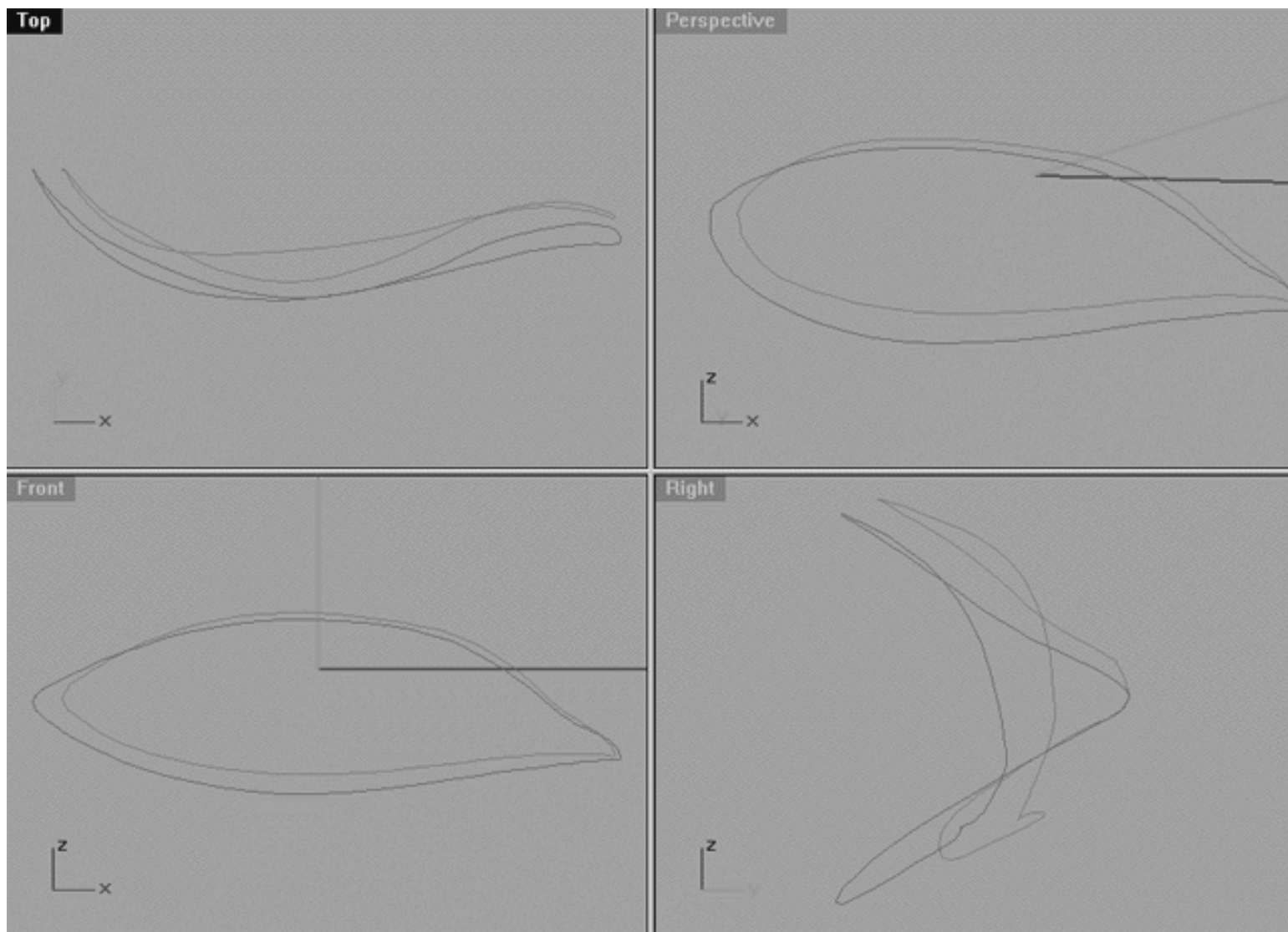
*This **Top Viewport** screenshot shows that beginning with the point at the 4 o'clock position on the lower row (as seen from the front view) and working clockwise a total of 5 points have now been moved upward along the Y axis.*

## Snap It Up

Congratulations! The 2nd eyelid curve has now been completed!

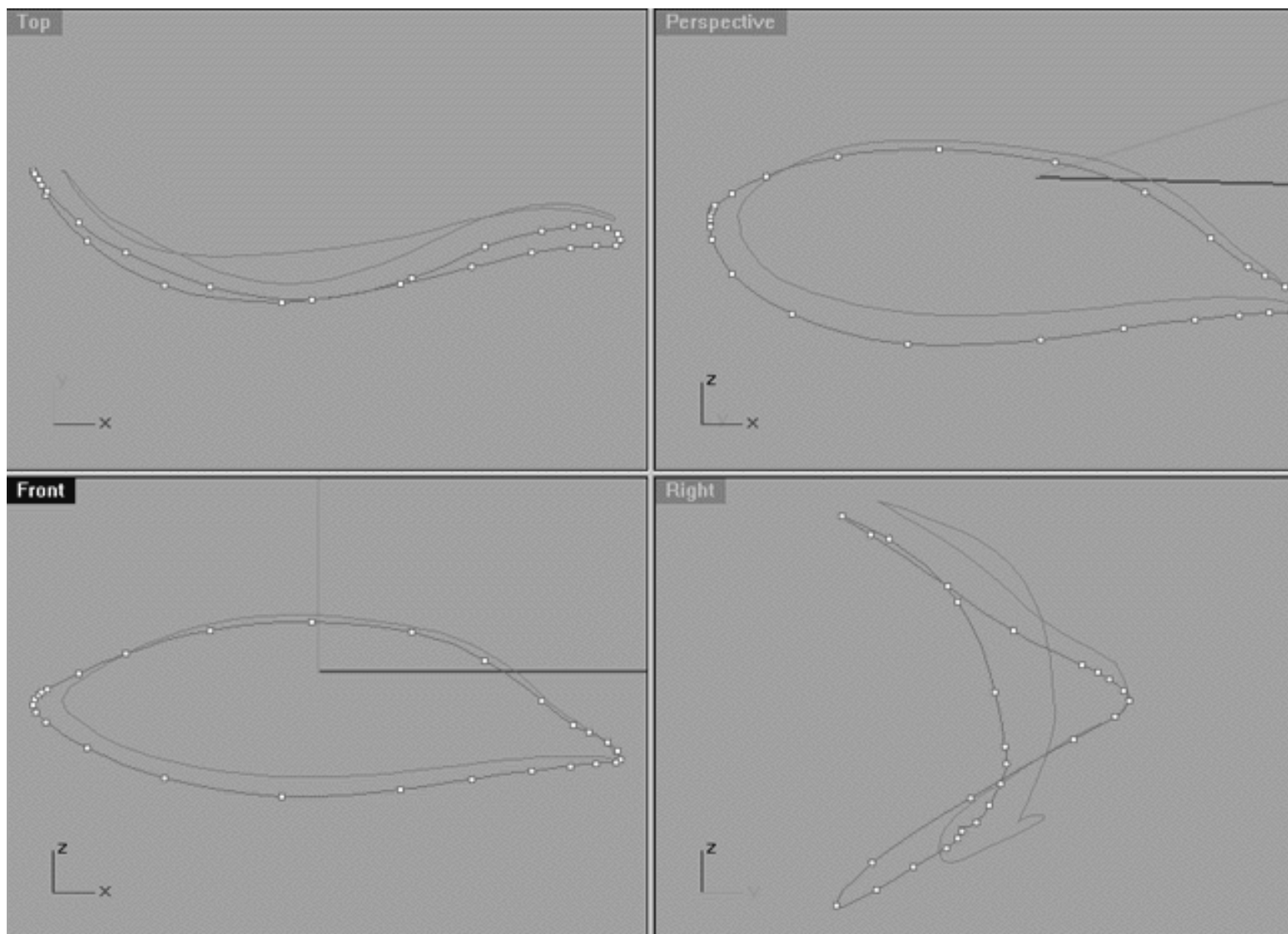
You can now check your work against ours and see how close you've come. To do this, open the Edit Layers dialogue box and turn **ON** the layer entitled: **Eyelid\_guide\_02**, then press **OK** to **Exit**. Then in **Any Viewport** select the **Eyelid\_guide\_02** curve and display its edit points. Once done, reopen the Edit Layers dialogue box and set the **Eyelid\_guide\_02** layer to **LOCK**, press **OK** to **Exit**. You can now compare the results and refine the specific areas where you've gone off track. You can then turn on the **Osnaps, Point** and snap each of the points on the curve you've created to those of the guide curve.

Once you've finished this process your monitor should resemble the screenshots below in all views.



*This **All Viewport** screenshot shows the now completed 2nd Eyelid Curve (magenta) and the locked (ghosted) 1st Eyelid Curve. Take some time to carefully observe the relationships between the two curves.*





This **All Viewport** screenshot shows the now completed 2nd Eyelid Curve (magenta) with its edit points displayed and the locked (ghosted) 1st Eyelid Curve.

## Shutting Down the Scene

- Save the file.
- Unhide any objects that may no longer be visible.
- Confirm that no Osnaps are currently active, disable any that are.
- Hide any edit points that are currently displayed.
- Unlock any currently locked objects -- type **UNLOCK** at the command line and press **Enter**.
- Open the Edit Layers Dialogue box and locate the layer entitled **SCENE START UP**. Make it the currently active layer by clicking in the "check" field -- a check mark should appear in the column, when it has press **APPLY**. Once done, the layer entitled **SCENE START UP** should now have become the active layer and should be **ON**.



- Turn **OFF** the layers entitled: **Eyelid Curves**, **Eyelid\_guide\_02**, **Eyelid\_02** and **Eyelid\_Xsection** and press **APPLY**.
  - The layer entitled: Photopoints should be set to **ON**.
  - With the exception of those mentioned, all other layers should be **OFF** -- press **OK** to Exit.
  - Perform a Zoom Extents All.
  - **S A V E Y O U R W O R K..!**
- 

Go to the [NEXT LESSON](#)

RETURN to the Top of page -- [Click Here](#)

Written by Joseph R. Saltzman.

Co-produced in association with Steven Ståhlberg

©1998-1999 Cinemagic Productions Limited. All Rights Reserved.

Duplication of this document including images and text by any means is expressly forbidden without prior written consent of Cinemagic Productions Limited.

Web Site: <http://www.cmagic.co.uk> Telephone: +44 (0)1753 733 190 Fax: +44 (0)1753 736 619 email: [cmagic@cmagic.co.uk](mailto:cmagic@cmagic.co.uk)

# MOVIE EDITING THE 2ND EYELID CURVE PART FOUR

To **PLAY** the example movie, double click below:

To **RETURN** to the tutorial -- [click here](#).

# MOVIE EDITING THE 2ND EYELID CURVE PART FOUR

## Part (B)

To **PLAY** the example movie, double click below:

To **RETURN** to the tutorial -- [click here](#).

# MOVIE EDITING THE 2ND EYELID CURVE PART FOUR

## Part (B)

To **PLAY** the example movie, double click below:

To **RETURN** to the tutorial -- [click here](#).

# MOVIE EDITING THE 2ND EYELID CURVE PART FIVE

To **PLAY** the example movie, double click below:

To **RETURN** to the tutorial -- [click here](#).

# MOVIE EDITING THE 2ND EYELID CURVE PART SIX

To **PLAY** the example movie, double click below:

To **RETURN** to the tutorial -- [click here](#).

# MOVIE EDITING THE 1ST EYELID CURVE PART ONE

To **PLAY** the example movie, double click below:

To **RETURN** to the tutorial -- [click here](#).



# MOVIE EDITING THE 1ST EYELID CURVE PART TWO

To **PLAY** the example movie, double click below:

To **RETURN** to the tutorial -- [click here](#).

# MOVIE EDITING THE 1ST EYELID CURVE PART THREE

To **PLAY** the example movie, double click below:

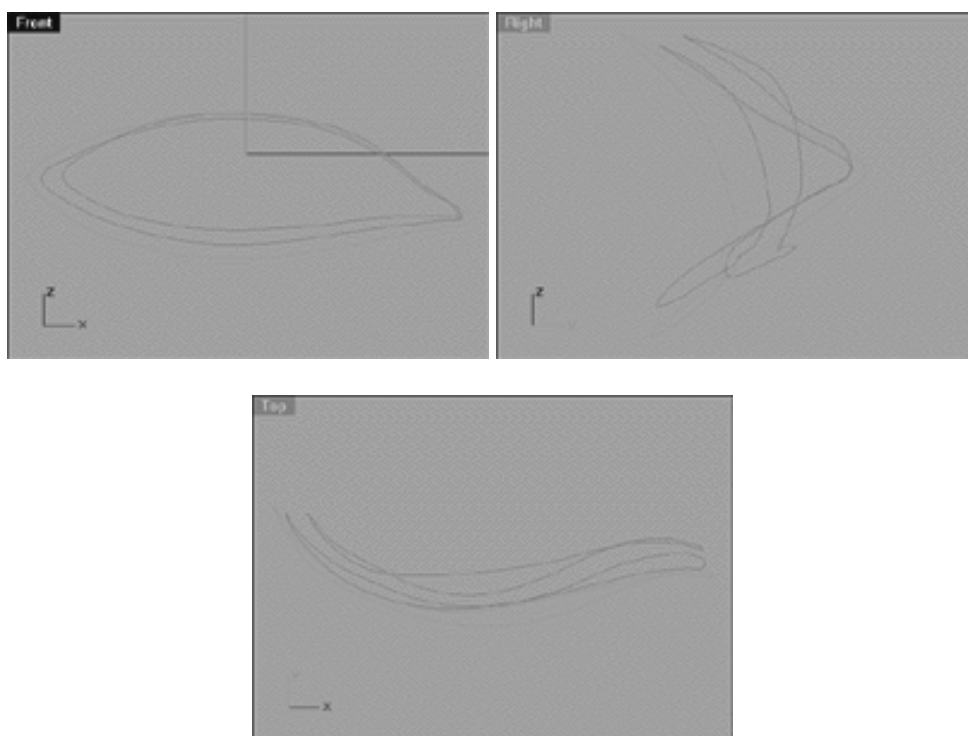
To **RETURN** to the tutorial -- [click here](#).

**RETURN** to previous page -- [Click Here](#)

**GOTO** the [NEXT LESSON](#)



## CREATING THE 3RD EYELID CURVE




### Contents:


- [Scene Setup](#)
- [Creating the 3rd Eyelid Curve](#)
- [Editing the 3rd Eyelid Curve, Lower Row, Right Side](#)
- [Editing the Lower Left Side](#)
- [Example Movie -- Create & Edit the 3rd Eyelid Curve, Pt 1](#)
- [Sliding Points, Left Side, Upper Row](#)
- [Refine the Corner -- Left Side](#)
- [Sliding Points, Right Side, Upper Row](#)
- [Refine the Corner -- Right Side](#)
- [Example Movie -- Editing the 3rd Eyelid Curve, Pt 2](#)

- [Lower Row, Left Side](#)
- [Upper Row, Left Side](#)
- [Lower Row, Right Side](#)
- [Example Movie -- Editing the 3rd Eyelid Curve, Pt 3](#)
- [Refine the Corner, Right Side, Pt 2](#)
- [Example Movie -- Editing the 3rd Eyelid Curve, Pt 4](#)
- [Snap It Up](#)
- [Example Movie -- Editing the 3rd Eyelid Curve, Pt 5](#)
- [Shutting Down the Scene](#)

---



## Scene Setup

- If you've not done so already start a Rhinoceros session by **double clicking** on the desktop icon  the application will begin.
- Choose File, Open from the menu bar and double click on **START\_A.3DM** in the file list, it will load and open.
- Confirm at the Lower Status Bar the currently active layer is entitled SCENE START UP. If it is active proceed to the next step, if it's not then make it active by left clicking on the layer box, highlighting the correct layer and clicking on it.
- Again, at the Layers Box on the Lower Status Bar this time right click on the box, the Edit Layers Dialogue box will open. Confirm the following switches have been enabled or disabled:
  - The Layer entitled: Eyelid\_Curves should be ON.
  - The Layer entitled: Eyelid\_02 should be ON.
  - The Layer entitled: Eyelid\_Xsection should be ON.
  - The Layer entitled: SCENE START UP should be ON.
  - The Layer entitled: Photopoints should be OFF.
  - All other layers should be set to OFF.
- When you've finished making your changes ( if any ) click on OK.
- Confirm that the grid display in the viewports has been disabled, if not turn it off now.
- Confirm that no Osnaps are currently enabled, if any are disable them.
- Confirm that no edit points are currently displayed, if any are hide them.

- Zoom out all the viewports by selecting the Zoom Extents/Zoom Extents All Views icon  or by typing the command: **ZoomExtentsAll** at the command line and pressing ENTER.

## Creating the 3rd Eyelid Curve

We can now create the 3rd Eyelid curve from a copy of 2nd Eyelid curve that we made in the last lesson that will be edited to suit our purposes.



- If you've not done so already make sure the 1st Eyelid curve object is visible but LOCKED. If not, lock it by selecting the object -- it will highlight and then typing: Lock at the command line and pressing Enter.
- The Cross section curve should also be visible, select it and display its edit points.
- Create a new layer entitled: Eyelid\_03, set the layer colour to orange and make it active.
- Maximise the **Right Viewport** and select the 2nd Eyelid Curve by left clicking on it -- it will highlight.
- From the toolbar choose the Copy Icon  or type: Copy at the command line.
- The system will respond with the following prompt at the command line: **Point to copy from (Vertical InPlace):**
- Type IN at the command line and press ENTER to complete the operation. A duplicate of the curve has now been created.
- Activate Osnaps End / Point.
- From the toolbar choose the Move Icon  and snap your cursor to the end point of the highlighted curve. Once done, move the object along the Y axis and snap to the 4th point of the cross section curve.

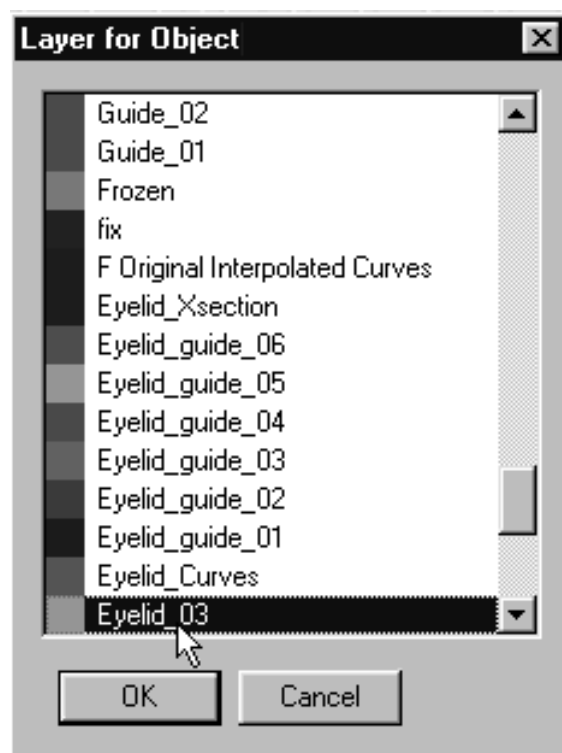


This screenshot of the **Right Viewport** shows the duplicate of the 2nd eyelid curve prior to being moved along the *Y* axis.



This screenshot of the **Right Viewport** shows the duplicate of the 2nd eyelid curve after to being moved along the *Y* axis and snapped to the 4th point on the cross section curve.

- Now be certain to assign the newly duplicated and moved curve to the currently active layer, in this case (Eyelid\_03). With the moved curve still selected, choose from the toolbar the Edit Layers Icon  and then select the change layers icon  from the fly out, the Layer for Object dialogue will appear as in the screenshot below:



*This screenshot shows the Layer for Object dialogue box.*

- Locate the layer entitled: Eyelid\_03 in the list, highlight it and then either double click on it or press OK to complete the operation. Once done, the copied curve should turn orange thus indicating it is now on the correct layer as in the screenshot below.





This **Right Viewport** screenshot shows the duplicated and moved curve has now been assigned to the correct layer (*Eyelid\_03*).

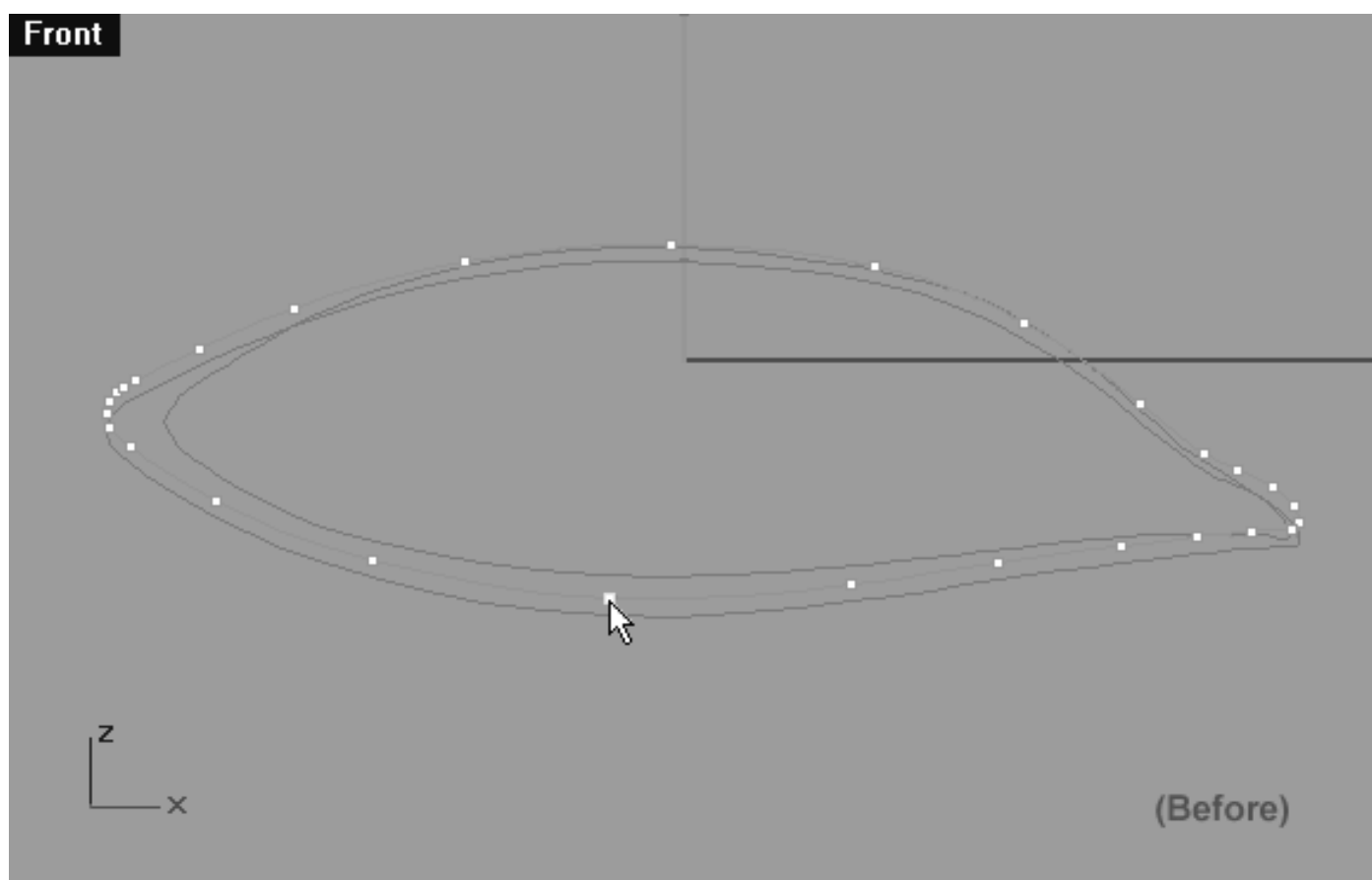
## Editing the 3rd Eyelid Curve

### Lower Row, Right Side

Now let's start moving some points...

- Minimise the **Right Viewport**.
- Disable any currently active Osnaps.
- In Any Viewport, select the 2nd Eyelid Curve by left clicking on it -- it will highlight. Once done, **LOCK** the object by typing the command: **LOCK** at the command line and pressing Enter to complete -- This will prevent it from being damaged.
- Temporarily turn off the edit points and hide the cross section curve.
- Select the 3rd Eyelid curve and display its edit points.
- Maximise the **Front Viewport** and select the point at the **6 o'clock** position on the lower row, zoom and pan as required -- it will highlight.

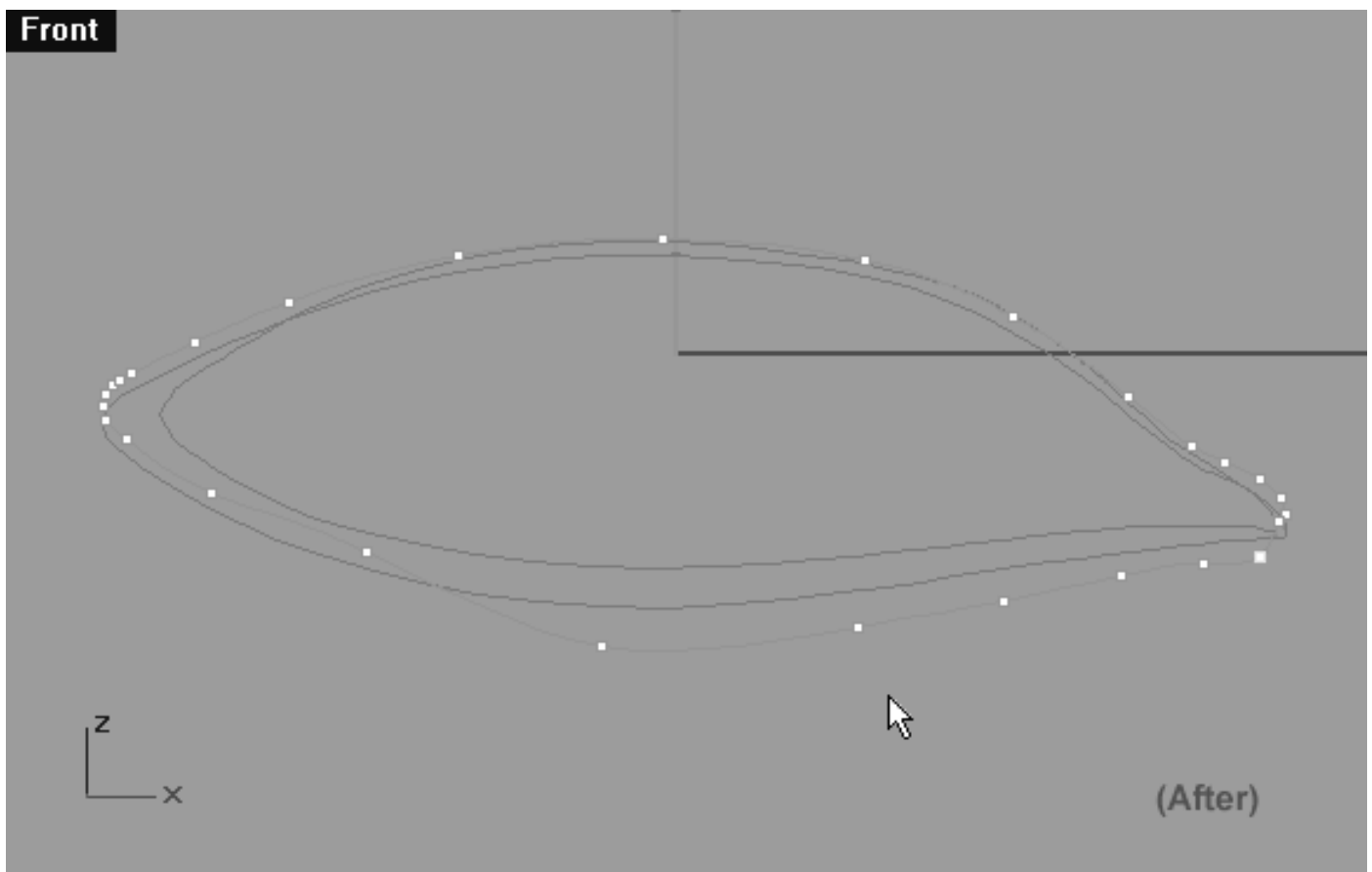
- Now whilst holding down the Shift key move the point downward along the Z axis, roughly about 1.316 units. Once done, again hold down the Shift key and move the point roughly 0.029 units to the right along the X axis.
- Working in an anti-clockwise manner repeat this general procedure with the following 5 lower row points. Your aim should again be to create a gentle arcing shape -- see the screenshots below.



This **Front Viewport** screenshot shows the 3rd Eyelid Curve (Eyelid\_03) prior to any editing taking place on the lower row. Notice that the point at roughly the 6 o'clock position has been selected and is now ready to be moved downward slightly along the Z axis.

### Helper Table:

Point	Approximate Units Moved
6 o'clock	Z: 1.316 (down) X:0.029 (right)
Next point anti-clockwise	Z: 1.234 (down) X:0.155 (right)
Next point anti-clockwise	Z: 1.128 (down) X:0.297 (right)
Next point anti-clockwise	Z: 0.922 (down) X:0.318 (right)
Next point anti-clockwise	Z: 0.808 (down) X:0.429 (right)
Next point anti-clockwise	Z: 0.834 (down) X:0.420 (right)

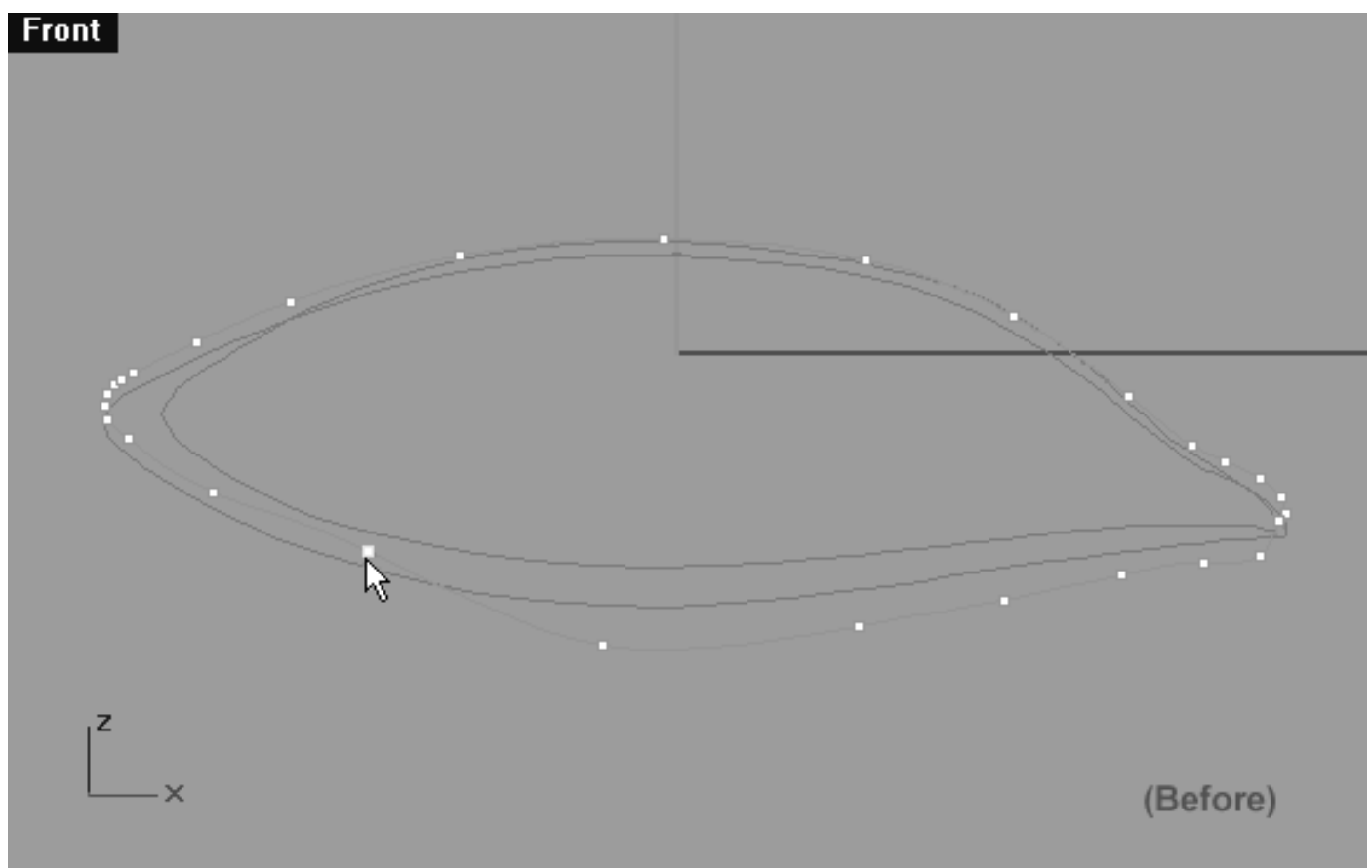


This **Front Viewport** screenshot shows the 3rd Eyelid Curve (Eyelid\_03) after editing has taken place on the lower row. Notice that a total of 6 points have now been moved on the lower row. Observe that not only have the points been moved downward along the Z axis but also outward slightly along the X axis too.

## Editing the Lower Left Side

Now let's start moving some points on the opposite side...

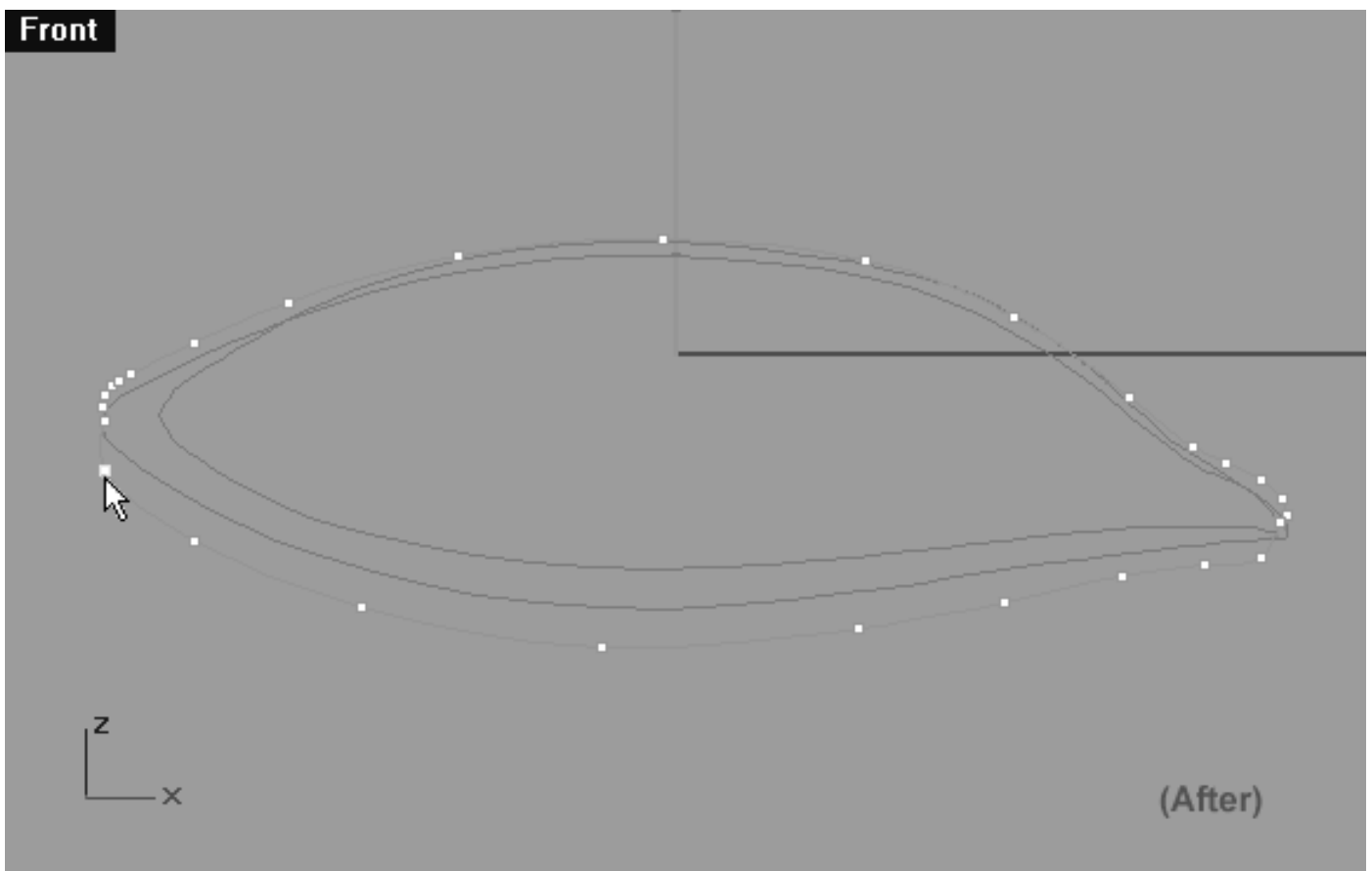
- Still working in the **Front Viewport**, this time select the point at the **7 o'clock** position on the lower row, left side -- it will highlight.
- Now whilst holding down the Shift key move the point downward along the Z axis roughly 1.327 units.
- Once done, again hold down the Shift key and move the point along the X axis to the left roughly 0.167 units.
- Working in a clockwise manner repeat this procedure with the following 2 lower row points. Your aim should again be to create a gentle arcing shape -- see the screenshots below.



This **Front Viewport** screenshot shows the 3rd Eyelid Curve (Eyelid\_03) prior to any editing taking place on the lower row, left side. Notice that the point at roughly the 7 o'clock position has been selected and is now ready to be moved downward slightly along the Z axis.

#### Helper Table:

Point	Approximate Units Moved
Point at 7 o'clock	Z: 1.327 (down) X: 0.167 (left)
Next Point (clockwise)	Z: 1.093 (down) X: 0.446 (left)
Next Point (clockwise)	Z: 0.755 (down) X: 0.587 (left)



This **Front Viewport** screenshot shows the 3rd Eyelid Curve (Eyelid\_03) after editing has taken place on the lower row, left side. Notice that a total of 3 points were moved this time round.



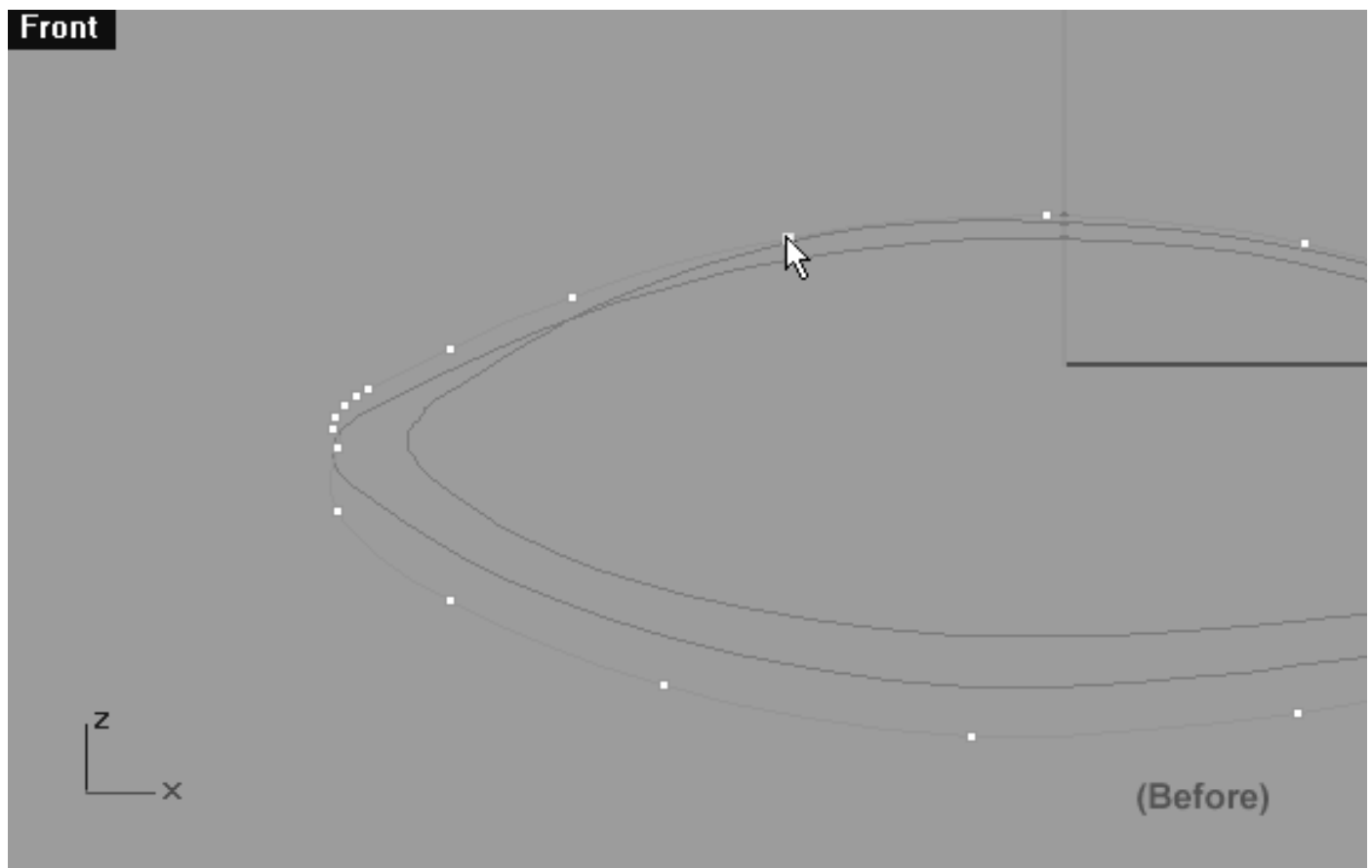
**View an example movie**

**Create and edit the 3rd Eyelid Curve, Part 1** [Click Here](#)

## Sliding Points Left Side, Upper Row

Now let's sort out the points on the upper row...

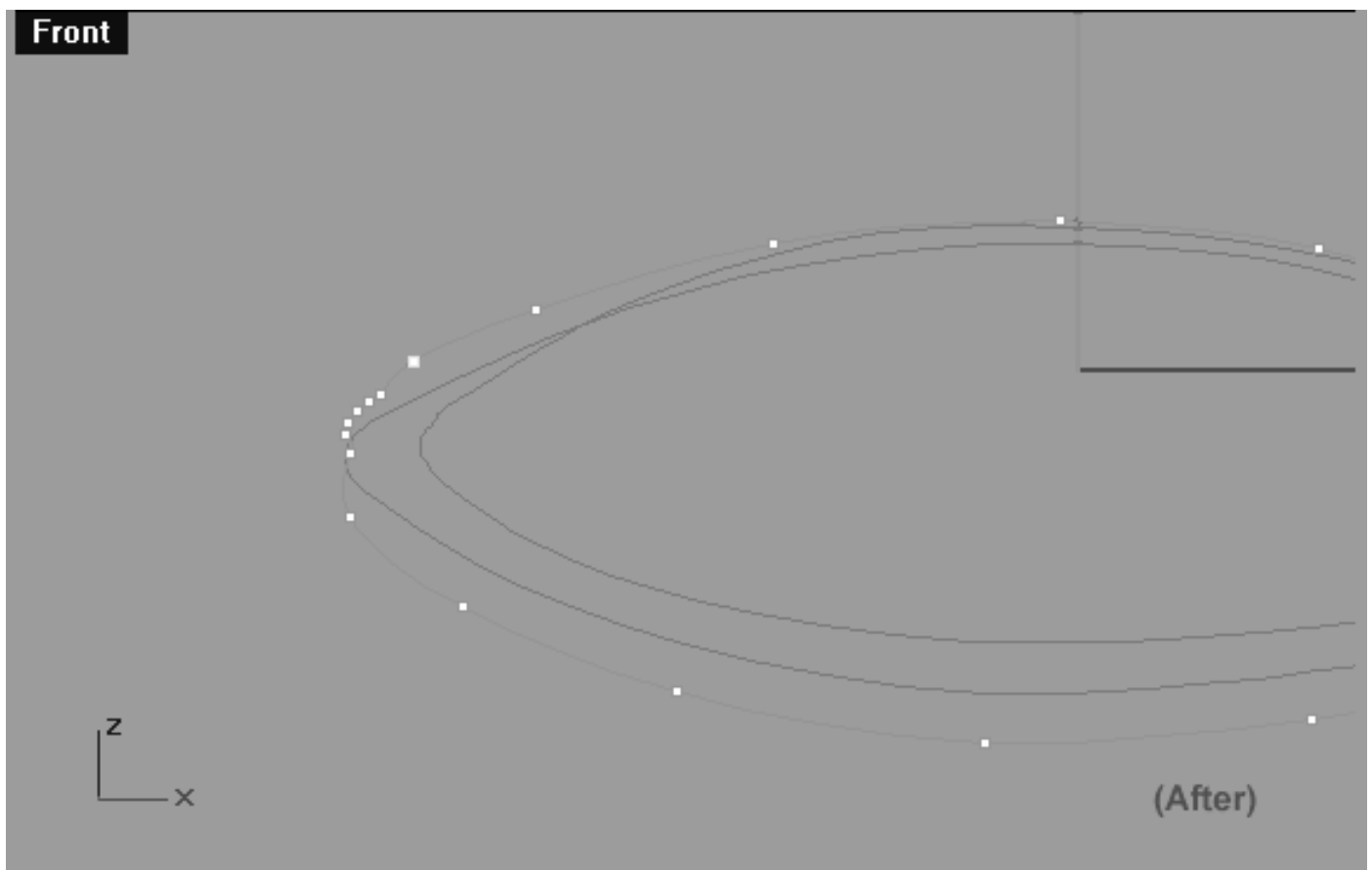
- In the **Front Viewport** select the point at roughly the **11 o'clock** position on the upper row -- it will highlight (see the screenshot below entitled: Before).
- Now hold down the Shift key and move the point just a bit along the X axis in an anti-clockwise direction toward the corner, roughly 0.521 units.
- Once done, again hold down the Shift key and move the point downward along the Z axis, roughly 0.074 units.
- Continue working in a anti-clockwise manner and repeat this general procedure with the following 2 points.



This **Front Viewport** screenshot shows the 3rd Eyelid Curve (Eyelid\_03) prior to any editing taking place on the upper row. Notice that the point at roughly the 11 o'clock position has been selected and is now ready to be moved outward slightly along the X axis and downward along the Z.

#### Helper Table:

Point	Approximate Units Moved
Point at 11 o'clock	Z: 0.074 (down) X: 0.521 (left)
Next point (anti-clockwise)	Z: 0.116 (down) X: 0.812 (left)
Next point (anti-clockwise)	Z: 0.100 (down) X: 0.890 (left)



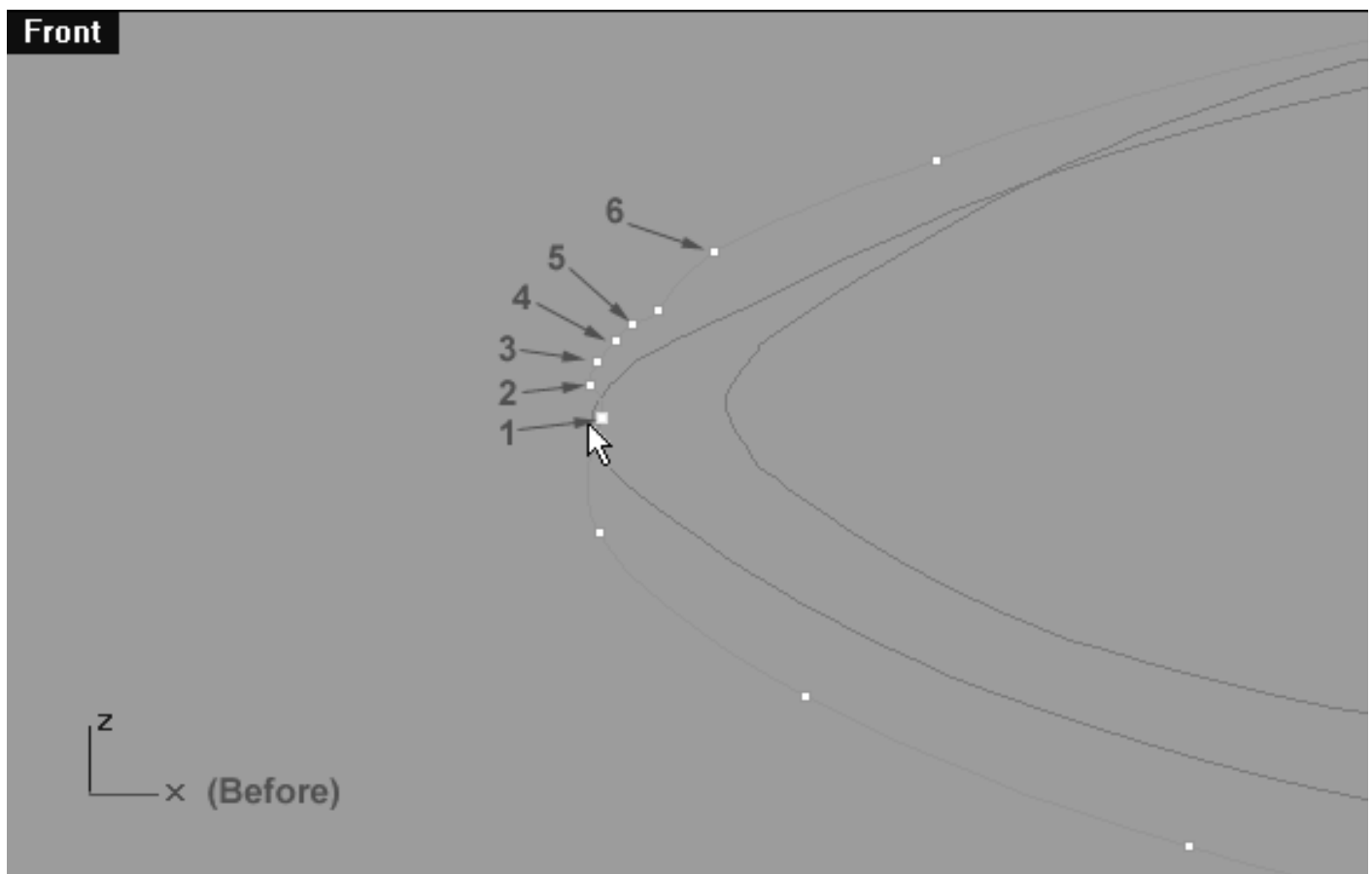
This **Front Viewport** screenshot shows the 3rd Eyelid Curve (Eyelid\_03) after editing has taken place on the upper row. Notice that only 3 points have been moved along the upper row this time. Observe that not only have the points been moved outward along the X axis but also downward at a very slight angle along the Z axis.

## Refine the Corner -- Left Side

As you can clearly see in the screenshot above, the points in the corner really require refinement now...

- In the **Front Viewport** start by selecting the point labelled number (1.) as shown in the screenshot below (Before).
- Now hold down the Shift key and move the point along the X axis to the left roughly 0.675 units. Once done, again hold down the Shift key move the point downward along the Z roughly 0.565 units until its approximately at the location shown the screenshot below (After).
- Continue this procedure in the corner area working on an incremental basis (example: select point 2, move point 2, select point 3, move point 3, etc.) You should be heading in a clockwise direction whilst selecting the points yet sliding them in a anti-clockwise direction in order to refine them.
- Once done, the placement of the left side corner points should be as seen in the screenshot below (After).

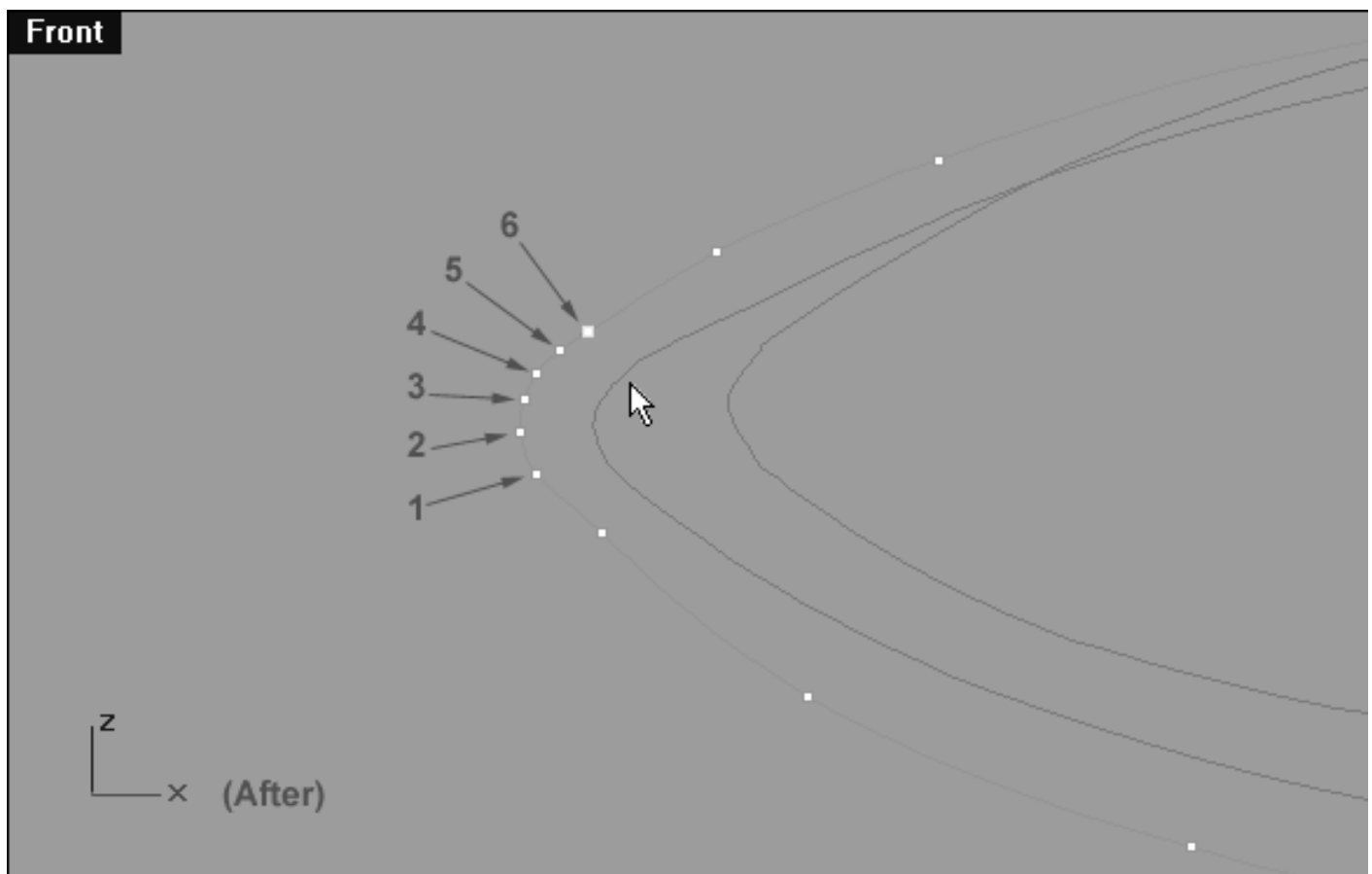




This **Front Viewport** screenshot shows the left side corner area that is in need of refinement. Start by sliding point 1 outward and downward.

#### Helper Table:

Point	Approximate Units Moved
labelled as No. 1 in screenshot	Z: 0.565 (down) X: 0.675 (left)
labelled as No. 2 in screenshot	Z: 0.483 (down) X: 0.790 (left)
labelled as No. 3 in screenshot	Z: 0.332 (down) X: 0.784 (left)
labelled as No. 4 in screenshot	Z: 0.256 (down) X: 0.761 (left)
labelled as No. 5 in screenshot	Z: 0.219 (down) X: 0.751 (left)
labelled as No. 6 in screenshot	Z: 0.191 (down) X: 0.763 (left)

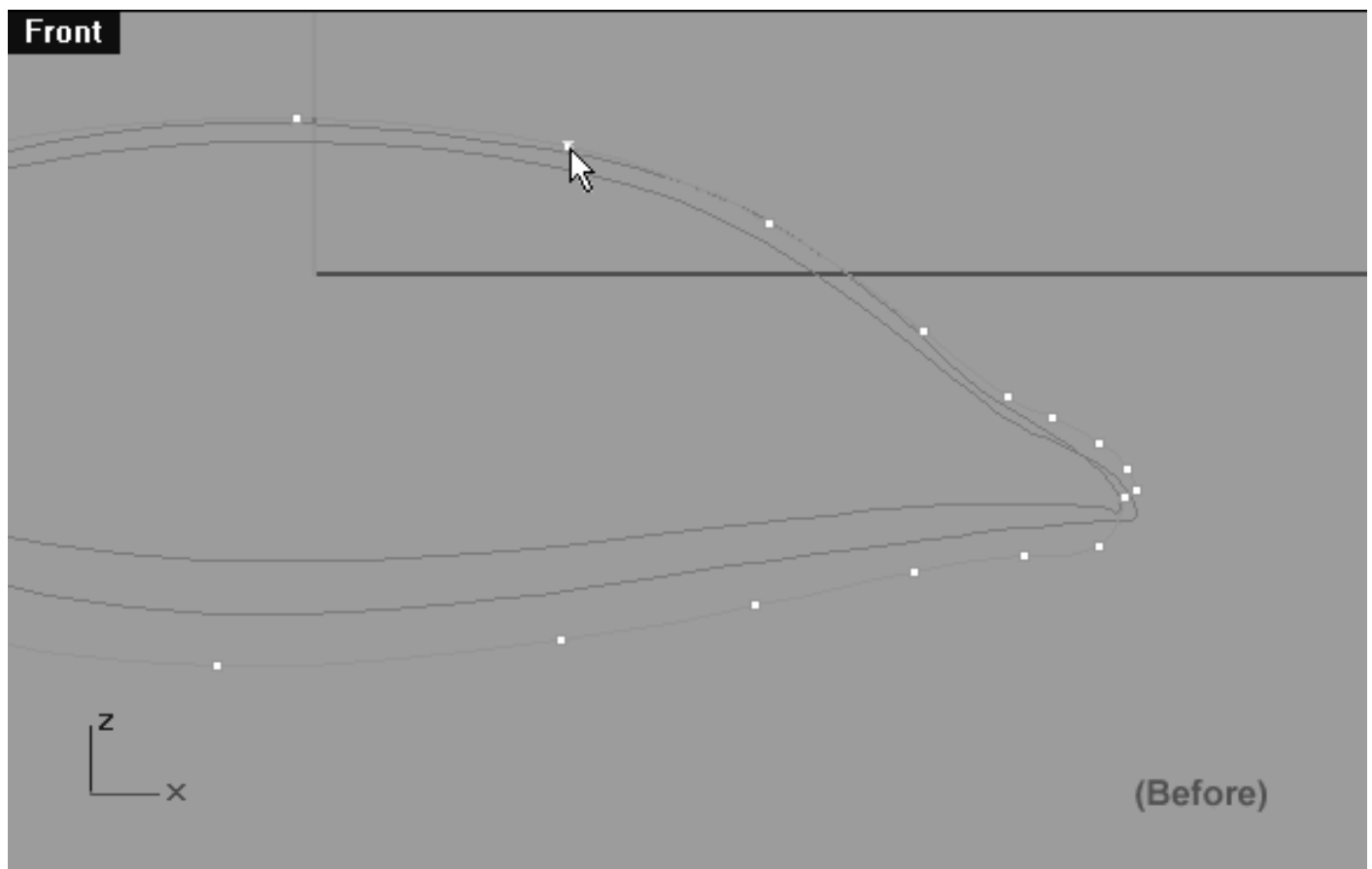


This **Front Viewport** screenshot shows the left side corner area after refinement has taken place. Your main aim should be to get the points spaced in an even and logical manner.

## Sliding Points Right Side, Upper Row

Now it's time refine the point placement of the right side, upper row by sliding points again...

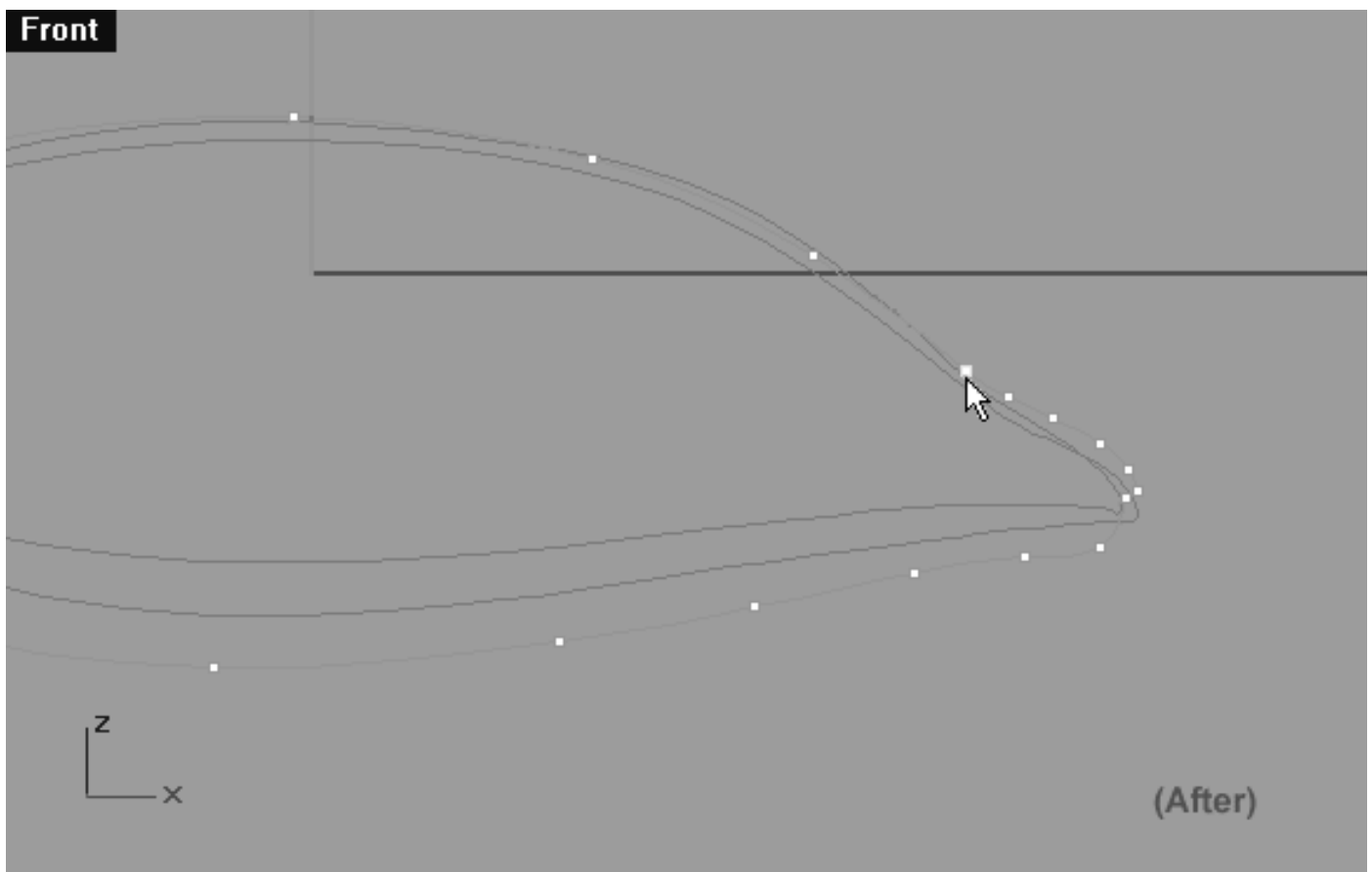
- In the **Front Viewport** select the point at roughly the **1 o'clock** position on the upper row, right side-- it will highlight (see the screenshot below entitled: Before).
- Now whilst holding down the Shift key move the point along the X axis roughly 0.476 units to the right. Once done, again hold down the Shift key and move the point downward along the Z axis roughly 0.255 units.
- Working clockwise, repeat this procedure with the following 2 points only. Once done, your monitor should resemble the screenshot below (After).



This **Front Viewport** screenshot shows the right side, upper row area that is in need of refinement. Start by sliding the point at the 1 o'clock position outward along the X axis and downward along the Z.

### Helper Table

Point	Approximate Units Moved
At 1 o'clock	Z: 0.255 (down) X: 0.476 (right)
Next point (clockwise)	Z: 0.588 (down) X: 0.707 (right)
Next point (clockwise)	Z: 0.657 (down) X: 0.774 (right)

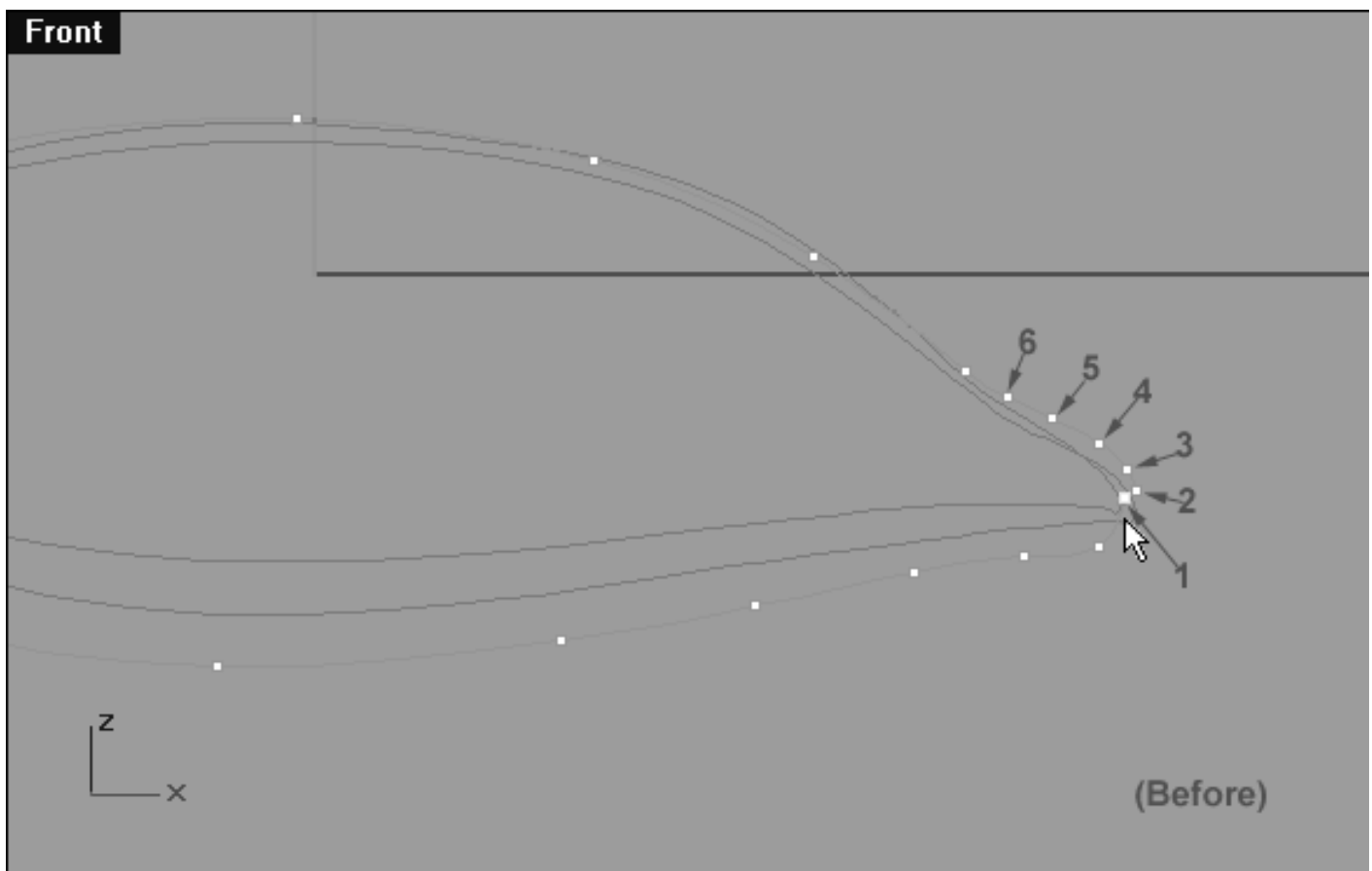


This **Front Viewport** screenshot shows the right side, upper row area after refinement has taken place.

## Refine the Corner -- Right Side

Once again we will now have to sort out the point placement and shape of the curve in the corner, this time on the right side.

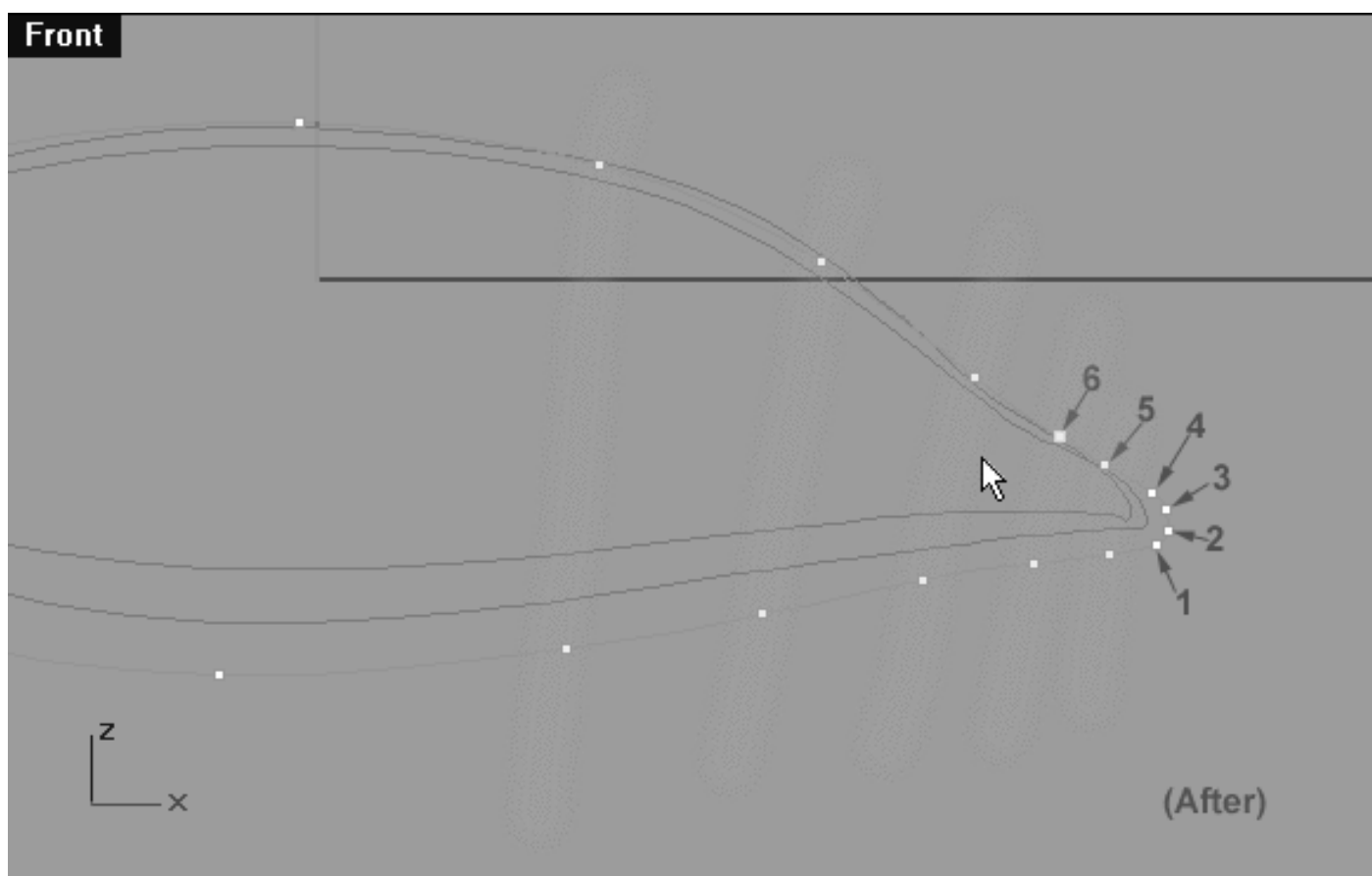
- In the **Front Viewport** start by selecting the point labelled number (1.) as shown in the screenshot below (Before).
- While holding down the Shift key, move the point downward along the Z axis roughly 0.683 units. Once done, again whilst holding down the Shift key move the point roughly 0.289 units to the right along X axis. It's really quite obvious where this point needs to be moved to and you shouldn't have any problem doing so -- just check out the screenshot below (After) to see just where it should be placed.
- Once done, continue working in a anti-clockwise direction sliding each point along the curve reshaping the corner as you go along. When completed, your monitor should resemble the screenshot below (After).



This **Front Viewport** screenshot shows the right side, corner area that is in need of refinement. Start by sliding the point labelled (1.) outward along the X axis and downward along the Z.

### Helper Table

Point	Approximate Units Moved
labelled as No. 1 in screenshot	Z: 0.683 (down) X: 0.289 (right)
labelled as No. 2 in screenshot	Z: 0.532 (down) X: 0.421 (right)
labelled as No. 3 in screenshot	Z: 0.606 (down) X: 0.506 (right)
labelled as No. 4 in screenshot	Z: 0.764 (down) X: 0.677 (right)
labelled as No.5 in screenshot	Z: 0.772 (down) X: 0.755 (right)
labelled as No.6 in screenshot	Z: 0.548 (down) X: 0.766 (right)



This **Front Viewport** screenshot shows the right side, corner area after refinement. **Note\*** -- Pay close attention to the placement of the points and their relationships to one another particularly in this area -- it's crucial. Notice the very corner points (1, 2, 3, & 4) above. Observe the important relationships between the points on the upper row and those on the lower row and see how they more or less line up (as highlighted in green above).

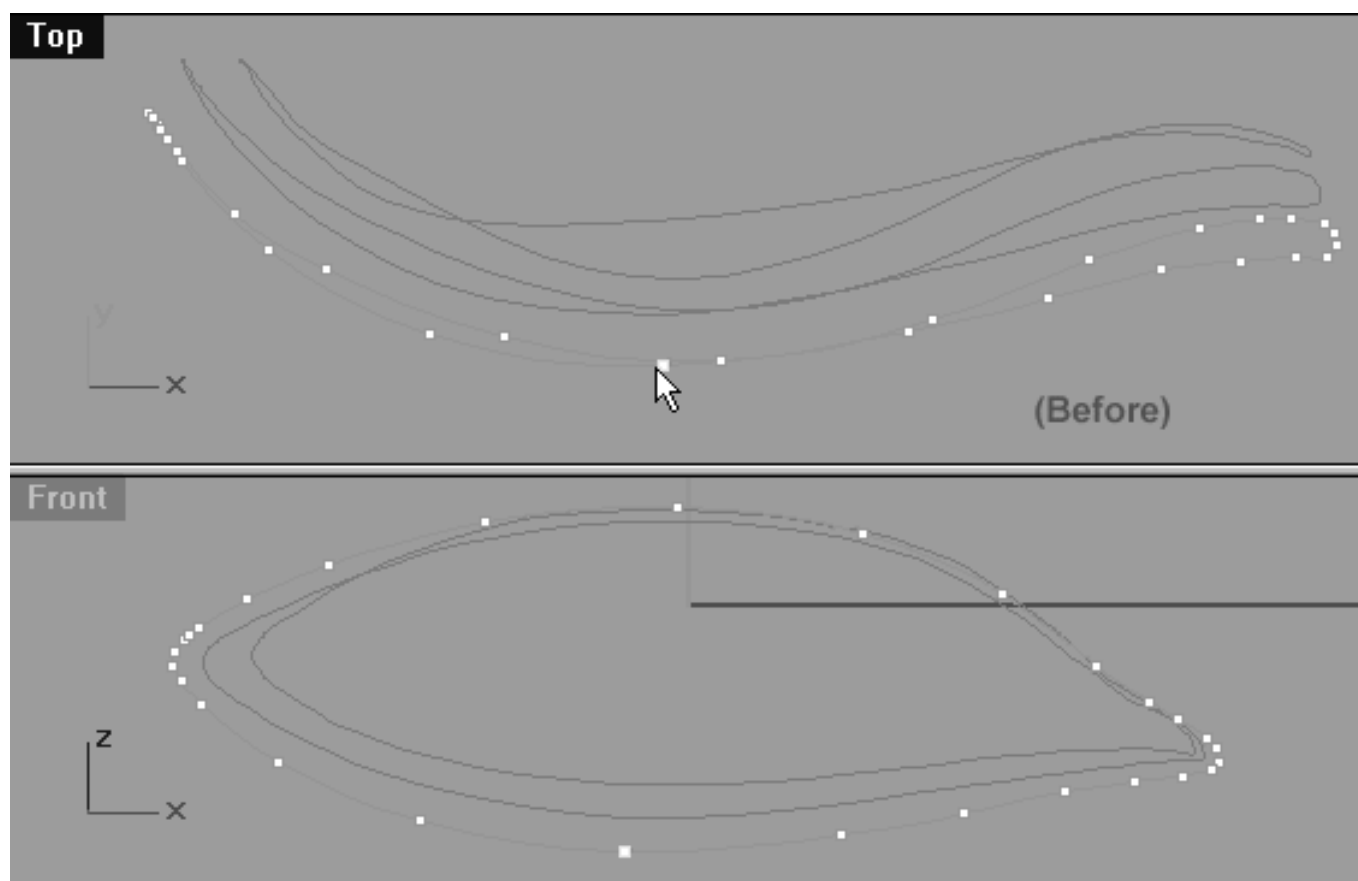


**View an example movie**

**Editing the 3rd Eyelid Curve, Pt. 2** [Click Here](#)

## Lower Row, Left Side

- Rearrange your viewports windows so that the Top and Front Views are clearly visible, it's important that you can see what you're doing. During the next few steps it's a very good idea to select the point to be moved in the Front Viewport and then actually setting about moving it in the Top Viewport.
- Now in the **Front Viewport**, select the point at the 6 o'clock position on the lower row of the curve (see the screenshot below entitled: Before) Once done, move your cursor into the Top Viewport and while holding down the Shift Key move it upward along the Y axis roughly 1.067 units.
- Continue working in a clockwise direction and repeat this procedure with the following 5 points until you've created a gentle arcing shape as in the screenshot below entitled: (After).

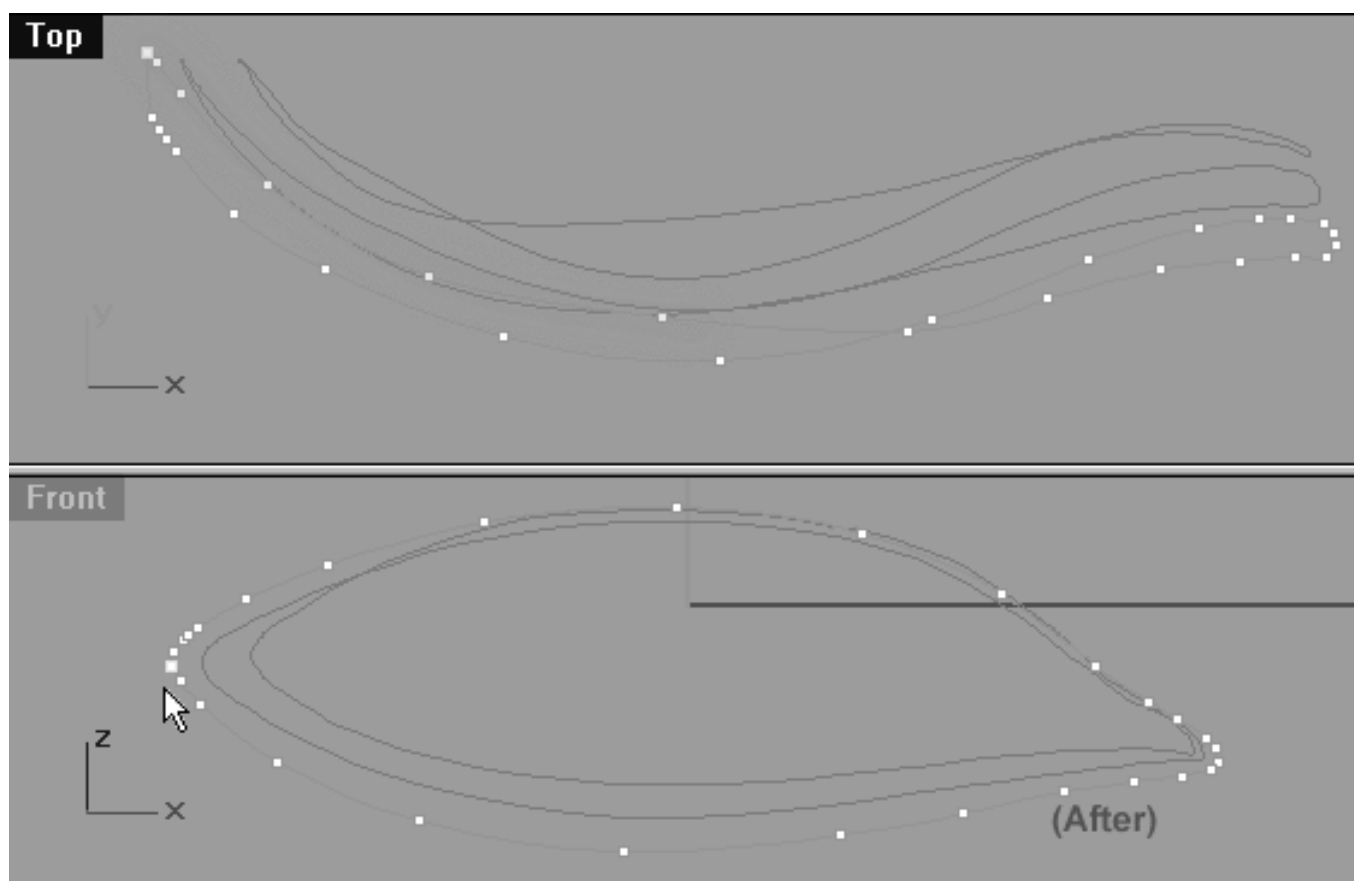


This **Front Viewport** screenshot shows the lower row, left side of the curve prior to any editing taking place. Notice, that the point at the 6 o'clock position has been selected and is ready to be moved.

### Helper Table

Point	Approximate Units Moved
Point at 6 o'clock	Y: 1.067 (up)
Next point (clockwise)	Y: 1.295 (up)
Next point (clockwise)	Y: 1.515 (up)
Next point (clockwise)	Y: 1.559 (up)
Next point (clockwise)	Y: 1.665 (up)
Next point (clockwise)	Y: 1.690 (up)



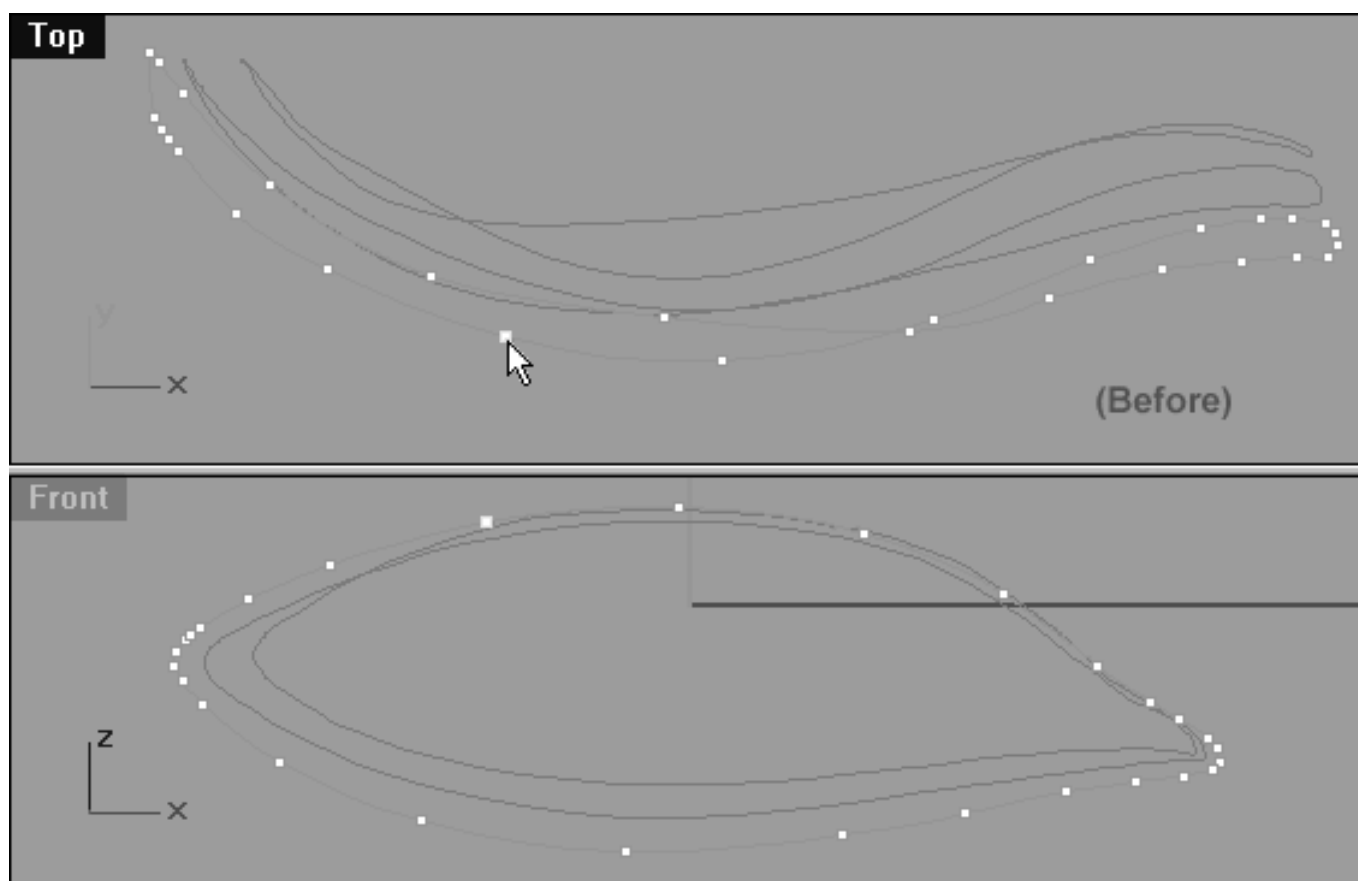


This **Front Viewport** screenshot shows the lower row, left side of the curve after editing has taken place. Notice, that starting at the 6 o'clock position and working clockwise a total of 6 points have been moved upward along the Y axis (highlighted in green). Observe the gentle arcing curve that this action has produced and pay attention to its relationship to the 2nd Eyelid curve (locked).

## Upper Row, Left Side

Once again, the method is similar to that of the previous step...

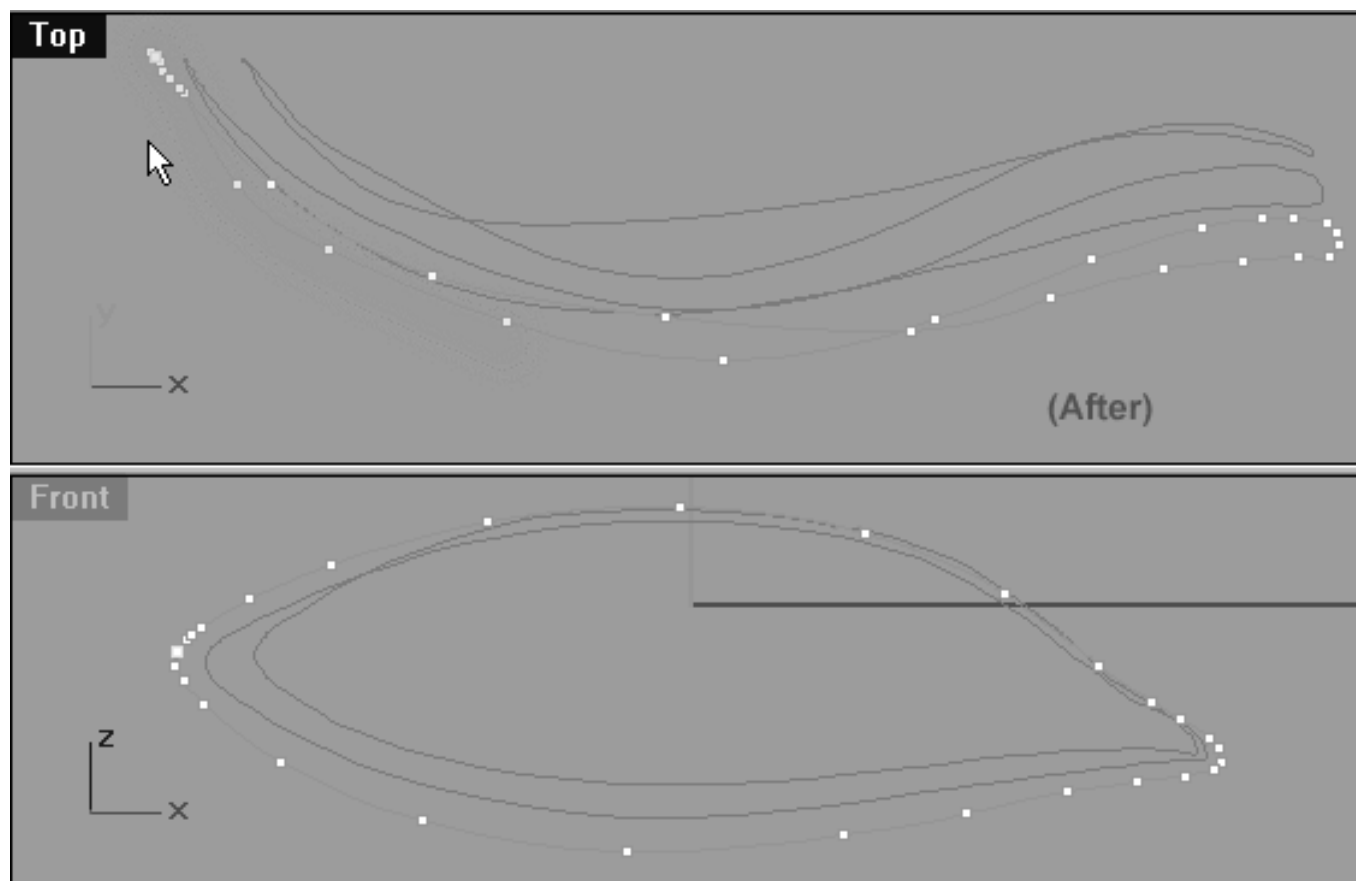
- In the **Front Viewport**, select the point at the 11 o'clock position on the upper row, left side of the curve (see the screenshot below entitled: Before) Once done, move your cursor into the **Top Viewport** and while holding down the Shift Key move it upward along the Y axis roughly 0.254 units.
- Continue working in an anti-clockwise direction and repeat this procedure with the remaining upper row points until you've created a gentle arcing shape as in the screenshot below entitled: (After).



This **Top/Front Viewport** screenshot shows the upper row, left side of the curve prior to any editing taking place. Notice, that the point at the 11 o'clock position has been selected and is ready to be moved.

### Helper Table

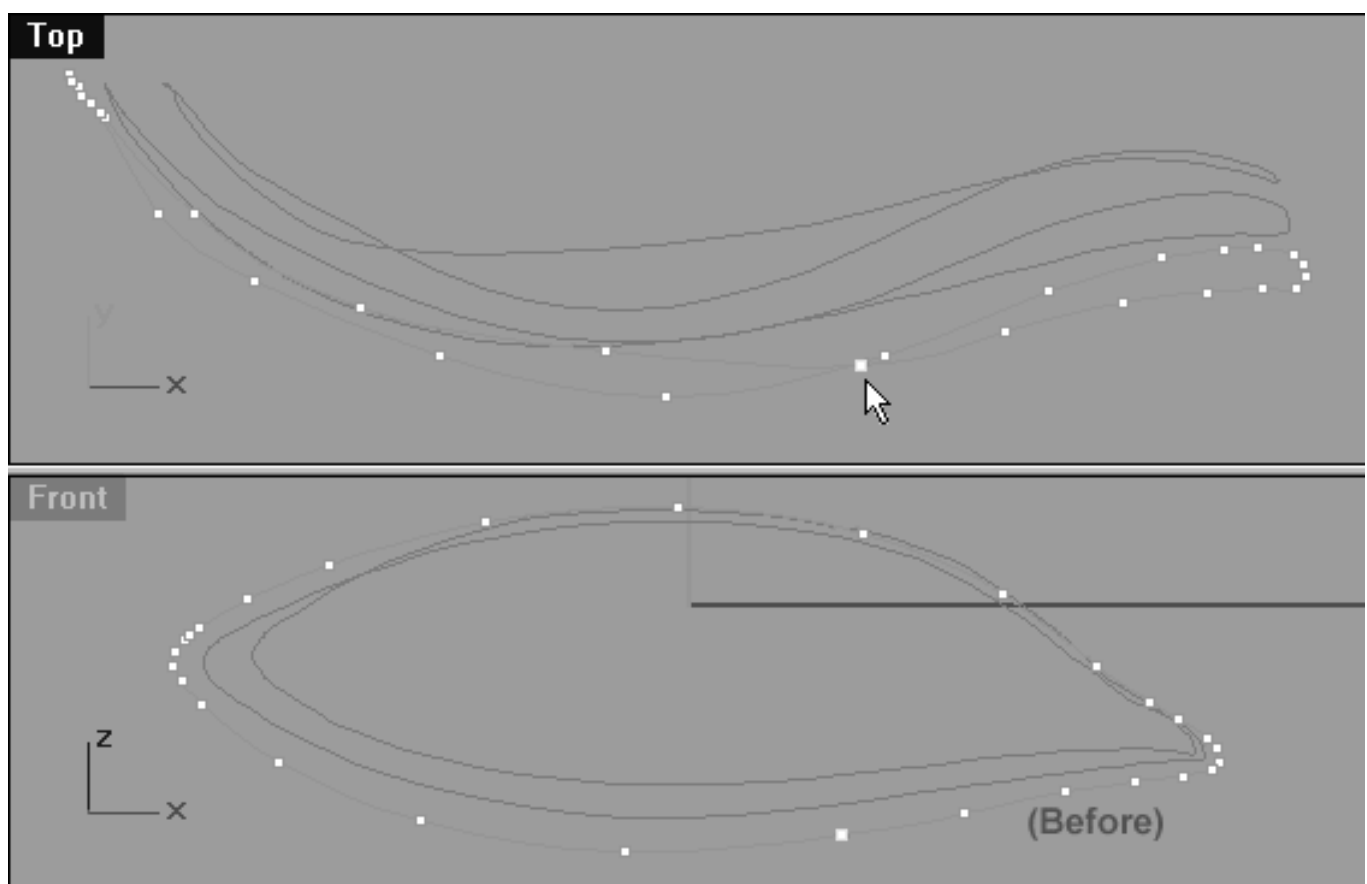
Point	Approximate Units Moved
Point at 11 o'clock	Y: 0.254 (up)
Next point (anti-clockwise)	Y: 0.457 (up)
Next point (anti-clockwise)	Y: 0.721 (up)
Next point (anti-clockwise)	Y: 1.283 (up)
Next point (anti-clockwise)	Y: 1.408 (up)
Next point (anti-clockwise)	Y: 1.510 (up)
Next point (anti-clockwise)	Y: 1.613 (up)



This **Top/Front Viewport** screenshot shows the upper row, left side of the curve after editing has taken place. Notice, that starting at the 11 o'clock position and working anti-clockwise all the remaining upper row points have been moved upward along the Y axis (highlighted in green). Observe the gentle arcing curve that this action has produced and pay attention to its relationship to the 2nd Eyelid curve (locked).

## Lower Row, Right Side

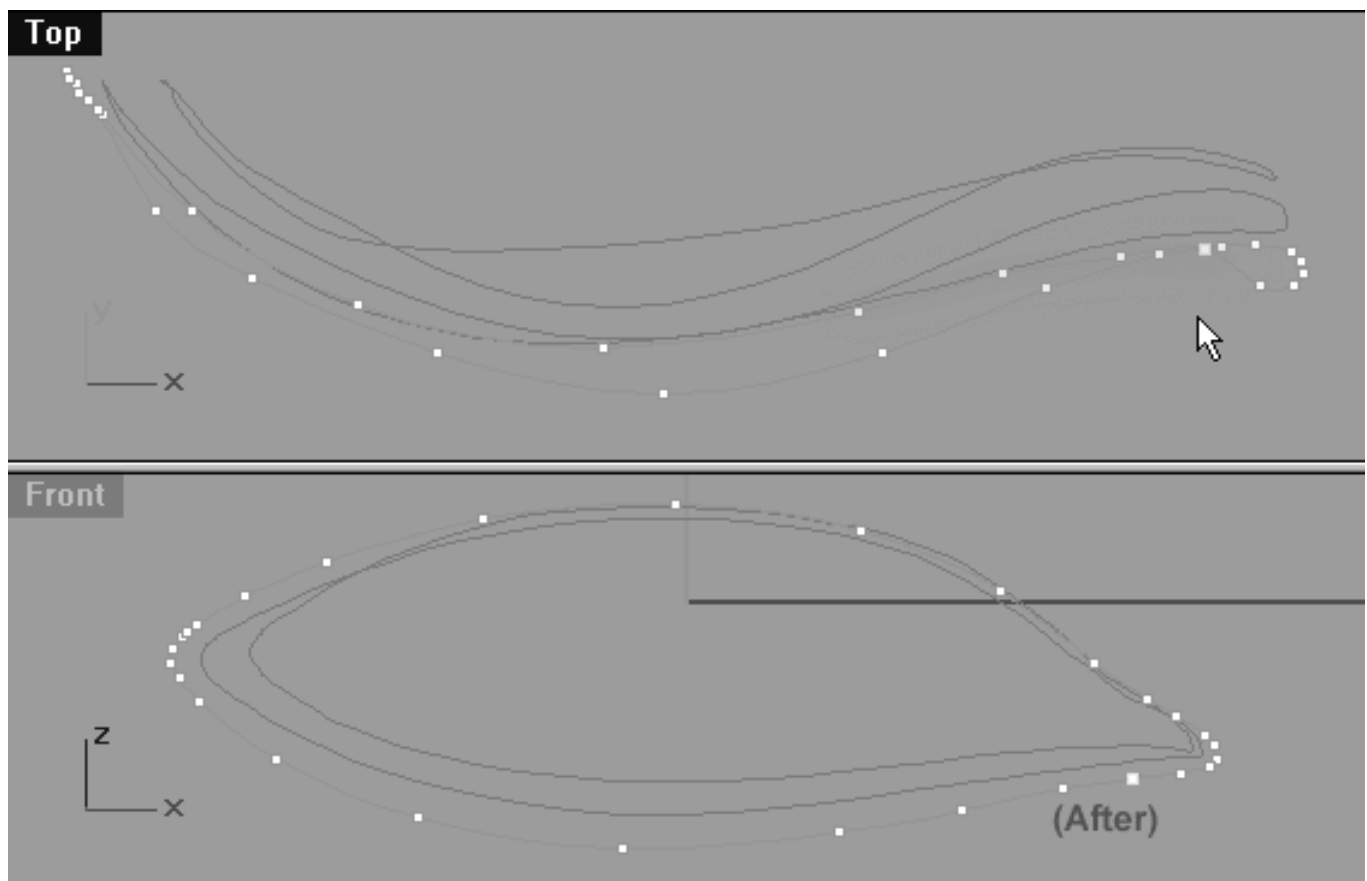
- In the Front Viewport select the point at the 5 o'clock position on the lower row, right side (see the screenshot below entitled: Before) Once done, move your cursor into the Top Viewport and whilst holding down the Shift Key move it upward along the Y axis roughly 1.097 units.
- Continue working in an anti-clockwise direction and repeat this procedure with the next 3 points until you've created a shape similar to that of the screenshot below entitled: (After).



This **Top/Front Viewport** screenshot shows the lower row, right side of the curve prior to any editing taking place. Notice, that the point at the 5 o'clock position has been selected and is ready to be moved.

### Helper Table

Point	Approximate Distance Moved
Point at 5 o'clock	Y: 1.097 (up)
Next point (anti-clockwise)	Y: 1.054 (up)
Next point (anti-clockwise)	Y: 0.976 (up)
Next point (anti-clockwise)	Y: 0.919 (up)



This **Top/Front Viewport** screenshot shows the lower row, right side of the curve after editing has taken place. Notice, that starting at the 5 o'clock position and working anti-clockwise the next 3 upper row points have been moved upward along the Y axis (highlighted in green). Observe the shape that this action has produced.



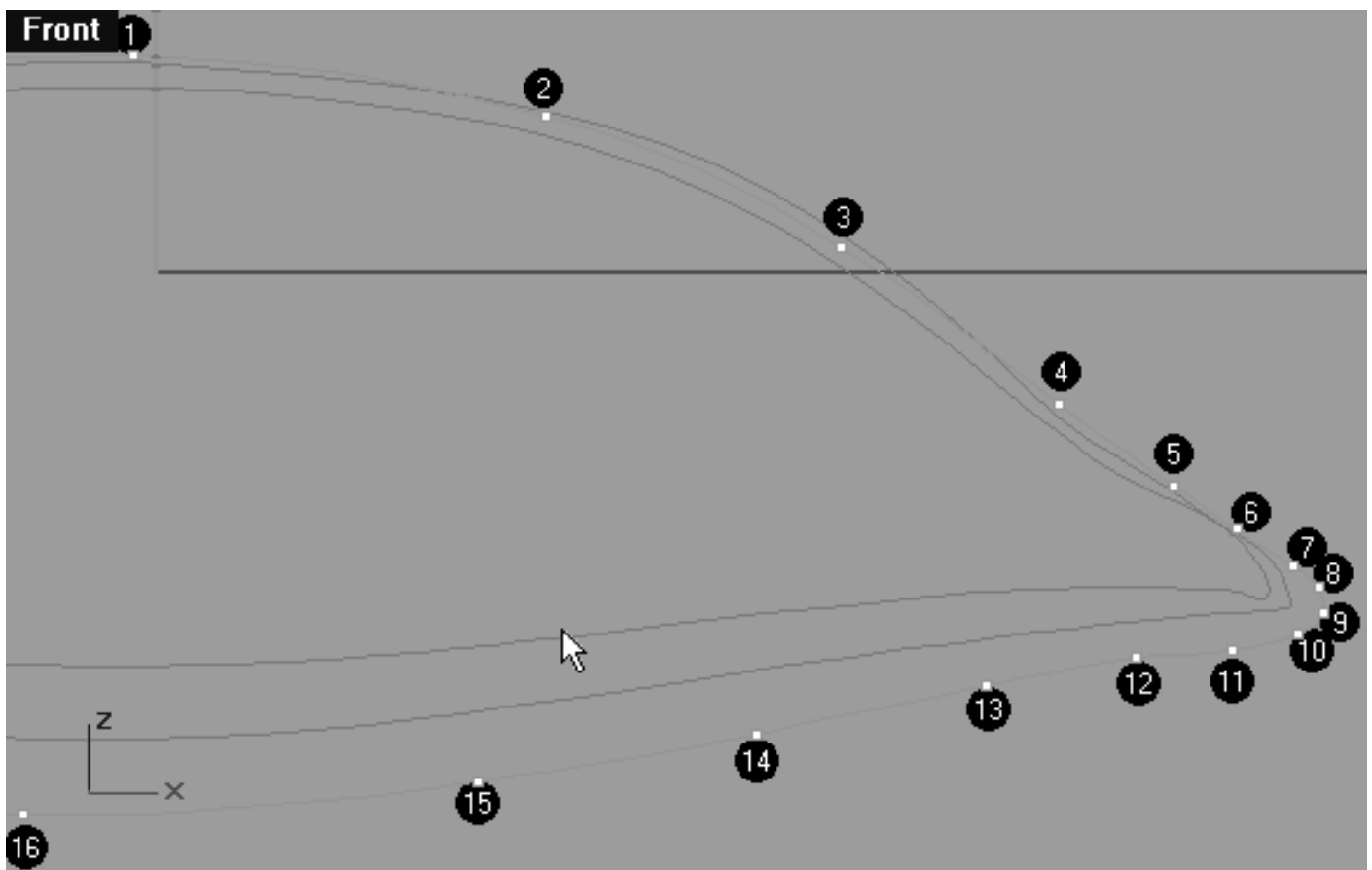
**View an example movie**

**Editing the 3rd Eyelid Curve, Pt. 3** [Click Here](#)

## Refine the Corner Right Side, Pt. 2

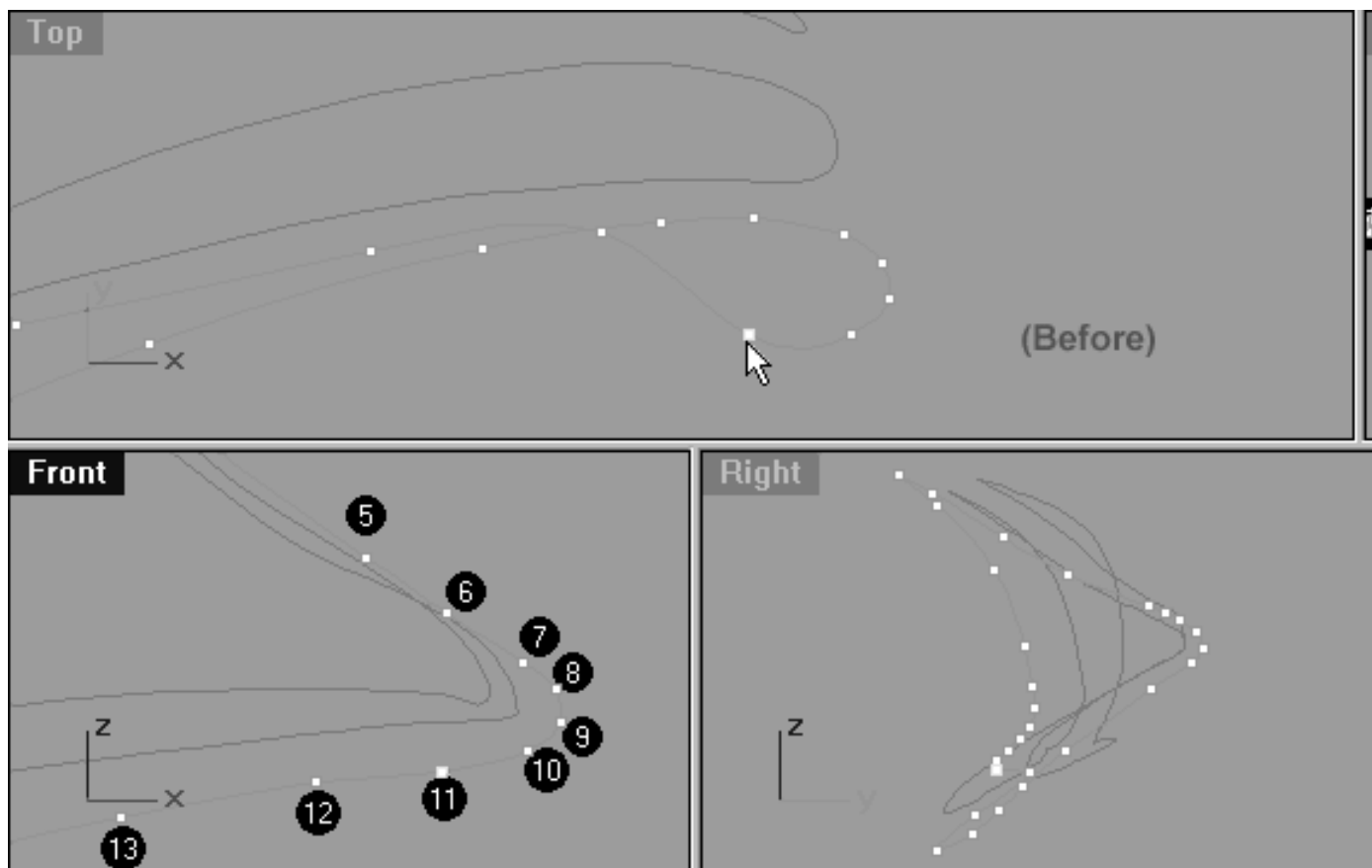
We are now very close to being finished with this curve and can set about refining the right corner for the final time. As I'm sure you're beginning to notice when working in the corners of the eyelid curve it can be rather difficult to tell what point you're working on due the bunching up points. As so to avoid any possible confusion, I've taken the liberty of numbering the points using the annotated dot feature found in Rhinoceros. In circumstances such as these it can be a very good idea to label your points in this way, I recommend it highly and it's well worth the few extra minutes it takes to do so.

In the screenshot below you'll notice that for the purposes of this step I've begun labelling the points at roughly the 12 o'clock position with this point becoming number (1). I've then continued working in a clockwise manner, incrementally labelling each point until reaching the 6 o'clock position which has been defined as point number (16).



This **Front Viewport** screenshot shows the points we will now concentrate on numbered with annotated dots.

- Rearrange your viewports so that you can clearly see the TOP, FRONT and RIGHT Viewports -- see the screenshot below entitled: (Before).
- In the **Front Viewport**, begin by selecting the point labelled number (11). Once done, move your cursor into the **Top Viewport** and whilst holding down the Shift Key move the point upward along the Y axis roughly 0.792 units.
- Next repeat the procedure, this time selecting and moving the point labelled number (10) and whilst holding down the Shift key move the point upward along the Y axis roughly 0.672 units. Once done, your monitor should resemble the screenshot below entitled: (After).

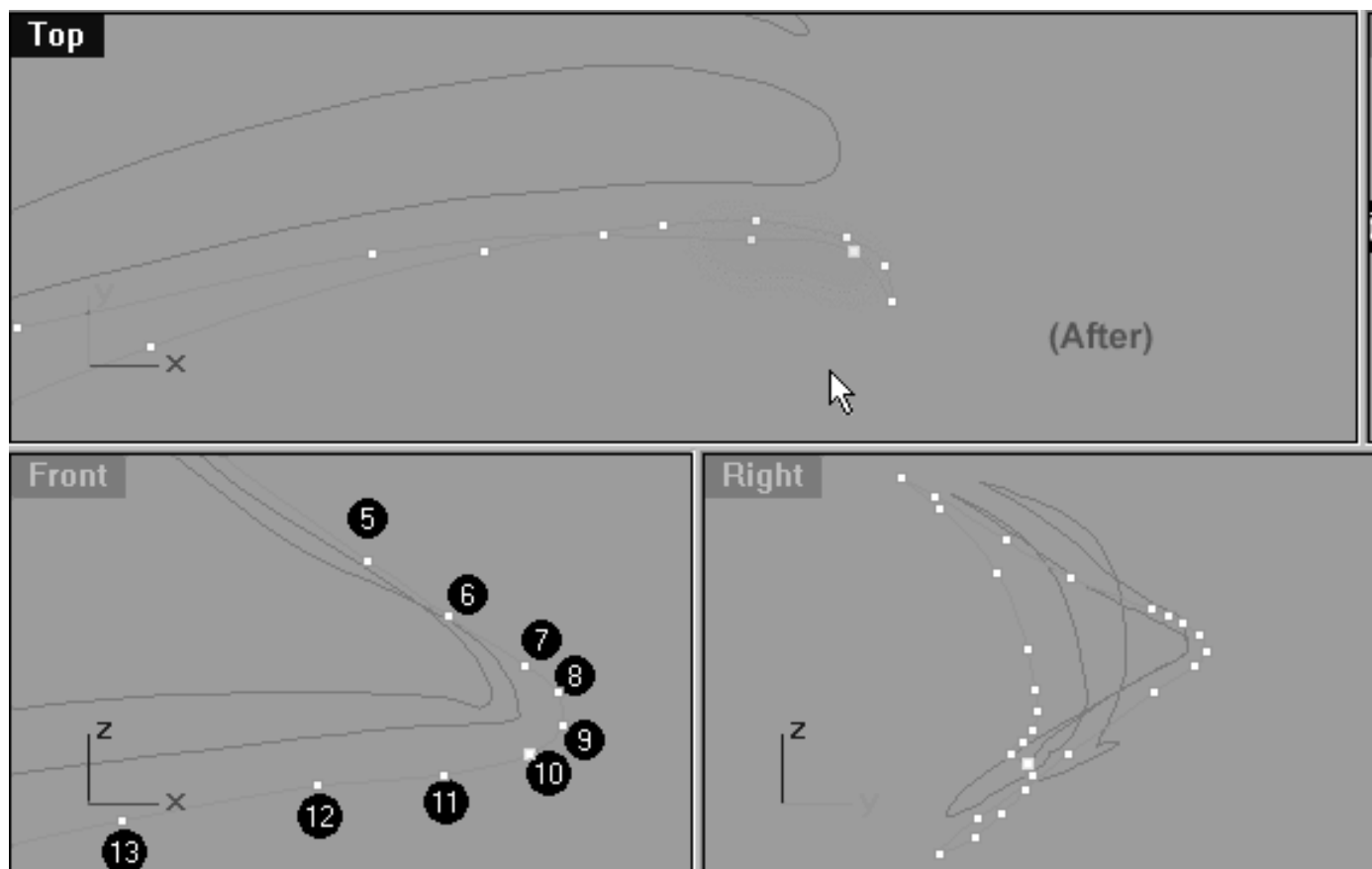


This **All Viewport** screenshot shows the point labelled number 11 has been selected and prior to being moved upward along the Y axis in the **Top Viewport**.

### Helper Table

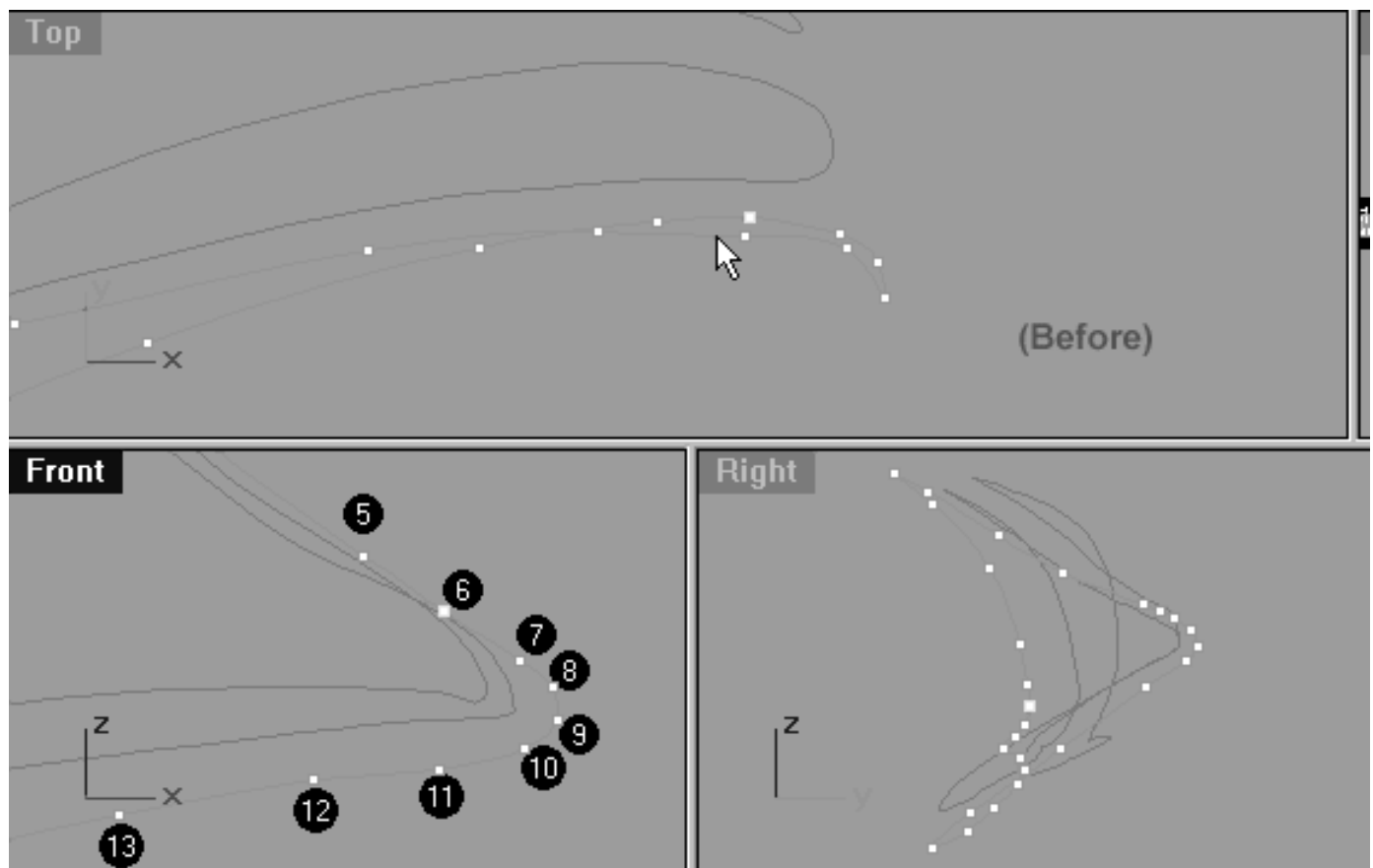
Point	Approximate Distance Moved
labelled as No.11 in screenshot	Y: 0.792 (up)
labelled as No.10 in screenshot	Y: 0.672 (up)





This **All Viewport** screenshot shows the point labelled number 11 and 10 have now been moved upward along the Y axis in the **Top Viewport** and are now resting at their new locations (highlighted in green).

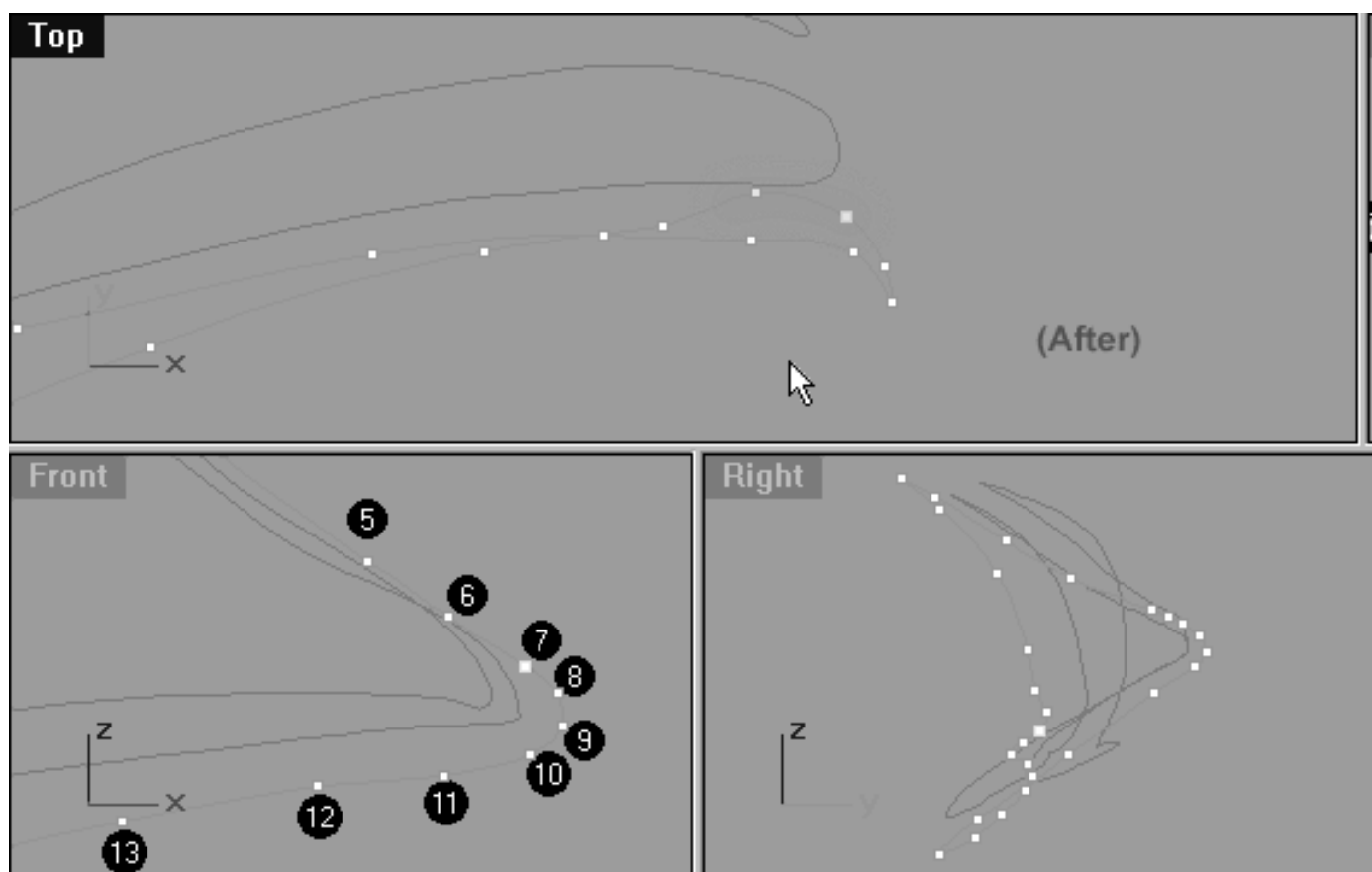
- In the **Front Viewport**, select the point labelled number (5). Once done, move your cursor into the **Top Viewport** and whilst holding down the Shift Key move the point upward along the Y axis roughly 0.118 units.
- Again, in the **Front Viewport**, continue by selecting the point labelled number (6). Once done, move your cursor into the **Top Viewport** and whilst holding down the Shift Key move the point upward along the Y axis roughly 0.190 units.
- Next repeat the procedure, select the point labelled number (7), then move your cursor into the **Top Viewport** and whilst holding down the Shift Key move the point upward along the Y axis roughly 0.143 units. Once done, your monitor should resemble the screenshot below entitled: (After).



This **All Viewport** screenshot shows the point labelled number 6 has been selected and prior to being moved upward along the *Y* axis in the **Top Viewport**.

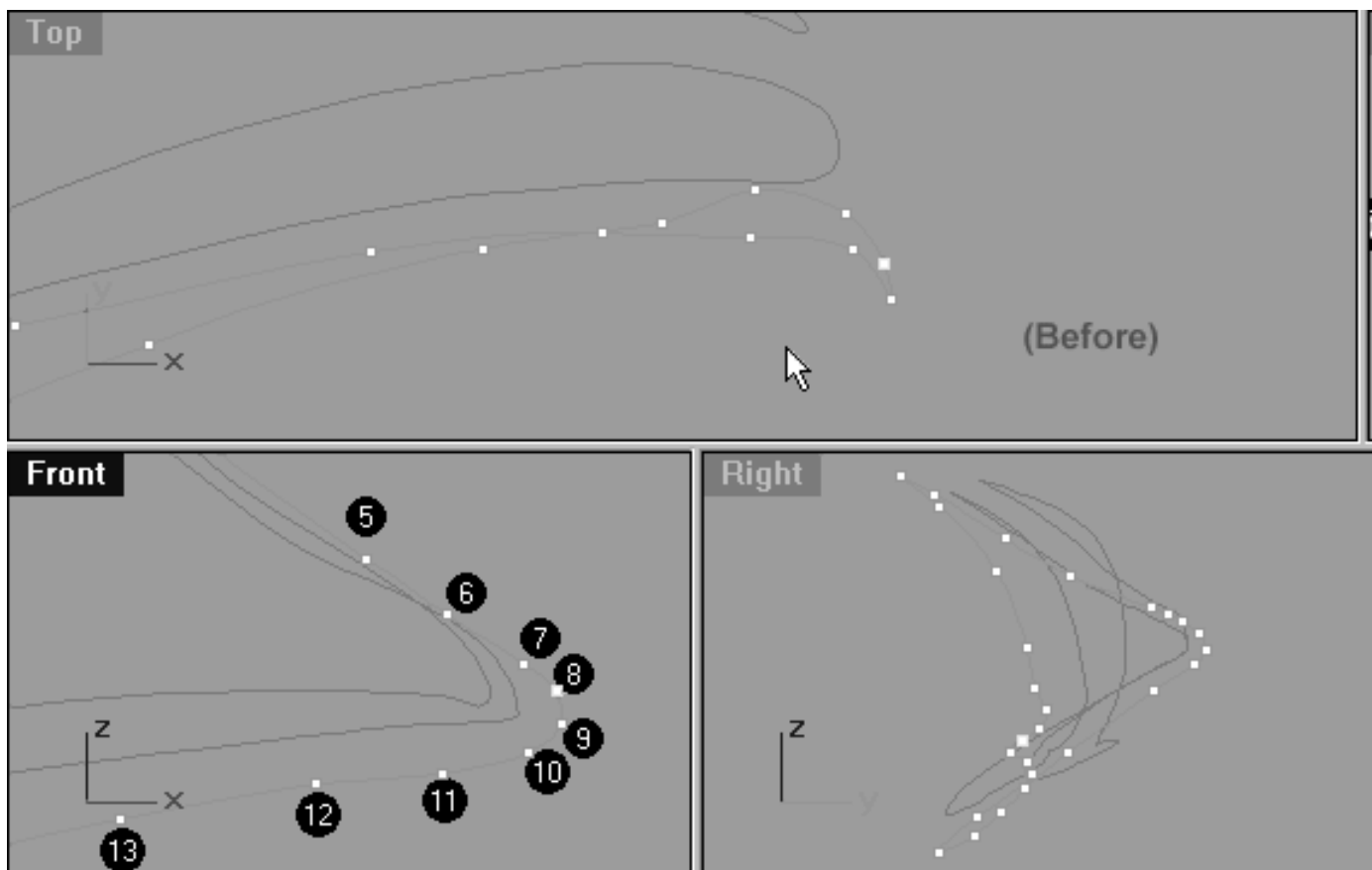
### Helper Table

Point	Approximate Distance Moved
labelled as No.5 in screenshot	Y: 0.118 (up)
labelled as No.6 in screenshot	Y: 0.190 (up)
labelled as No.7 in screenshot	Y: 0.143 (up)



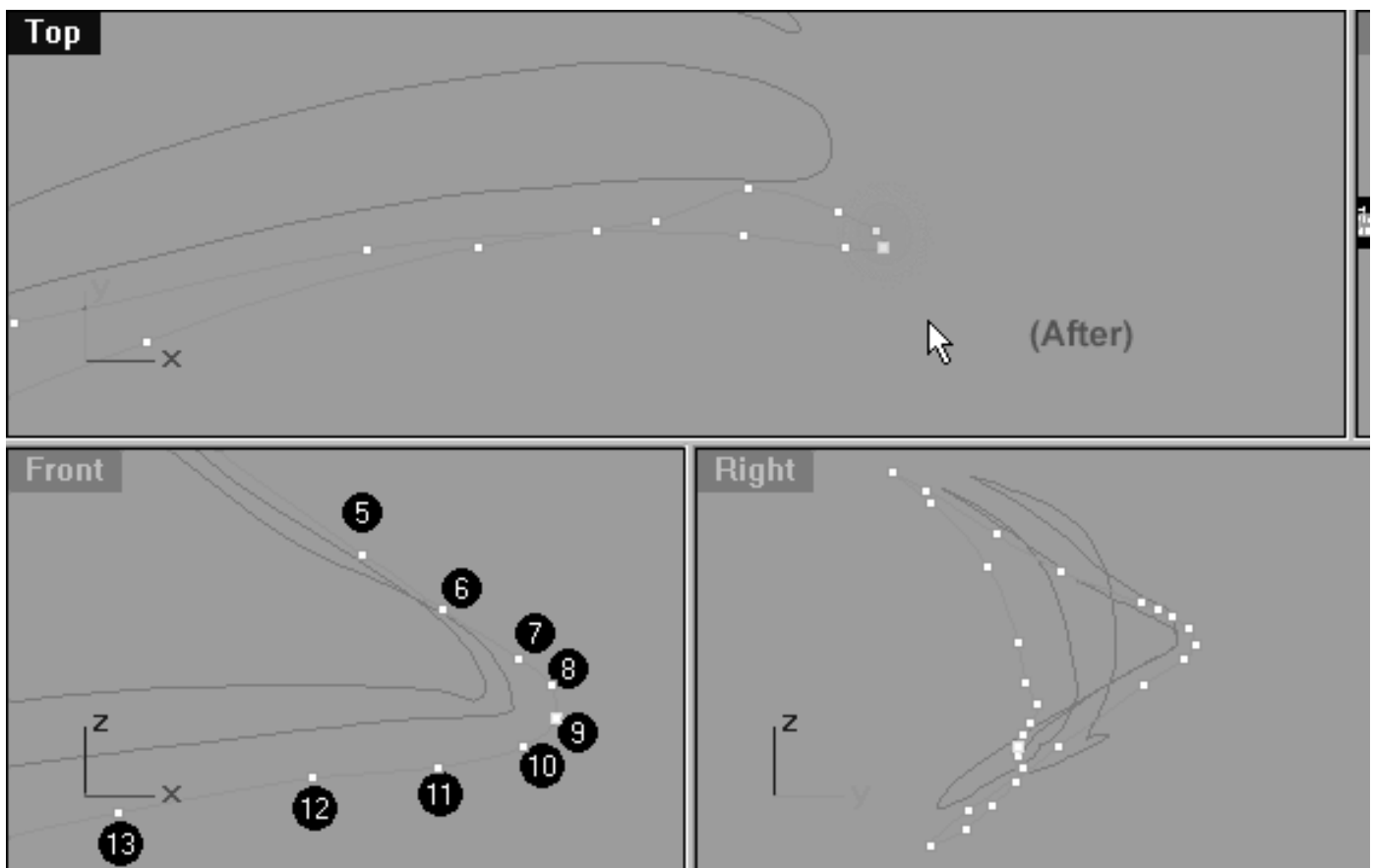
This **All Viewport** screenshot shows the point labelled number 6 and 7 have now been moved upward along the Y axis in the **Top Viewport** and are now resting at their new locations (highlighted in green).

- In the **Front Viewport**, continue by selecting the point labelled number (8). Once done, move your cursor into the **Top Viewport** and whilst holding down the Shift Key move the point upward along the Y axis roughly 0.219 units.
- Next repeat the procedure, this time select the point labelled number (9) and whilst holding down the Shift key move the point upward along the Y axis roughly 0.399 units. Once done, your monitor should resemble the screenshot below entitled: (After).



This **All Viewport** screenshot shows the point labelled number 8 has been selected and prior to being moved upward along the Y axis in the **Top Viewport**.

Point	Approximate Distance Moved
labelled as No.8 in screenshot	Y: 0.219 (up)
labelled as No.9 in screenshot	Y: 0.399 (up)



This **All Viewport** screenshot shows the point labelled number 8 and 9 have now been moved upward along the Y axis in the **Top Viewport** and are now resting at their new locations (highlighted in green).



**View an example movie**

**Editing the 3rd Eyelid Curve, Pt. 4** [Click Here](#)

## Snap It Up

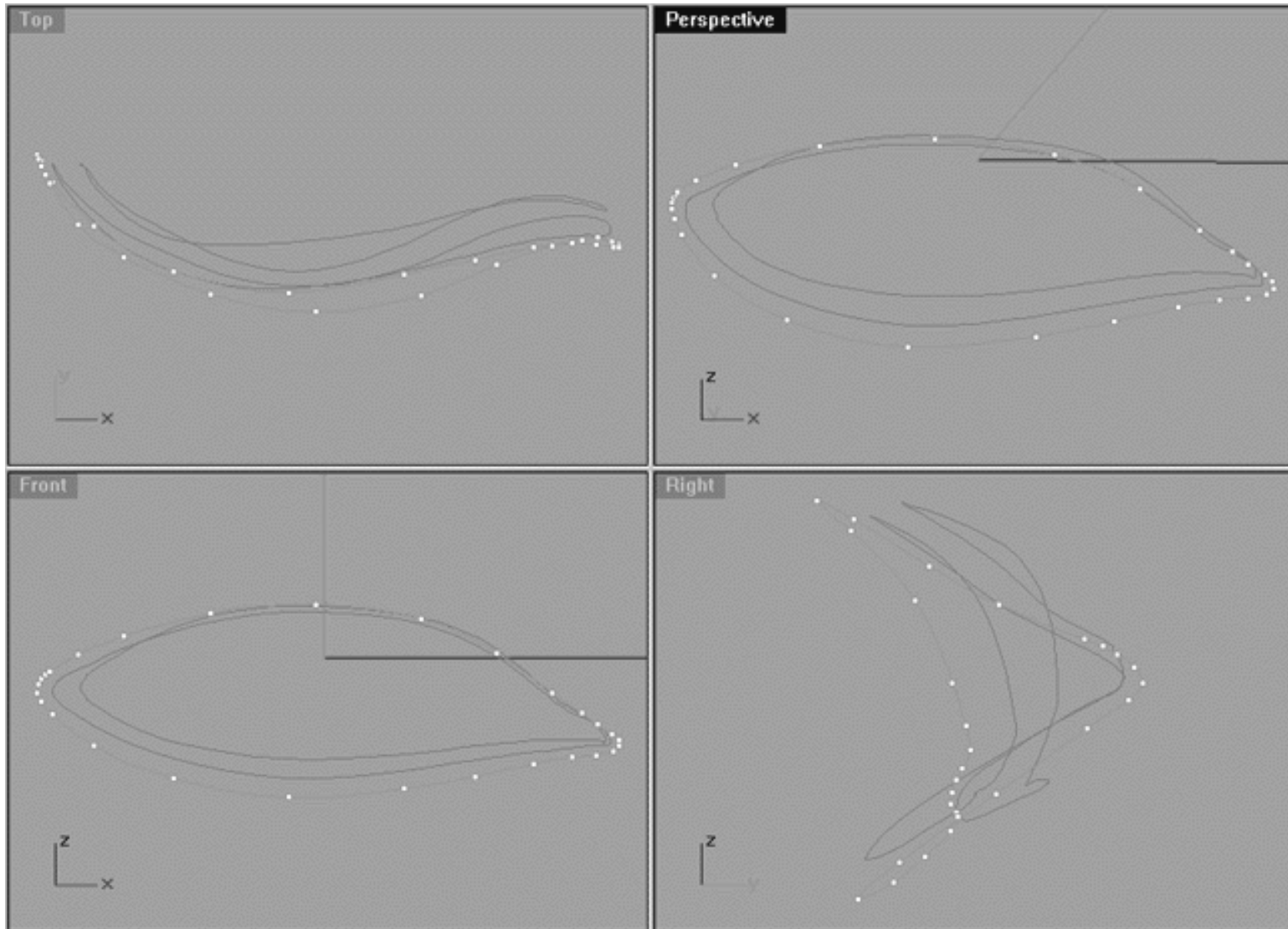
Congratulations, The 3rd eyelid curve has now been completed!

You should some take a little time to carefully inspect the curve in order to clean up, refine and adjust points as required.

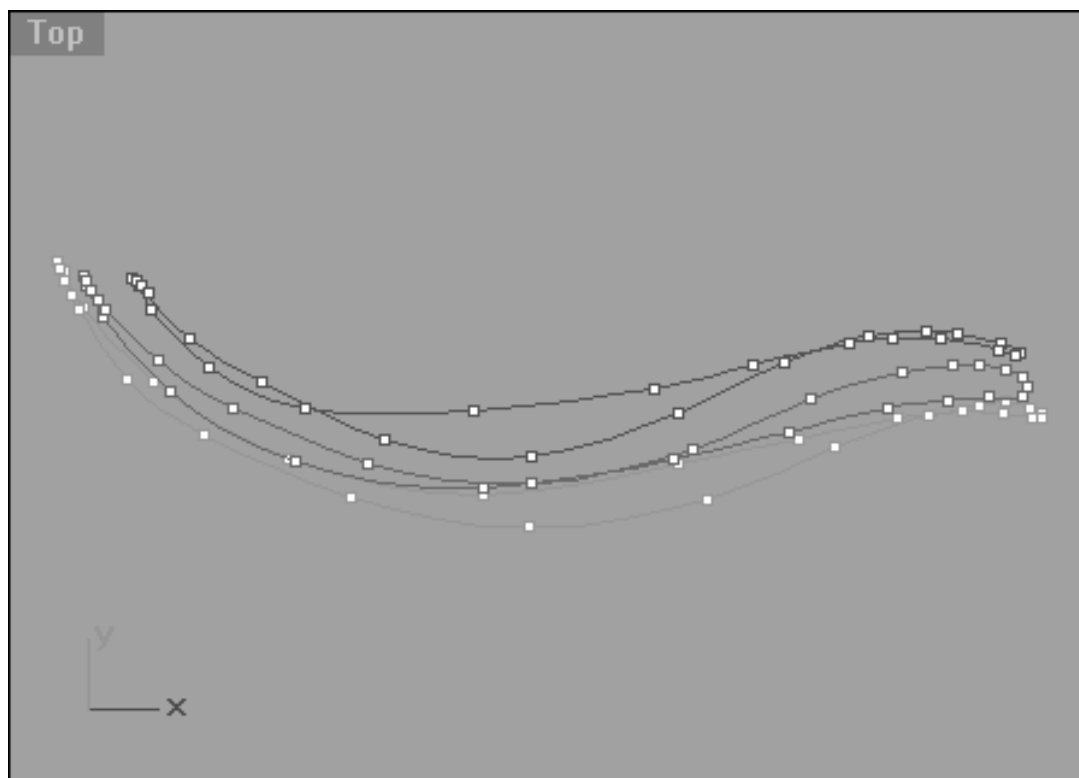
While this exercise wasn't easy, I'm glad to be able to say that the worst of it is over now and you should find difficulty decreasing a bit. If you come away with anything from this particular exercise it should be the importance of working in a systematic manner.

You can now check your work against ours and see how close you've come. To do this, open the Edit Layers dialogue box and turn **ON** the layer entitled: **Eyelid\_guide\_03**, then press **OK** to **Exit**. Then in **Any Viewport** select the **Eyelid\_guide\_03** curve and display its edit points. Once done, reopen the Edit Layers dialogue box and set the **Eyelid\_guide\_03** layer to **LOCK**, press **OK** to **Exit**. You can now compare the results and refine the specific areas where you've gone off track. You can then turn on the **Osnaps, Point** and snap each of the points on the curve you've created to those of the guide curve.

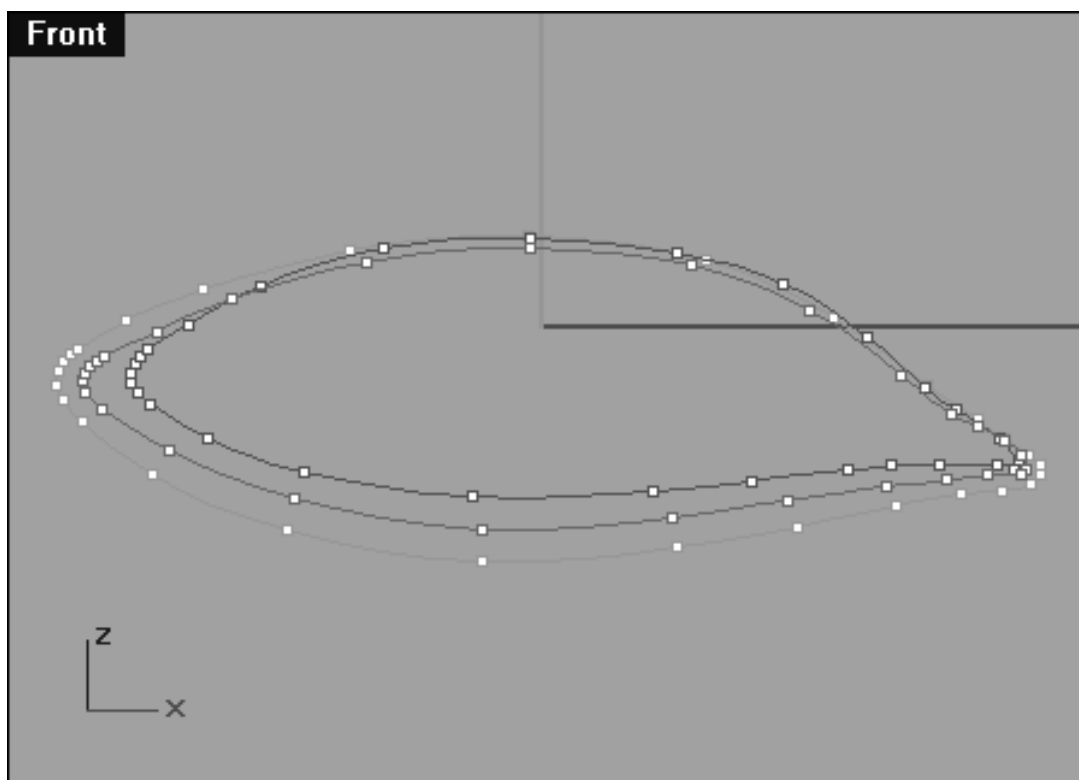
Once you've finished this process your monitor should resemble the screenshots below in all views.



*This **All Viewport** screenshot shows the now fully completed and refined 3rd Eyelid Curve. Observe the relationships in all views between the points and carefully study the relationships between all 3 curves.*

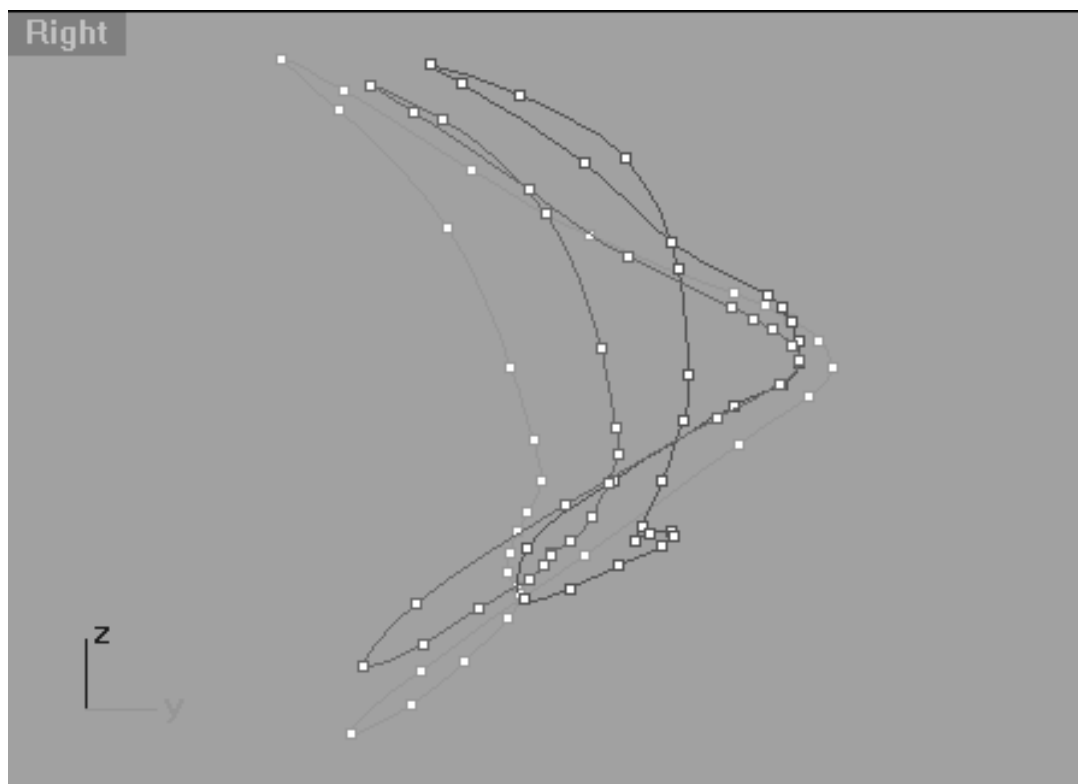


This **Top Viewport** screenshot shows the now fully completed and refined 3rd Eyelid Curve. The points on Eyelid Curves 1 and 2 have also been unlocked and displayed so that you can study their placement and relationships to each other.



This **Front Viewport** screenshot shows the now fully completed and refined 3rd Eyelid Curve. The points on Eyelid Curves 1 and 2 have also been unlocked and displayed so that you can study their placement and relationships to each other.





This **Right Viewport** screenshot shows the now fully completed and refined 3rd Eyelid Curve. The points on Eyelid Curves 1 and 2 have also been unlocked and displayed so that you can study their placement and relationships to each other.



**View an example movie**

**Editing the 3rd Eyelid Curve, Pt. 5** [Click Here](#)

# Shutting Down the Scene

- Confirm that no Osnaps are currently active, disable any that are.
- Display any currently hidden objects, type the command: Show at the command line and press Enter.
- Hide any edit points that are currently displayed.
- Unlock any currently locked objects -- type **UNLOCK** at the command line and press **Enter**.
- Open the Edit Layers Dialogue box and locate the layer entitled **SCENE START UP**. Make it the currently active layer by clicking in the "check" field -- a check mark should appear in the column, when it has press **APPLY**. Once done, the layer entitled **SCENE START UP** should now have become the active layer and should be **ON**.
- The Layer entitled: Photopoints should be **ON**.
- Turn off the layers entitled: **Eyelid Curves, Eyelid\_02, Eyelid\_guide\_03, Eyelid\_03** and **Eyelid\_Xsection** and press **APPLY**.
- All other layers should be **OFF** -- press **OK** to Exit.
- Perform a Zoom Extents All.
- **S A V E Y O U R W O R K..!**

---

[NEXT PAGE](#)

RETURN to the Top of page -- [Click Here](#)

Written by Joseph R. Saltzman.

Co-produced in association with Steven Ståhlberg  
©1998-1999 Cinemagic Productions Limited. All Rights Reserved.

Duplication of this document including images and text by any means is expressly forbidden without prior written consent of Cinemagic Productions Limited.

Web Site: <http://www.cmagic.co.uk> Telephone: +44 (0)1753 733 190 Fax: +44 (0)1753 736 619 email: [cmagic@cmagic.co.uk](mailto:cmagic@cmagic.co.uk)

qat240199

# MOVIE EDITING THE 3RD EYELID CURVE PART ONE

To **PLAY** the example movie, double click below:

To **RETURN** to the tutorial -- [click here](#).

# MOVIE EDITING THE 3RD EYELID CURVE PART TWO

To **PLAY** the example movie, double click below:

To **RETURN** to the tutorial -- [click here](#).

# MOVIE EDITING THE 3RD EYELID CURVE PART THREE

To **PLAY** the example movie, double click below:

To **RETURN** to the tutorial -- [click here](#).

# MOVIE EDITING THE 3RD EYELID CURVE PART FOUR

To **PLAY** the example movie, double click below:

To **RETURN** to the tutorial -- [click here](#).

# MOVIE EDITING THE 3RD EYELID CURVE PART FIVE

To **PLAY** the example movie, double click below:

To **RETURN** to the tutorial -- [click here](#).

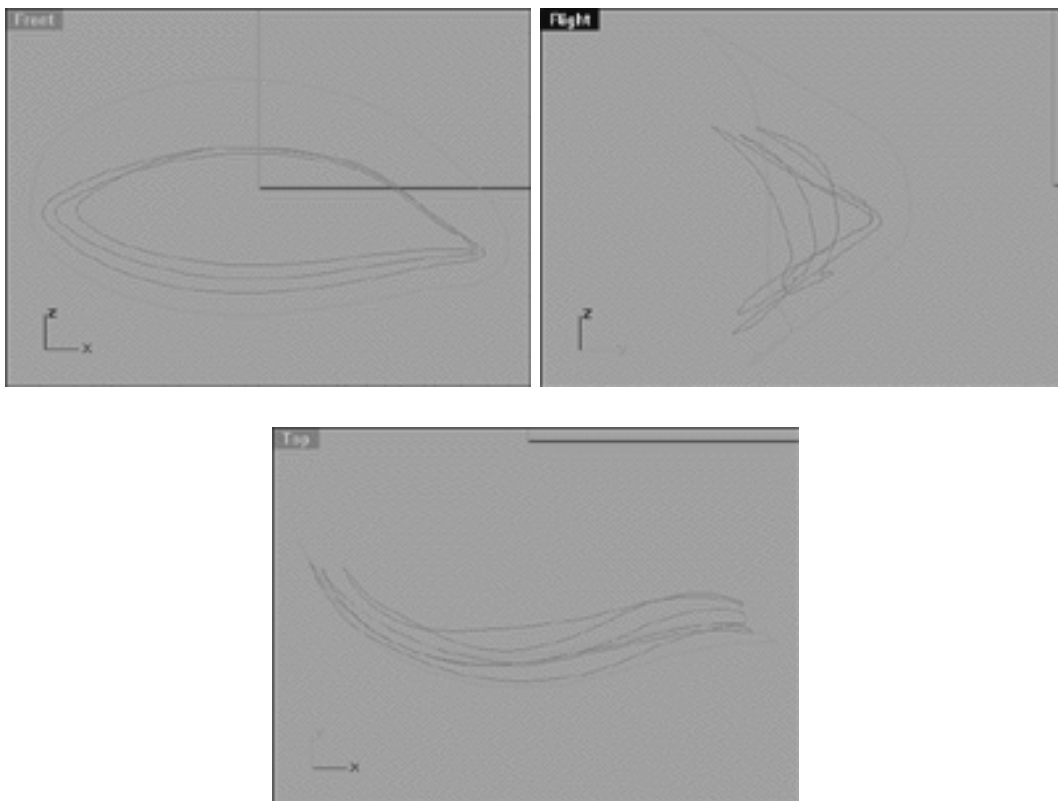


**RETURN** to previous page -- [Click Here](#)

**GOTO** the [NEXT LESSON](#)



## CREATING THE 4TH EYELID CURVE




---


## Contents:

- [Scene Setup](#)
- [Creating the 4th Eyelid Curve](#)
- [Editing the 4th Eyelid Curve, Lower Row, Right Side](#)
- [The Lower Left Side](#)
- [Slide Those Points, Left Side, Upper Row](#)
- [Refine the Corner, Left Side](#)
- [Example Movie -- Creating & Editing the 4th Eyelid Curve, Pt 1](#)

- [Refine the Corner, Right Side](#)
  - [Slide Those Points, Right Side, Upper Row](#)
  - [The Lower Row, Right Side](#)
  - [Example Movie -- Editing the 4th Eyelid Curve, Pt 2](#)
  - [Refine the Corner, Right Side](#)
  - [The Corner, Upper Row, Right Side](#)
  - [The Upper Row, Left Side](#)
  - [Example Movie -- Editing the 4th Eyelid Curve, Pt 3](#)
  - [Details, details...](#)
  - [Example Movie -- Editing the 4th Eyelid Curve, Pt 4](#)
  - [Snap It Up](#)
  - [Shutting Down the Scene](#)
- 


## Scene Setup

- If you've not done so already start a Rhinoceros session by **double clicking** on the desktop icon  the application will begin.
- Choose File, Open from the menu bar and double click on **START\_A.3DM** in the file list, it will load and open.
- Confirm at the Lower Status Bar the currently active layer is entitled SCENE START UP. If it is active proceed to the next step, if it's not then make it active by left clicking on the layer box, highlighting the correct layer and clicking on it.
- Again, at the Layers Box on the Lower Status Bar this time right click on the box, the Edit Layers Dialogue box will open. Confirm the following switches have been enabled or disabled:
  - The Layer entitled: Eyelid\_Curves should be ON.
  - The Layer entitled: Eyelid\_02 should be ON.
  - The Layer entitled: Eyelid\_03 should be ON.
  - The Layer entitled: Eyelid\_Xsection should be ON.
  - The Layer entitled: Photopoints should be OFF.
  - The Layer entitled: SCENE START UP should be ON.


- All other layers should be set to OFF.
- When you've finished making your changes ( if any ) click on OK.
- Confirm that the grid display in the viewports has been disabled, if not turn it off now.
- Confirm that no Osnaps are currently enabled, if any are disable them.
- Confirm that no edit points are currently displayed, if any are hide them.
- Zoom out all the viewports by selecting the Zoom Extents/Zoom Extents All Views icon  or by typing **ZoomExtentsAll** at the command line and pressing ENTER.

## Creating the 4th Eyelid Curve

Time to create the 4th Eyelid curve. Once again we will do this from a copy of 3rd Eyelid curve that we made in the previous lesson.

- If you've not done so already make sure the 1st and 2nd Eyelid curve objects are visible but LOCKED. If not, lock them by selecting the objects -- they will highlight and then typing: Lock at the command line and pressing Enter.
- The Cross section curve should also be visible, select it and display its edit points.
- Create a new layer entitled: Eyelid\_04, set the layer colour to green and make it active.
- Maximise the **Right Viewport** and select the 3rd Eyelid Curve by left clicking on it -- it will highlight.
- From the toolbar choose the Copy Icon  or type: Copy at the command line.
- The system will respond with the following prompt at the command line: **Point to copy from (Vertical InPlace):**
- Type IN at the command line and press ENTER to complete the operation. A duplicate of the curve has now been created.
- Activate Osnaps End / Point.



- From the toolbar choose the Move Icon  and snap your cursor to the end point of the highlighted curve. Once done, move the object along the Y and Z axis and snap to the 5th point of the cross section curve.





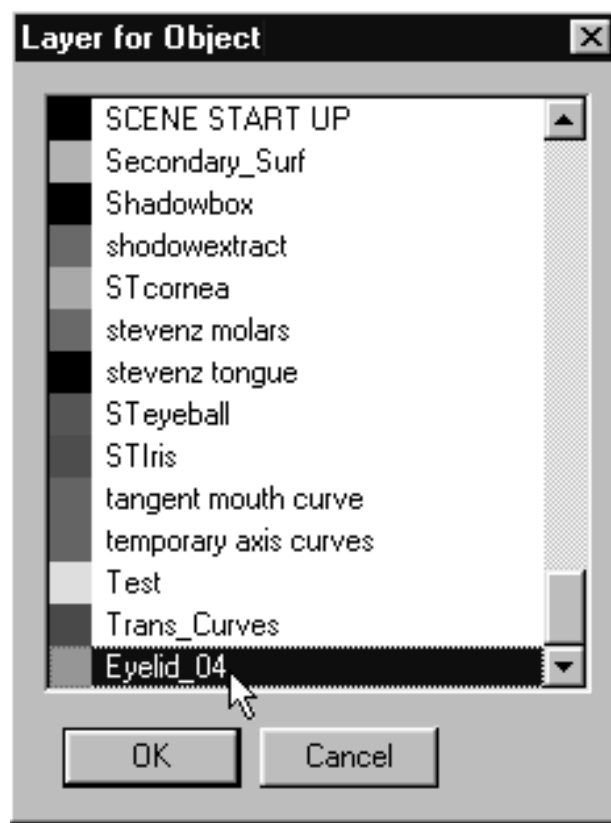
This **Right Viewport** screenshot shows the duplicate of the 3rd eyelid curve prior to being moved along the Y and Z axis.



This **Right Viewport** screenshot shows the duplicate of the 3rd eyelid curve after to being moved along the Y and Z axis and snapped to the 5th point on the cross section curve.

- Now be certain to assign the newly duplicated and moved curve to the currently active layer, in this case (Eyelid\_04). With the moved curve still selected, choose from the toolbar the Edit

Layers Icon  and then select the change layers icon  from the fly out, the Layer for Object dialogue will appear as in the screenshot below:



*This screenshot shows the Layer for Object dialogue box.*

- Locate the layer entitled: Eyelid\_04 in the list, highlight it and then either double click on it or press OK to complete the operation. Once done, the copied curve should turn green thus indicating it is now on the correct layer as in the screenshot below.



This **Right Viewport** screenshot shows the duplicated and moved curve has now been assigned to the correct layer (*Eyelid\_04*).

## Editing the 4th Eyelid Curve

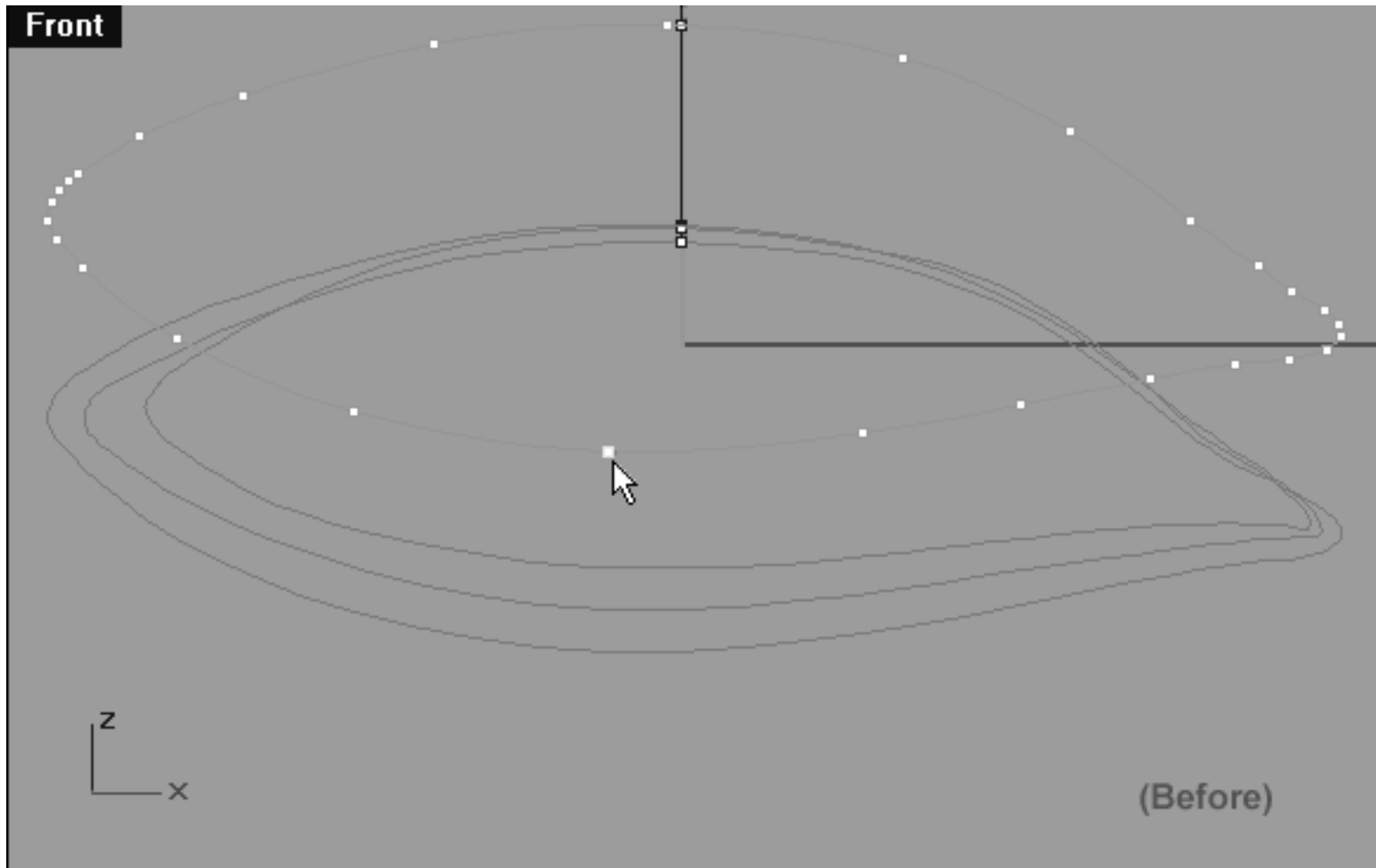
### Lower Row, Right Side

Now let's start moving some points...

- Minimise the **Right Viewport**.
- Disable any currently active Osnaps.
- In Any Viewport, select the 3rd Eyelid Curve by left clicking on it -- it will highlight. Once done, LOCK the object by typing LOCK at the command line. This will prevent it from being damaged.
- Temporarily turn off the edit points and hide the cross section curve.
- Select the 4th Eyelid curve and display its edit points.



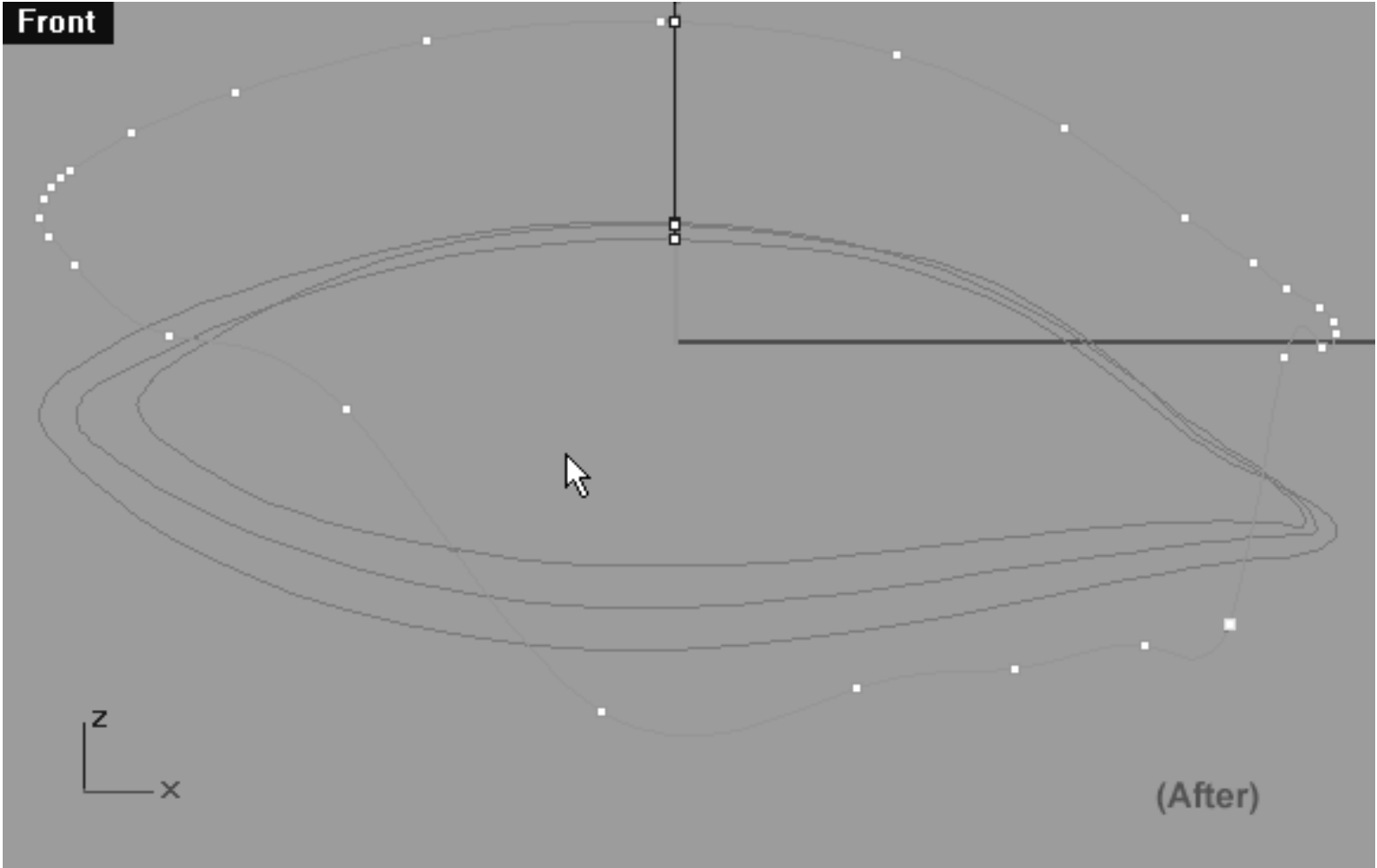
- Maximise the **Front Viewport** and select the point at the **6 o'clock** position on the lower row -- it will highlight.
- Now whilst holding down the Shift key move the point downward along the Z axis.
- Working in an anti-clockwise manner repeat this procedure with the following 4 lower row points. Your aim should again be to create a shape similar to the screenshot below entitled: (After).
- Refer to the helper table below for guidance.



*This **Front Viewport** screenshot shows the 4th Eyelid Curve (Eyelid\_04) prior to any editing taking place on the lower row. Notice that the point at roughly the 6 o'clock position has been selected and is now ready to be moved downward slightly along the Z axis.*

Helper Table:

Point	Approximate Units Moved
6 o'clock	Z: 5.795
Next point anti-clockwise	Z: 5.760
Next point anti-clockwise	Z: 5.825
Next point anti-clockwise	Z: 5.830
Next point anti-clockwise	Z: 5.841



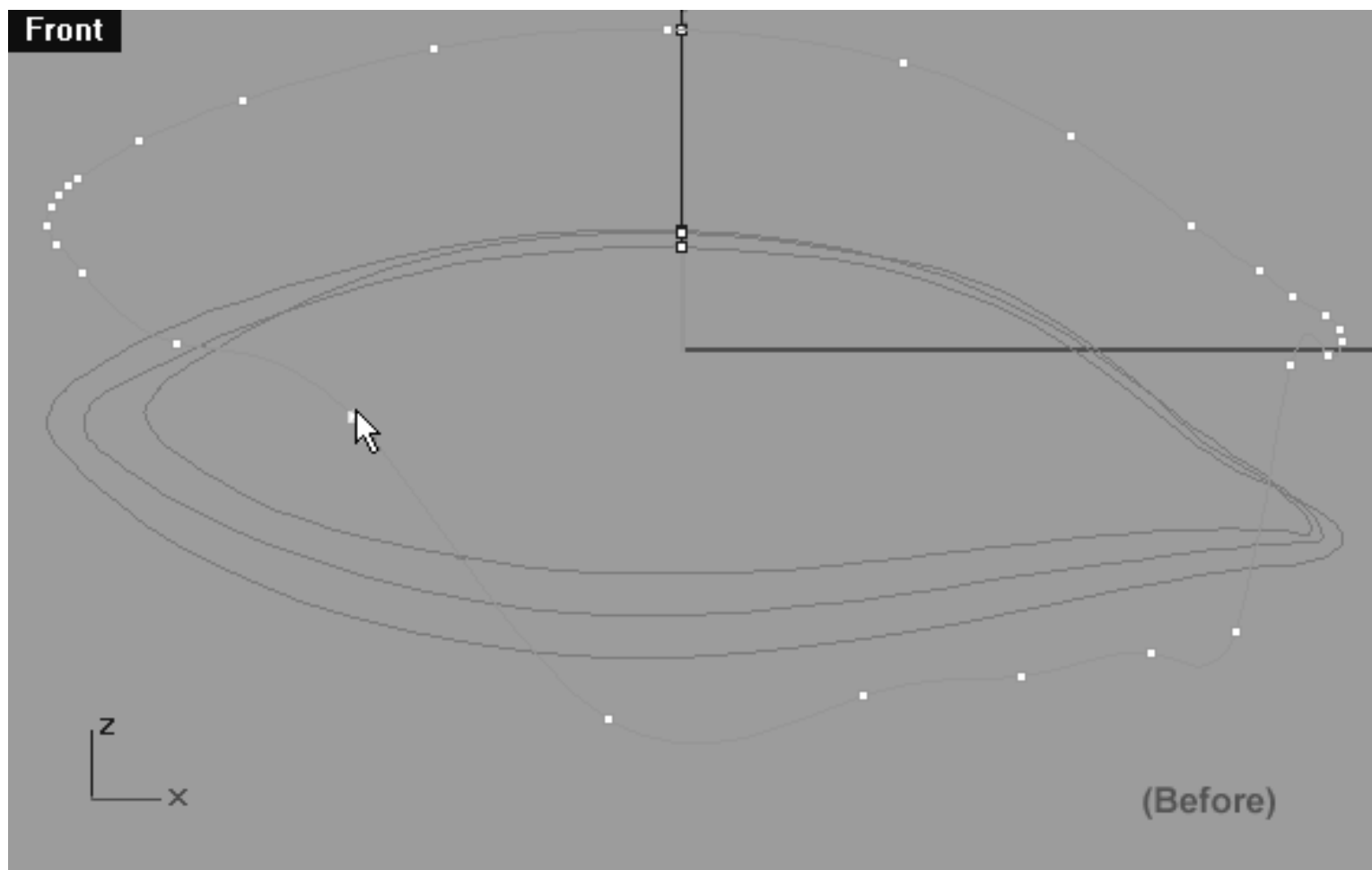
This **Front Viewport** screenshot shows the 4th Eyelid Curve (Eyelid\_04) after editing has taken place on the lower row. Notice that a total of 5 points have now been moved on the lower row.

## The Lower Left Side

Now let's start moving some points on the opposite side...

- Still working in the **Front Viewport**, this time select the point at the **7 o'clock** position on the lower row, left side -- it will highlight.
- Now whilst holding down the Shift key move the point downward along the Z axis first and then along the X axis as required.

- Working in a clockwise manner repeat this procedure with the following 3 lower row points. Your aim should again be to create a gentle arcing shape -- see the screenshots below.
- Refer to the helper table for guidance.

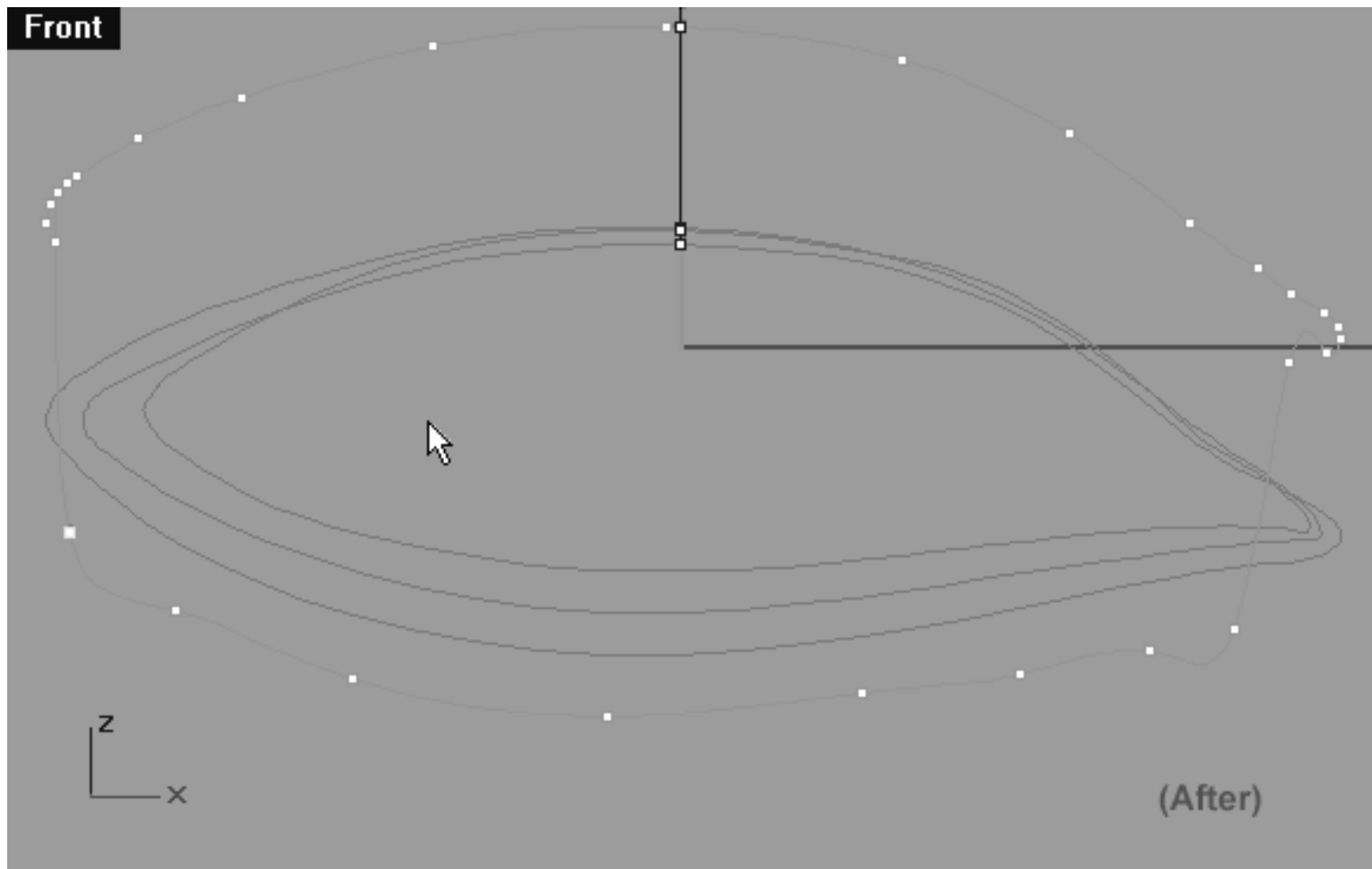


This **Front Viewport** screenshot shows the 4th Eyelid Curve (Eyelid\_04) prior to any editing taking place on the lower row, left side. Notice that the point at roughly the 7 o'clock position has been selected and is now ready to be moved downward along the Z and X axis.

### Helper Table:

Point	Approximate Units Moved
7 o'clock	Z: 5.828
Next point clockwise	Z: 5.793, X: 0.081 (left)
Next point clockwise	Z: 5.718, X: 0.261 (left)

**\*Important Note:** When a measurement is given in a helper table for more than one axis, the measurement was arrived at by holding down the SHIFT key and FIRST moving the point along the Z axis and then taking note of the value listed in the info box at the lower status bar. Now that the point has been moved along the first axis the procedure was repeated, again by holding down the SHIFT key and then moving the point along the X axis and then taking note of the value listed in the info box for the particular axis at the lower status bar. In any event, the values listed in the helper tables are only estimates and your results may vary.



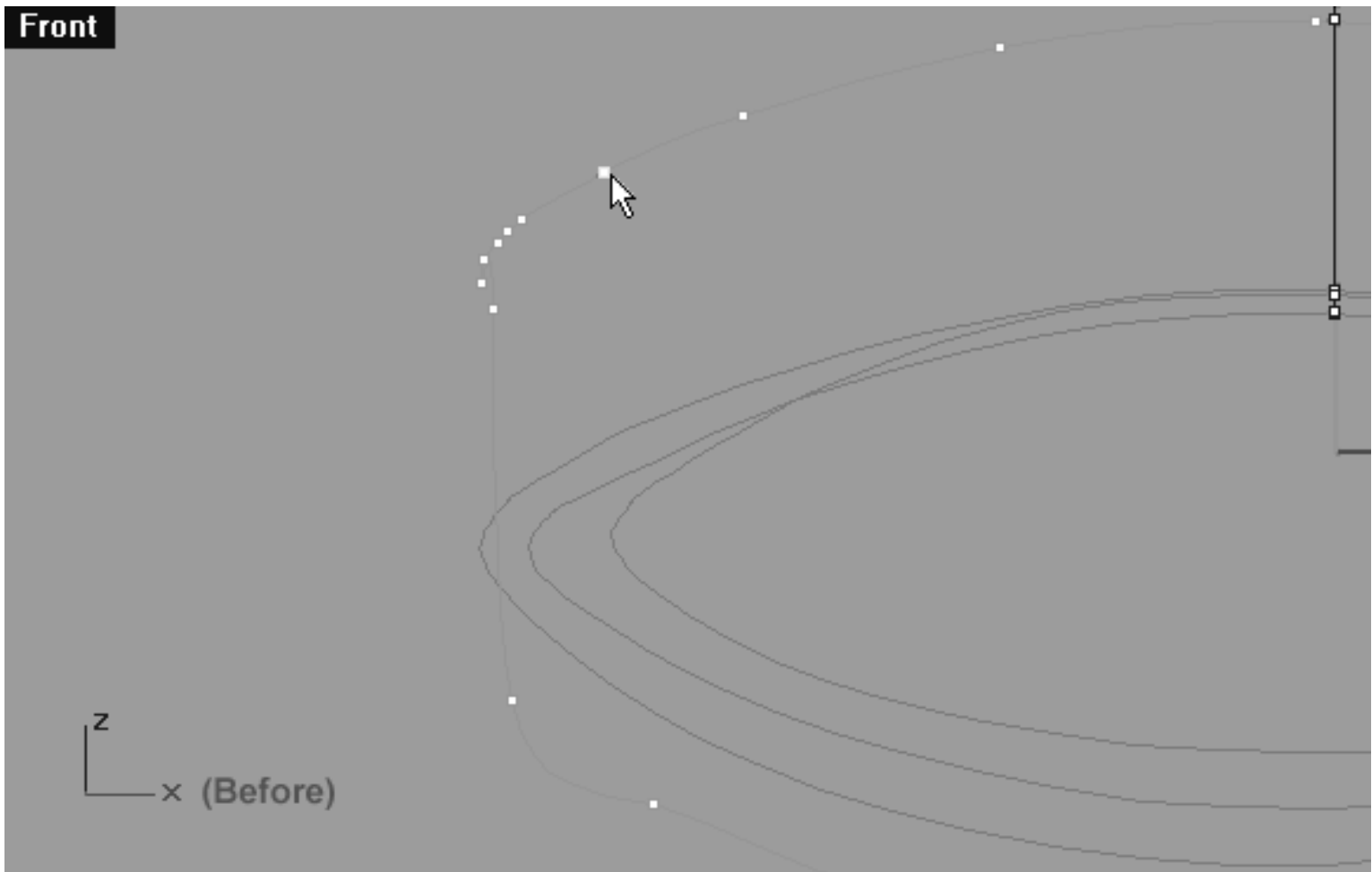
This **Front Viewport** screenshot shows the 4th Eyelid Curve (Eyelid\_04) after editing has taken place on the lower row, left side. Notice that a total of 3 points were moved this time round.

## Slide those points Left Side, Upper Row

Now let's sort out the points on the upper row...

- In the **Front Viewport** start with the point at the **12 o'clock** position on the upper row and count over 3 points in an anti-clockwise direction and select the point -- it will highlight (see the screenshot below entitled: (Before)).
- Now whilst holding down the Shift key move the point downward just a bit along the Z axis and then along the X as required.
- Once done, your monitor should resemble the screenshot below entitled: (After).
- Refer to the helper table for guidance.

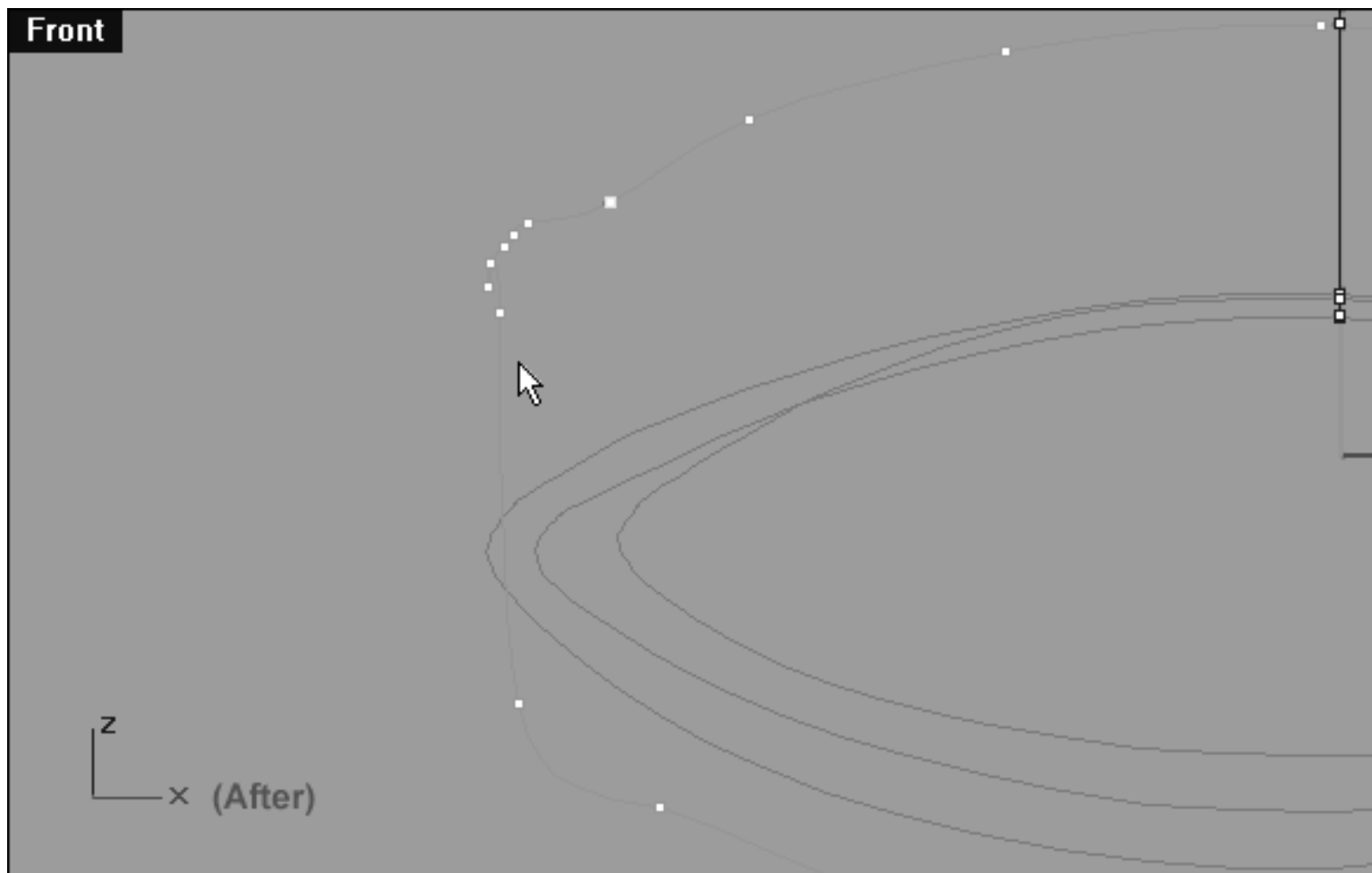
Front



This **Front Viewport** screenshot shows the 4th Eyelid Curve (Eyelid\_04) prior to any editing taking place on the upper row. Notice that the 3rd point from the 12 o'clock position has been selected and is now ready to be moved downward slightly along the Z and X axis.

### Helper Table:

Point	Approximate Units Moved
3 o'clock	Z: 0.497, X: 0.124 (left)

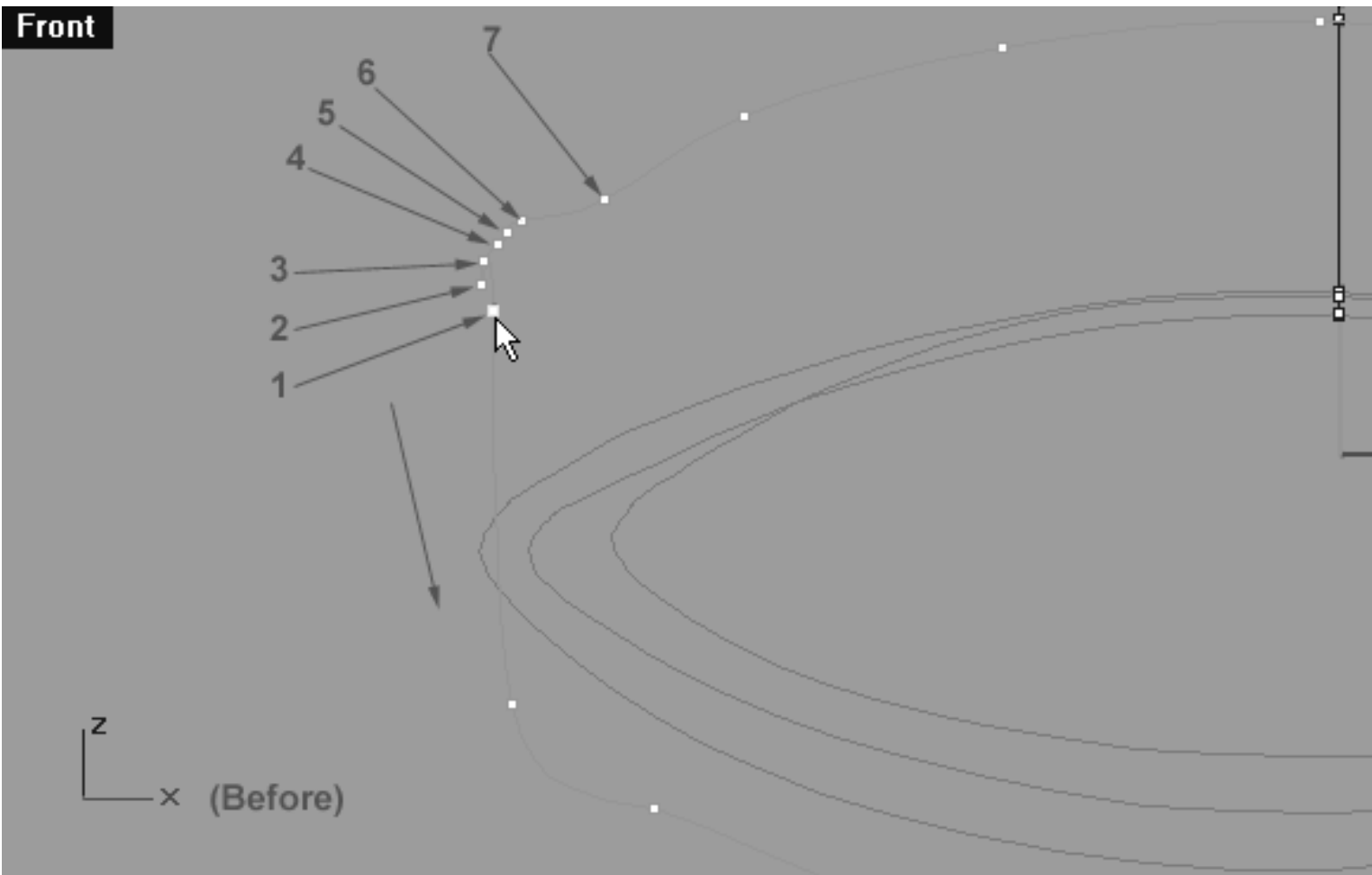


This **Front Viewport** screenshot shows the 4th Eyelid Curve (Eyelid\_04) after editing has taken place on the upper row. Notice that only 1 point have been moved along the upper row this time.

## Refine the Corner -- Left Side

As you can clearly see in the screenshot above, the points in the corner really require refinement now...

- In the **Front Viewport** start by selecting the point labelled number (1.) as shown in the screenshot below (Before).
- Now move the point downward along the Z axis and outward along the X slightly until it's approximately at the location shown the screenshot below (After).
- Continue this procedure in the corner area working on an incremental basis (example: select point 2, move point 2, select point 3, move point 3, etc.) You should be heading in a clockwise direction whilst selecting the points yet sliding them in a anti-clockwise direction in order to refine them.
- Once done, the placement of the left side corner points should be as seen in the screenshot below (After).

**Front**

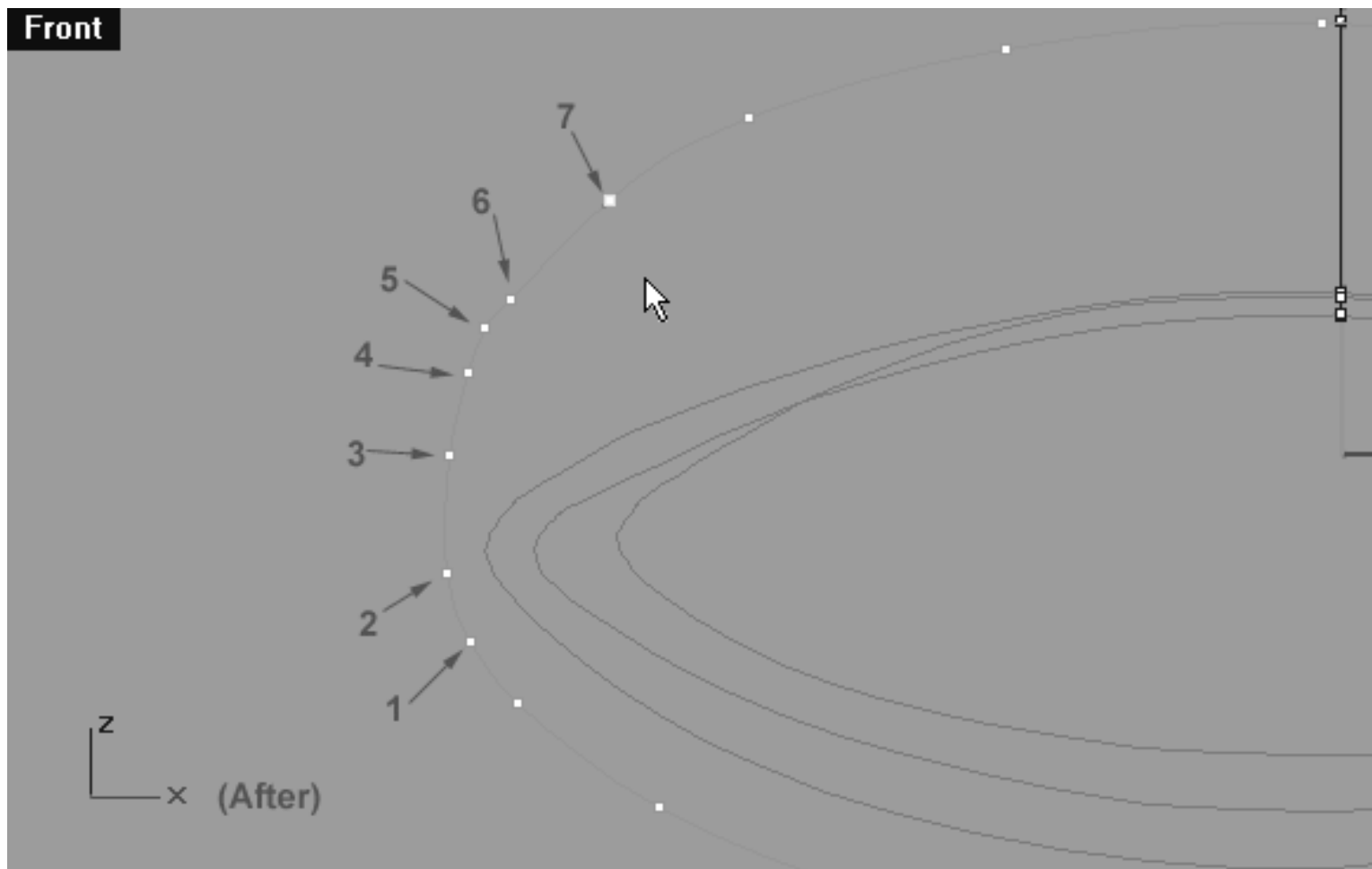
This **Front Viewport** screenshot shows the left side corner area that is in need of refinement. Start by sliding point 1 downward and outward.

**Helper Table:**

Point	Approximate Units Moved
Labelled as No 1	Z: 5.370, X: 0.491 (left)
Labelled as No 2	Z: 4.718, X: 0.783 (left)
Labelled as No 3	Z: 3.083, X: 0.718 (left)
Labelled as No 4	Z: 2.047, X: 0.572 (left)
Labelled as No 5	Z: 1.536, X: 0.476 (left)
Labelled as No 6	Z: 1.209, X: 0.385 (left)
Labelled as No 7	Nil



Front



This **Front Viewport** screenshot shows the left side corner area after refinement has taken place. Your main aim should be to get the points spaced in a more even and logical manner.



**View an example movie**

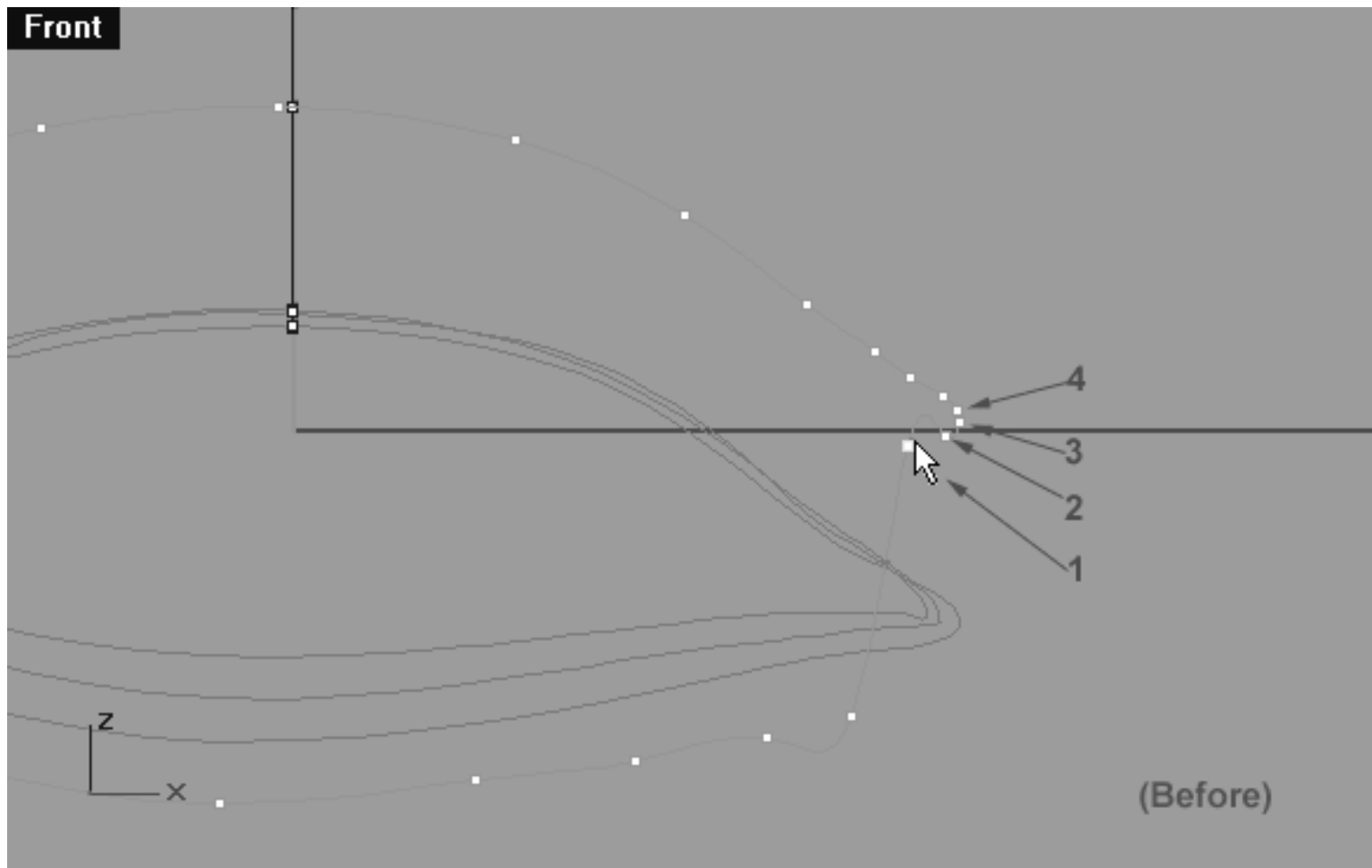
**Creating and editing the 4th Eyelid Curve, Part 1** [Click Here](#)

## Refine the Corner -- Right Side

Once again we will now have to sort out the point placement and shape of the curve in the corner, this time on the right side.

- In the **Front Viewport** start by selecting the point labelled number (1.) as shown in the screenshot below (Before).
- Move the point downward along the Z axis while at the same time moving outward along the X at an angle. It's really quite obvious where this point needs to be moved to and you shouldn't have any problem doing so -- just check out the screenshot below (After) to see just where it should be placed.

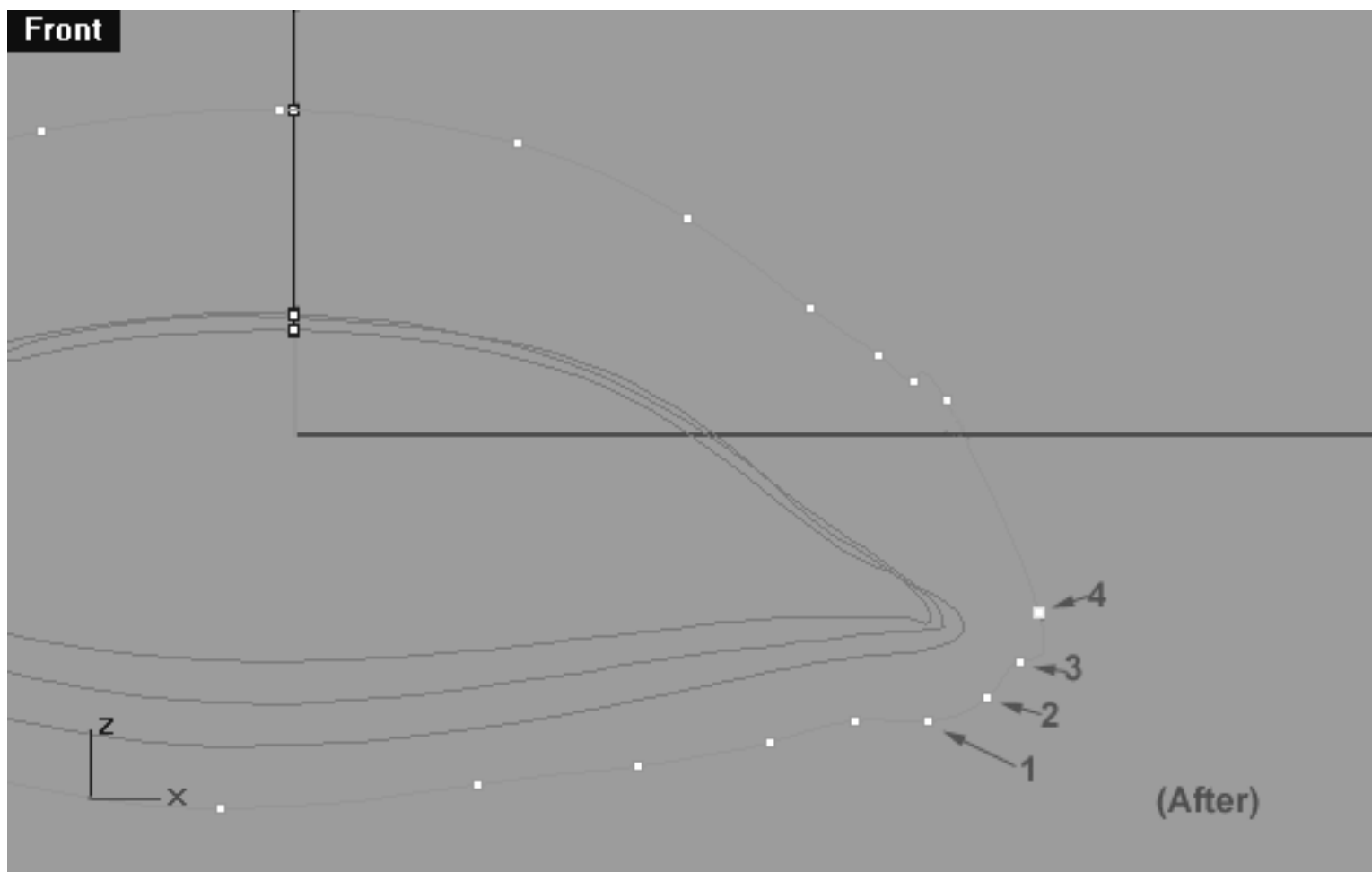
- Once done, continue working in a anti-clockwise direction sliding each point along the curve reshaping the corner as you go along. When completed, your monitor should resemble the screenshot below (After).



This **Front Viewport** screenshot shows the right side, corner area that is in need of refinement. Start by sliding the point labelled (1.) downward along the Z axis and outward along the X at an angle.

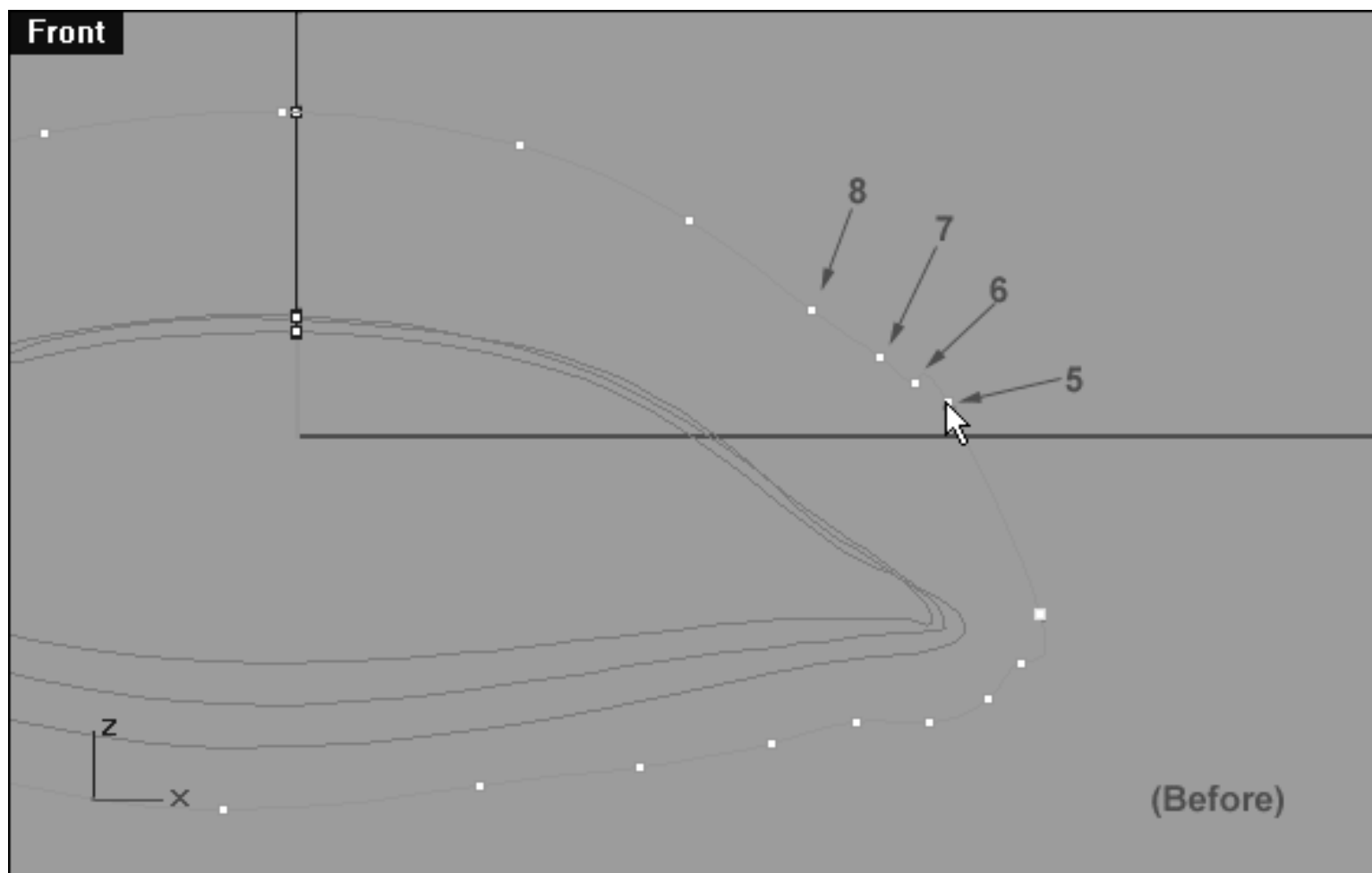
### Helper Table:

Point	Approximate Units Moved
Labelled as No 1	Z: 5.843, X: 0.328 (right)
Labelled as No 2	Z: 5.512, X: 0.732 (right)
Labelled as No 3	Z: 5.156, X: 1.233 (right)
Labelled as No 4	Z: 4.291, X: 1.623 (right)



This **Front Viewport** screenshot shows the right side, corner area after refinement. Notice that a total of 4 points have been moved during this step.

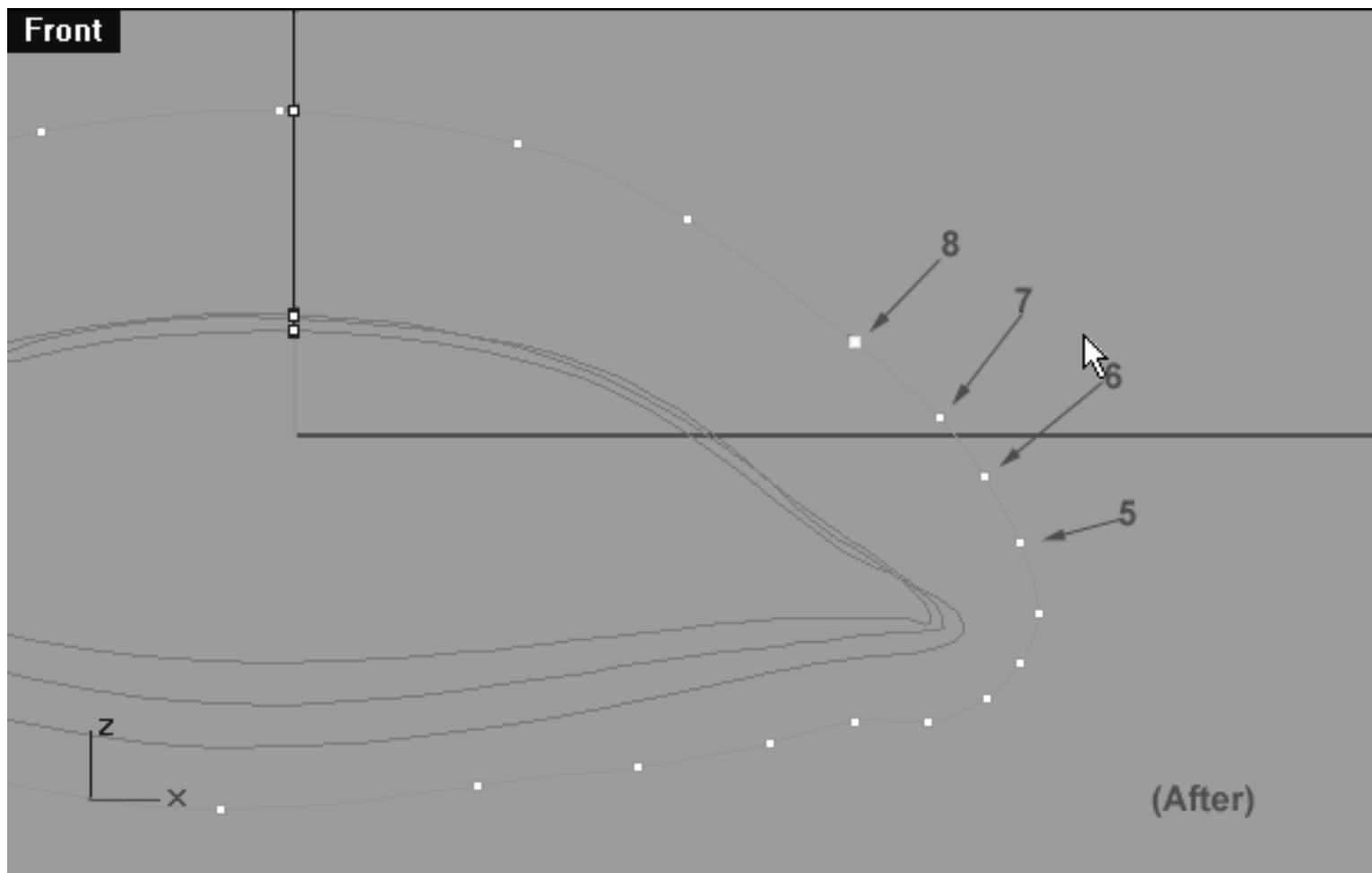
- In the **Front Viewport** start by selecting the point labelled number (5.) as shown in the screenshot below (Before).
- Move the point downward along the Z axis while at the same time moving outward along the X at an angle.
- Once done, continue working incrementally in an anti-clockwise direction sliding the next 3 points along the curve and reshaping the corner as you go along. When completed, your monitor should resemble the screenshot below (After).



This *Front Viewport* screenshot shows the points labelled 5 - 8 prior to refinement.

### Helper Table:

Point	Approximate Units Moved
Labelled as No 5	Z: 3.228, X: 1.736 (right)
Labelled as No 6	Z: 2.000, X: 1.525 (right)
Labelled as No 7	Z: 1.378, X: 1.257 (right)
Labelled as No 8	Z: 0.725, X: 0.944 (right)

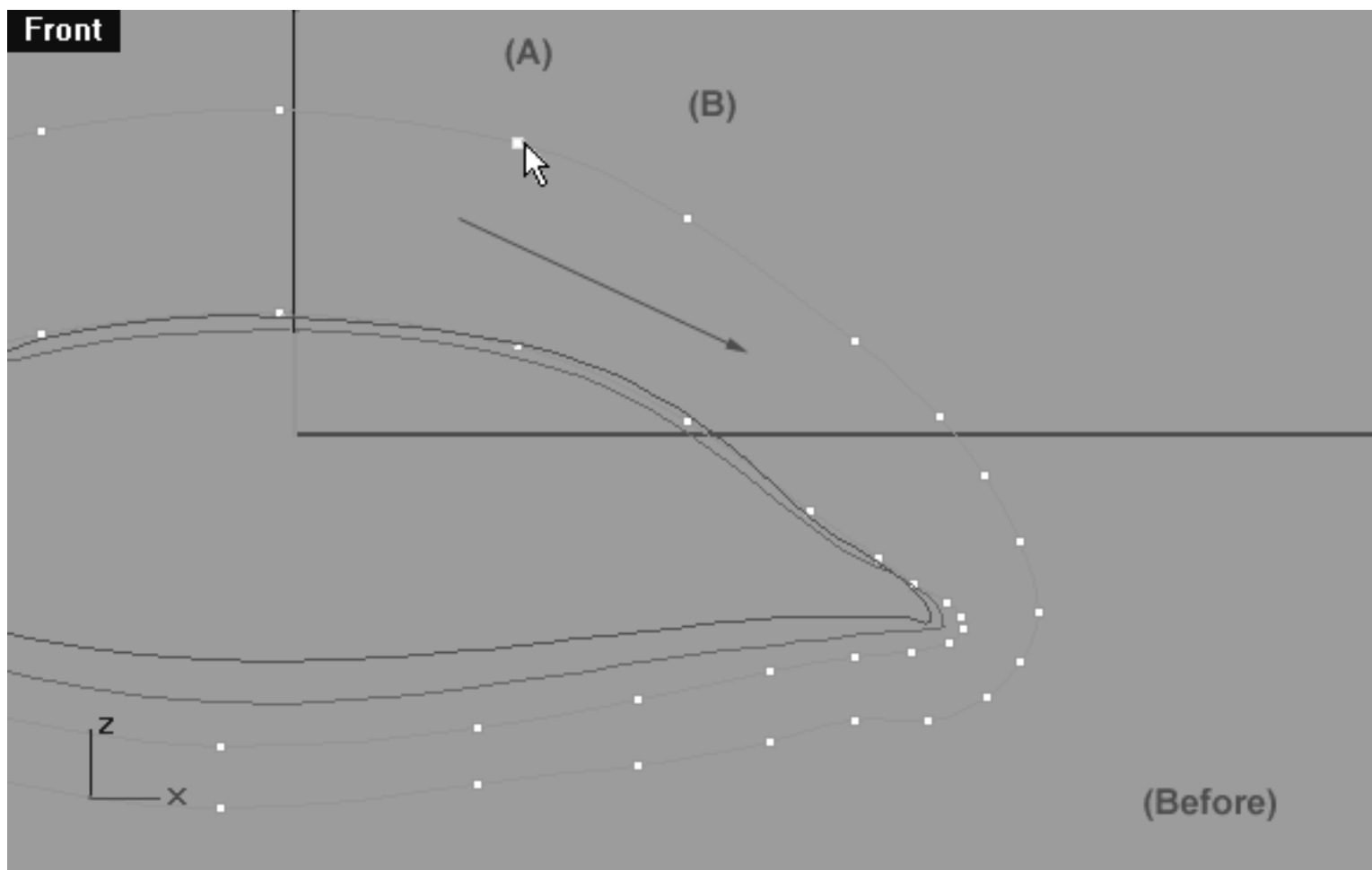


This **Front Viewport** screenshot shows points labelled 5 - 8 after refinement.

## Slide those points Right Side, Upper Row

Now it's time refine the point placement of the right side, upper row by sliding only two points ever so slightly.

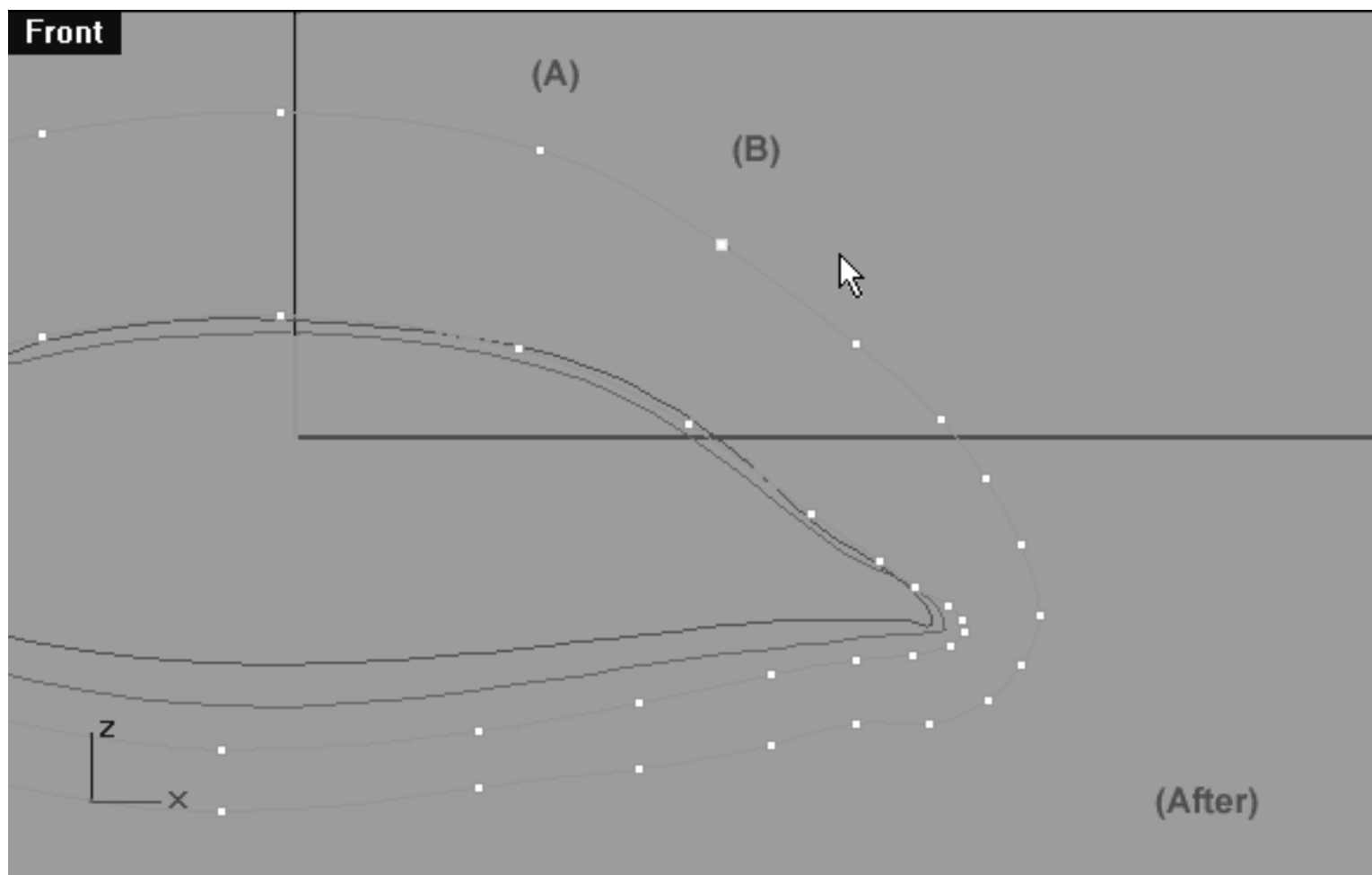
- Unlock the ghosted curves by typing: Unlock at the command line. Once done, select the 3rd curve and display its edit points (this will be very helpful in determining the most advantageous point placement on the 4th curve).
- Next, In the **Front Viewport** select the point at the **1 o'clock** position on the upper row, right side (A) -- it will highlight (see the screenshot below entitled: Before).
- Now slide the point along the X axis ever so slightly -- see the screenshot below (After).
- Working clockwise, repeat this procedure with the next point (B) only. Once done, your monitor should resemble the screenshot below (After).



This **Front Viewport** screenshot shows the right side, upper row area that is in need of refinement. Start by sliding the point at the 1 o'clock position (A) along the X axis. **\*Note** -- only fine adjustment is required, so take it easy..!

### Helper Table:

Point	Approximate Units Moved
Labelled A	Z: 0.220, X: 0.340 (right)
Labelled B	Z: 0.391, X: 0.774 (right)

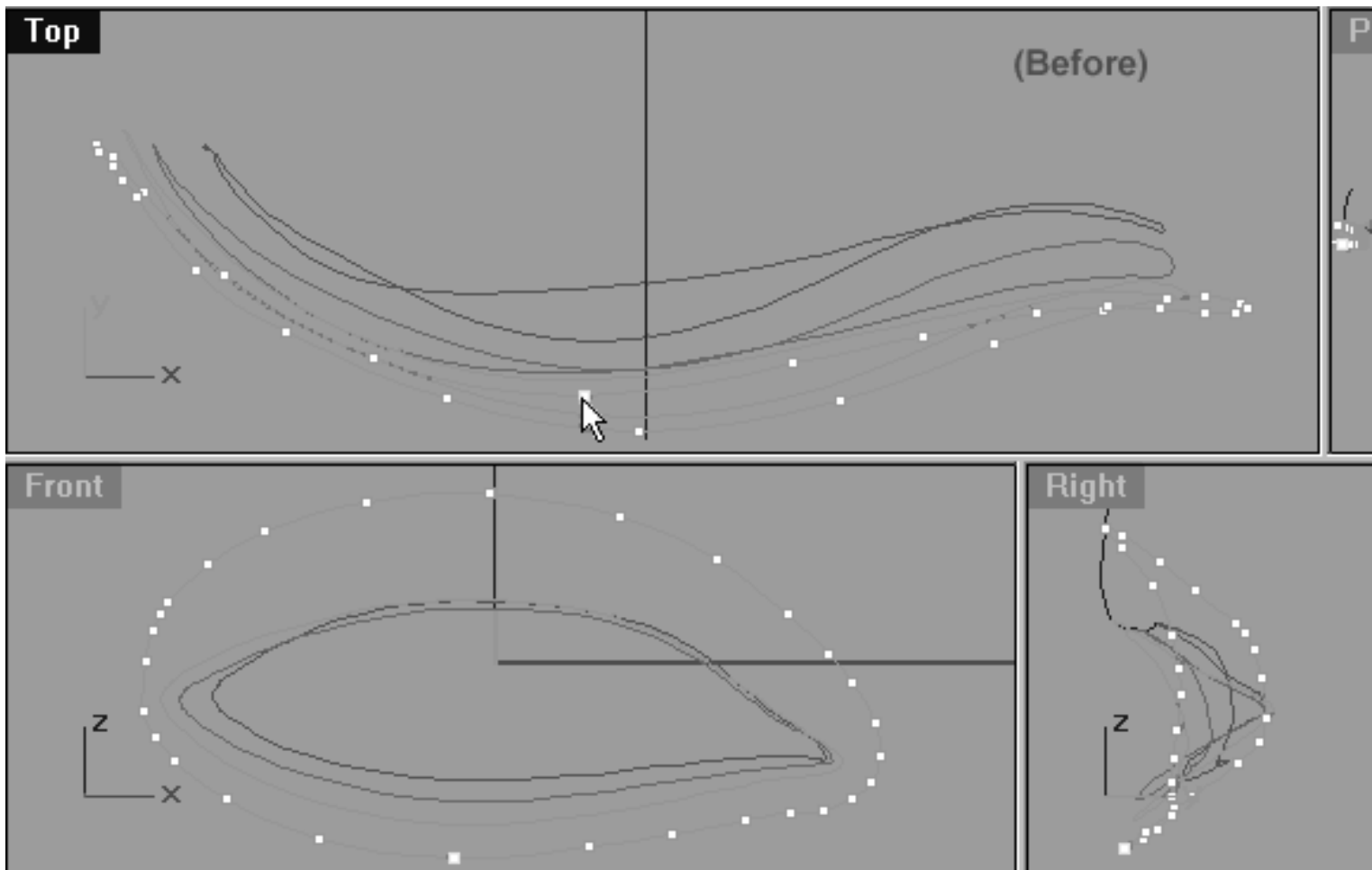


This **Front Viewport** screenshot shows the right side, upper row area after refinement has taken place. Notice that we haven't moved the two points very far -- but just enough to make a difference..!

## The Lower Row, Right Side

- Temporarily turn off any edit points that may currently be displayed.
- Select and then LOCK eyelid curves 1,2 and 3.
- Select the 4th eyelid curve and once again display its edit points.
- Rearrange the viewports in order to see the Top, Front and Right views as in the following screenshots.
- In the Front Viewport select the point at the 6 o'clock position on the lower curve -- see the screenshot below entitled: (Before). Once done, move your cursor into the Top Viewport and while holding down the Shift Key move it upward along the Y axis.
- Continue working in an anti-clockwise direction and repeat this procedure with the next 4 lower row points until you've created a shape similar to that of the screenshot below entitled: (After).

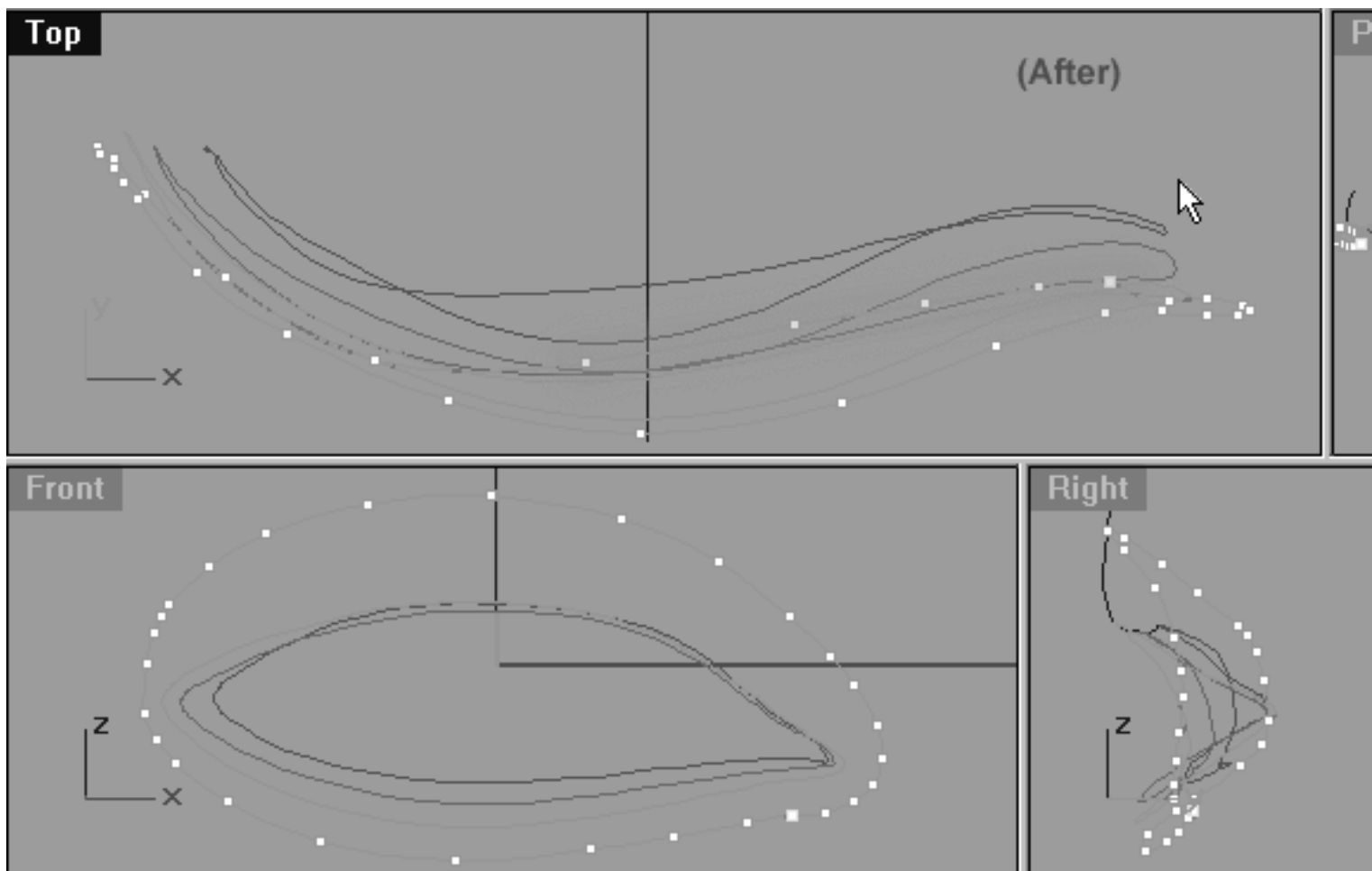




*This **All Viewport** screenshot shows the lower row, right side of the curve prior to any editing taking place. Notice, that the point at the 6 o'clock position has been selected and is ready to be moved.*

### Helper Table:

Point	Approximate Units Moved
6 o'clock	X: 0.989
Next point anti-clockwise	X: 0.934
Next point anti-clockwise	X: 0.877
Next point anti-clockwise	X: 0.822
Next point anti-clockwise	X: 0.616



This **All Viewport** screenshot shows the lower row, right side of the curve after editing has taken place. Notice, that starting at the 6 o'clock position and working anti-clockwise the next 4 lower row points have been moved upward along the Y axis (as seen from the top view) and (highlighted in green). Observe the shape that this action has produced and its relationship to that of the other curves.



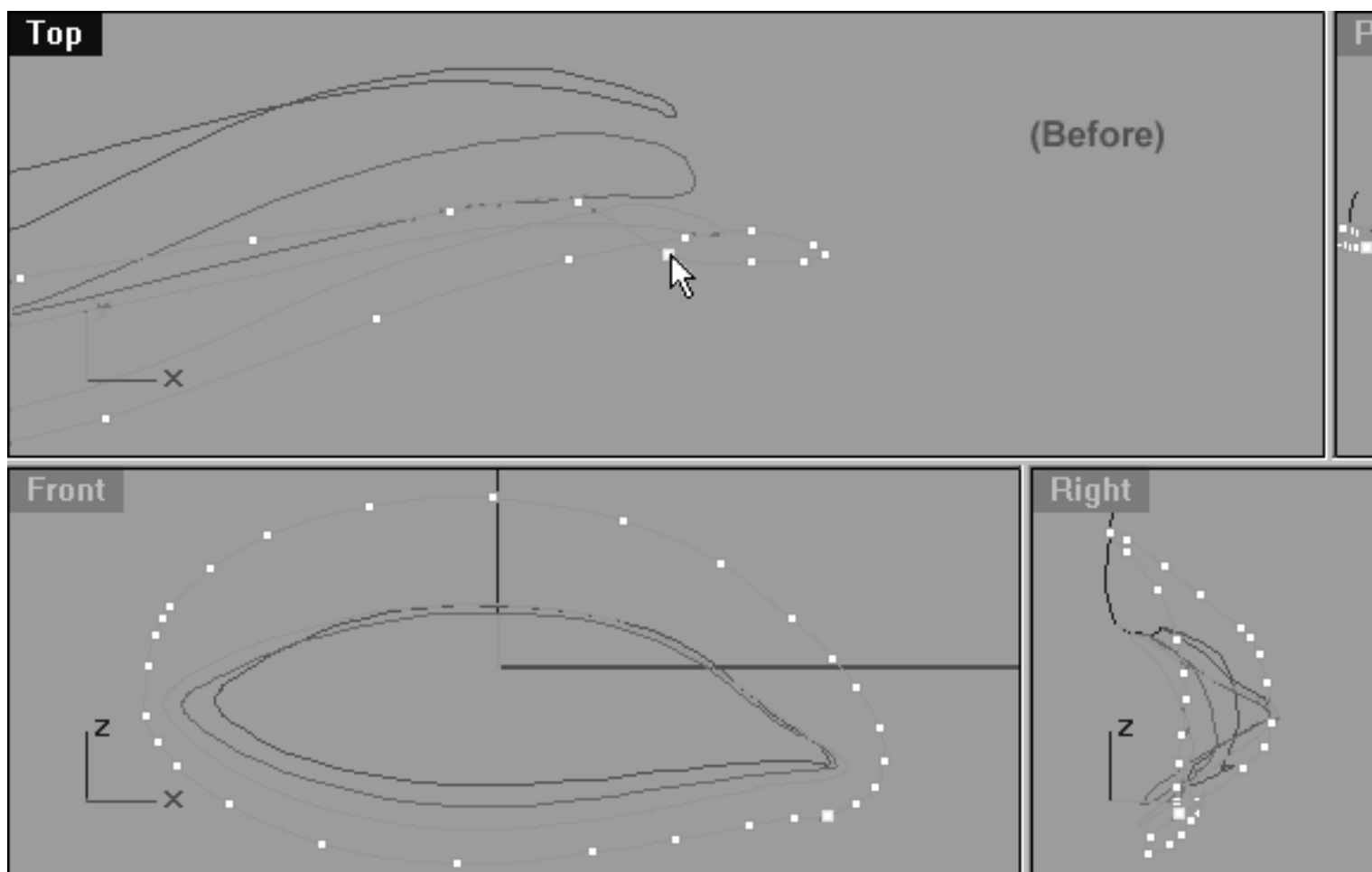
**View an example movie**

**Editing the 4th Eyelid Curve, Pt. 2** [Click Here](#)

## Refine the Corner -- Right Side

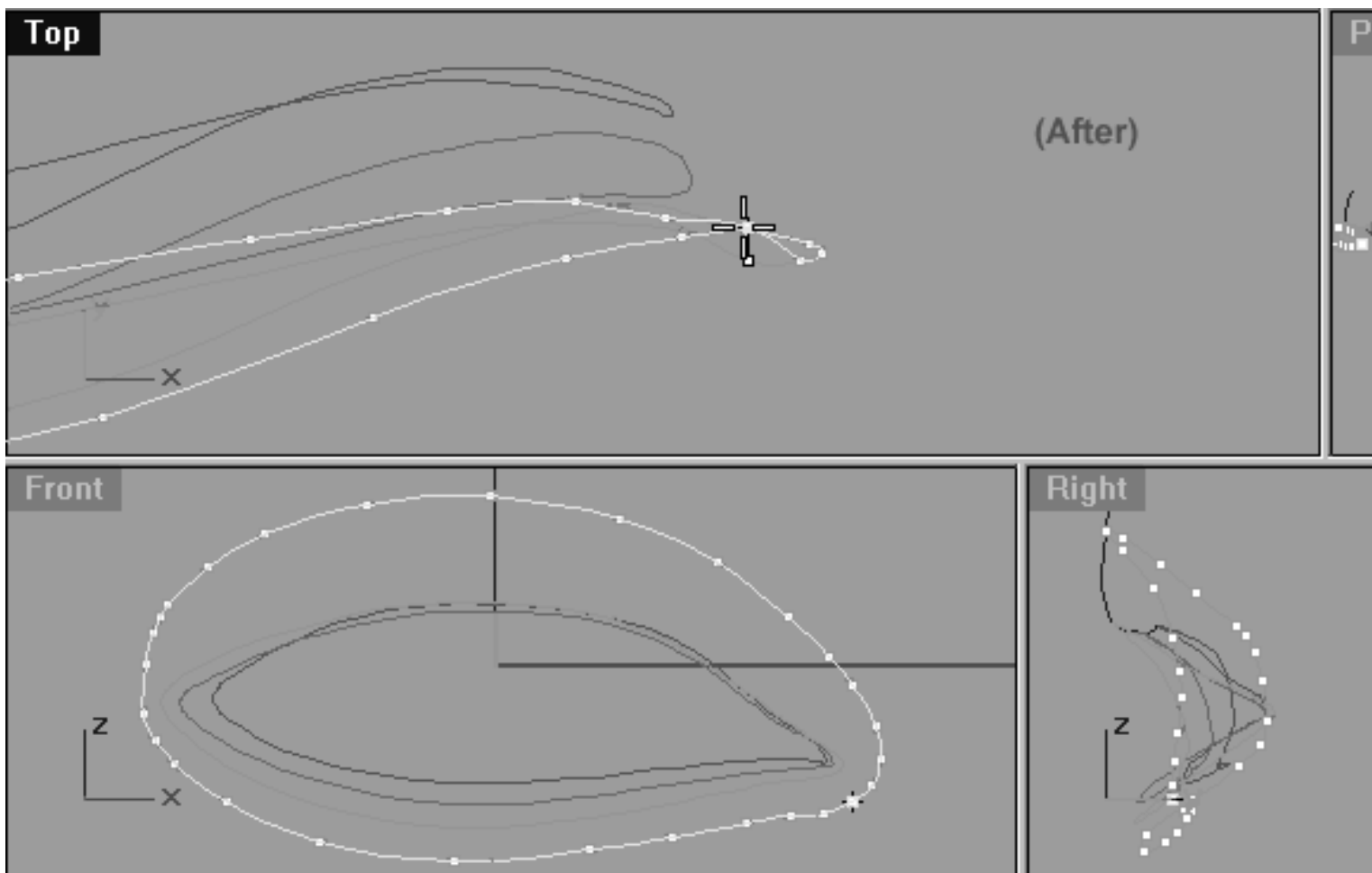
- If you've not already done so, rearrange your viewports so that you can clearly see the TOP, FRONT and RIGHT Viewports -- see the screenshot below entitled: (Before).
- In the **Front Viewport**, start at point located at the 6 o'clock position on the lower curve and working in an anti-clockwise manner count over to the 5th point and select it. Once done, move your cursor into the **Top Viewport** and whilst holding down the Shift Key move the point upward along the Y axis.

- Next, still working anti-clockwise select the next point and repeat the procedure. Once done, your monitor should resemble the screenshot below entitled: (After).



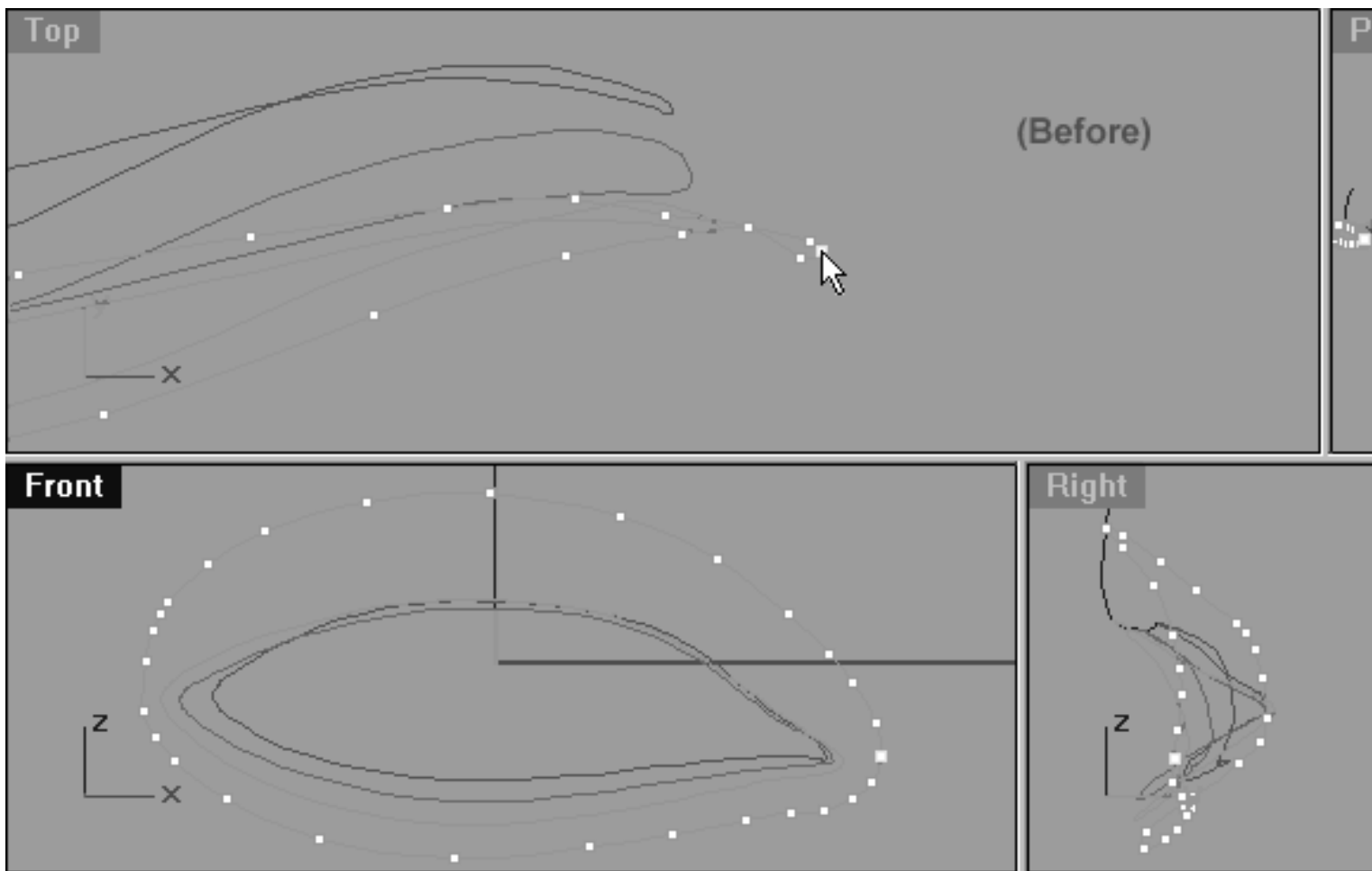
The above **All Viewport** screenshot shows the corner, right side of the curve prior to any editing taking place. Notice, that the 5th point anti-clockwise from the 6 o'clock position has been selected and is ready to be moved.

Point	Approximate Units Moved
5th point anti-clockwise from 6 o'clock	Y: 0.516
Next point anti-clockwise	Y: 0.348



This **All Viewport** screenshot shows the two points have now been moved upward along the Y axis in the **Top Viewport**.

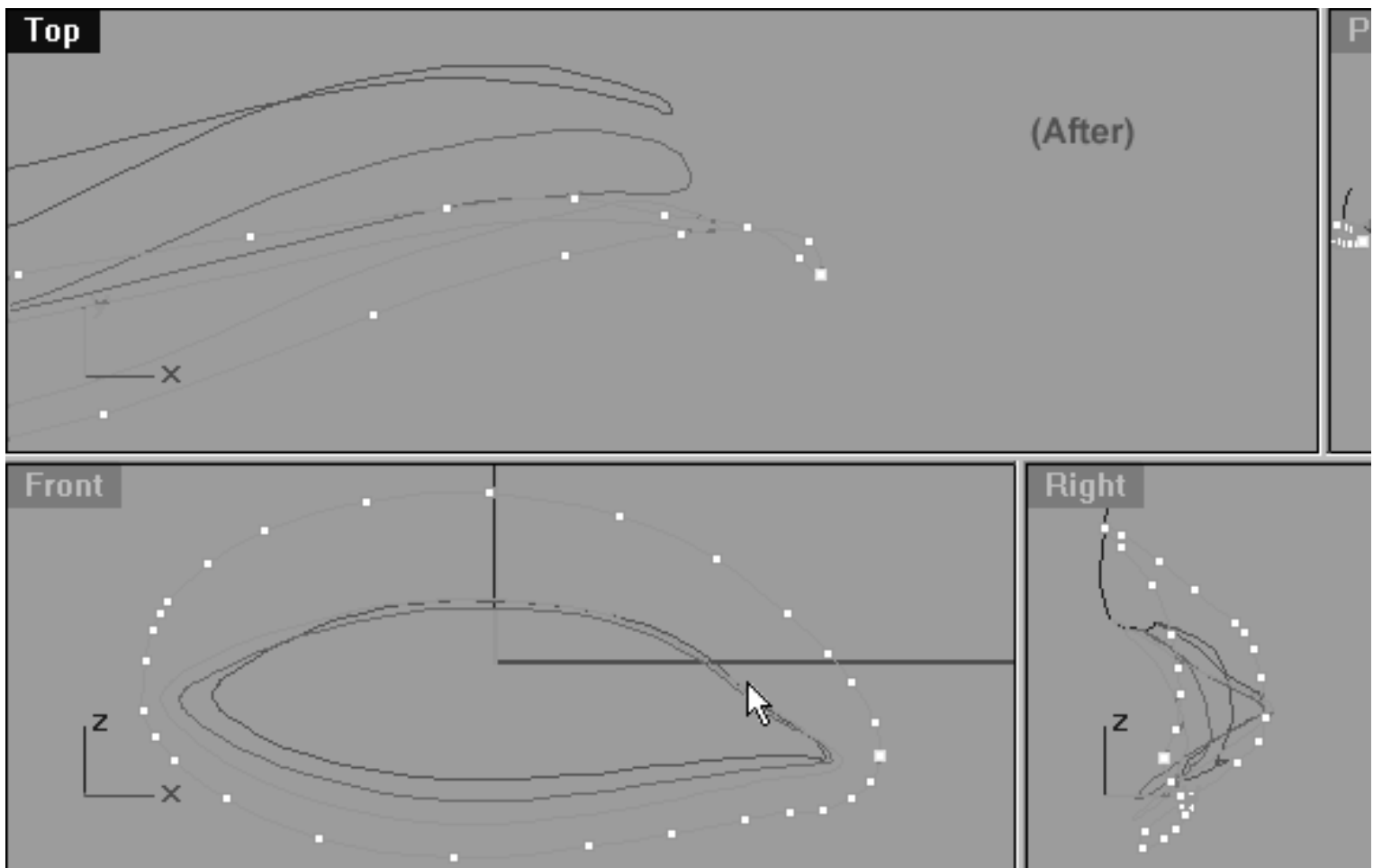
- In the **Front Viewport**, continue by selecting the corner most point . Once done, move your cursor into the **Top Viewport** and whilst holding down the Shift Key move the point downward along the Y axis -- see the screenshots below.



This **All Viewport** screenshot shows the corner most point prior to being moved downward along the Y axis in the **Top Viewport**.

## Helper Table

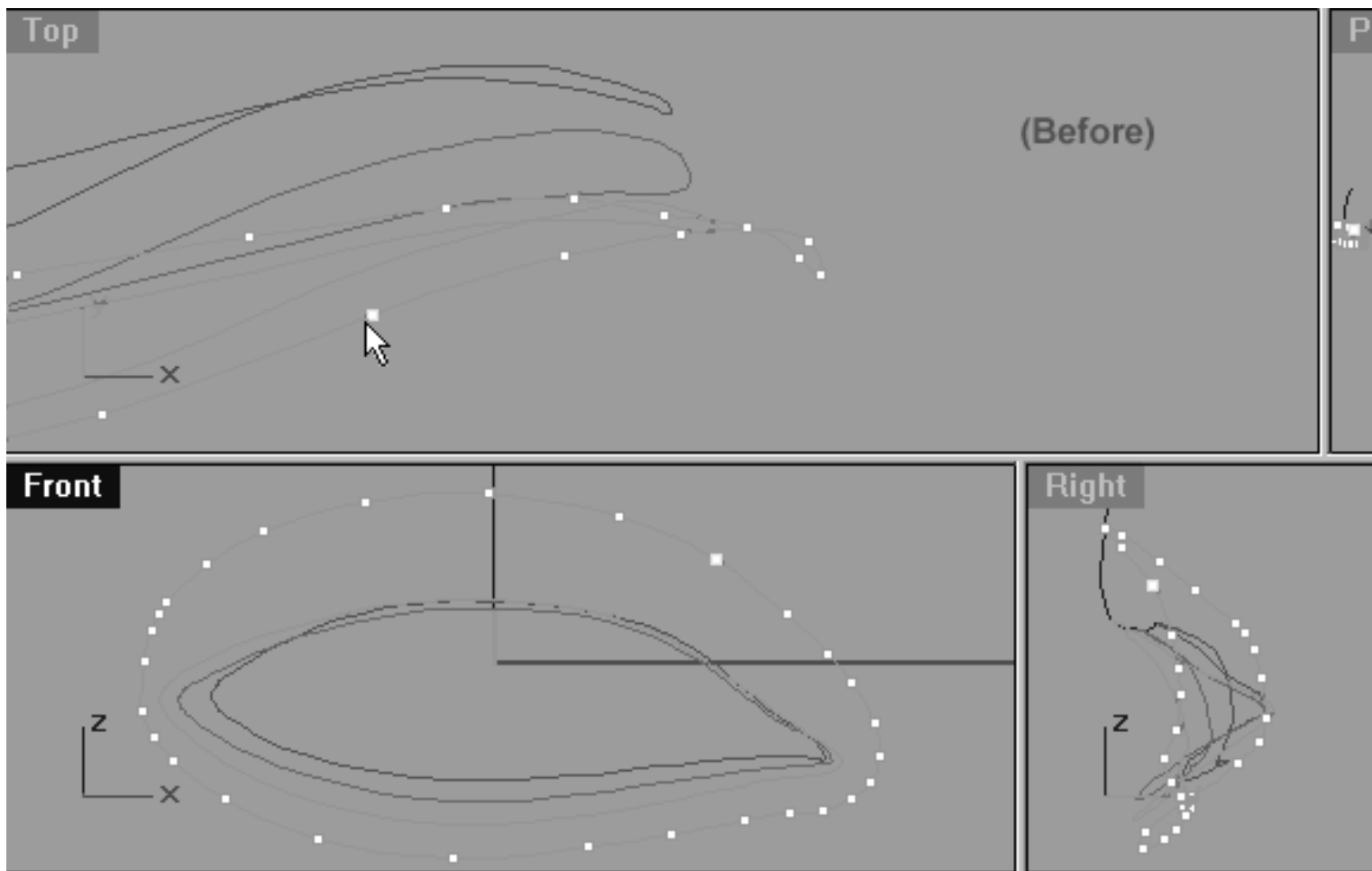
Point	Approximate Units Moved
Corner Point	Y: 0.322 (down)



This **All Viewport** screenshot shows the corner most point has now been moved downward along the Y axis in the **Top Viewport**.

## The Corner Upper Row, Right Side

- In the **Front Viewport**, working clockwise, continue by selecting the 2nd point from the 12 o'clock position. Once done, move your cursor into the **Top Viewport** and whilst holding down the Shift Key move the point downward along the Y axis.
- Next, continue working clockwise and repeat the procedure, this time until you reach the corner most point. Once done, your monitor should resemble the screenshot below entitled: (After).

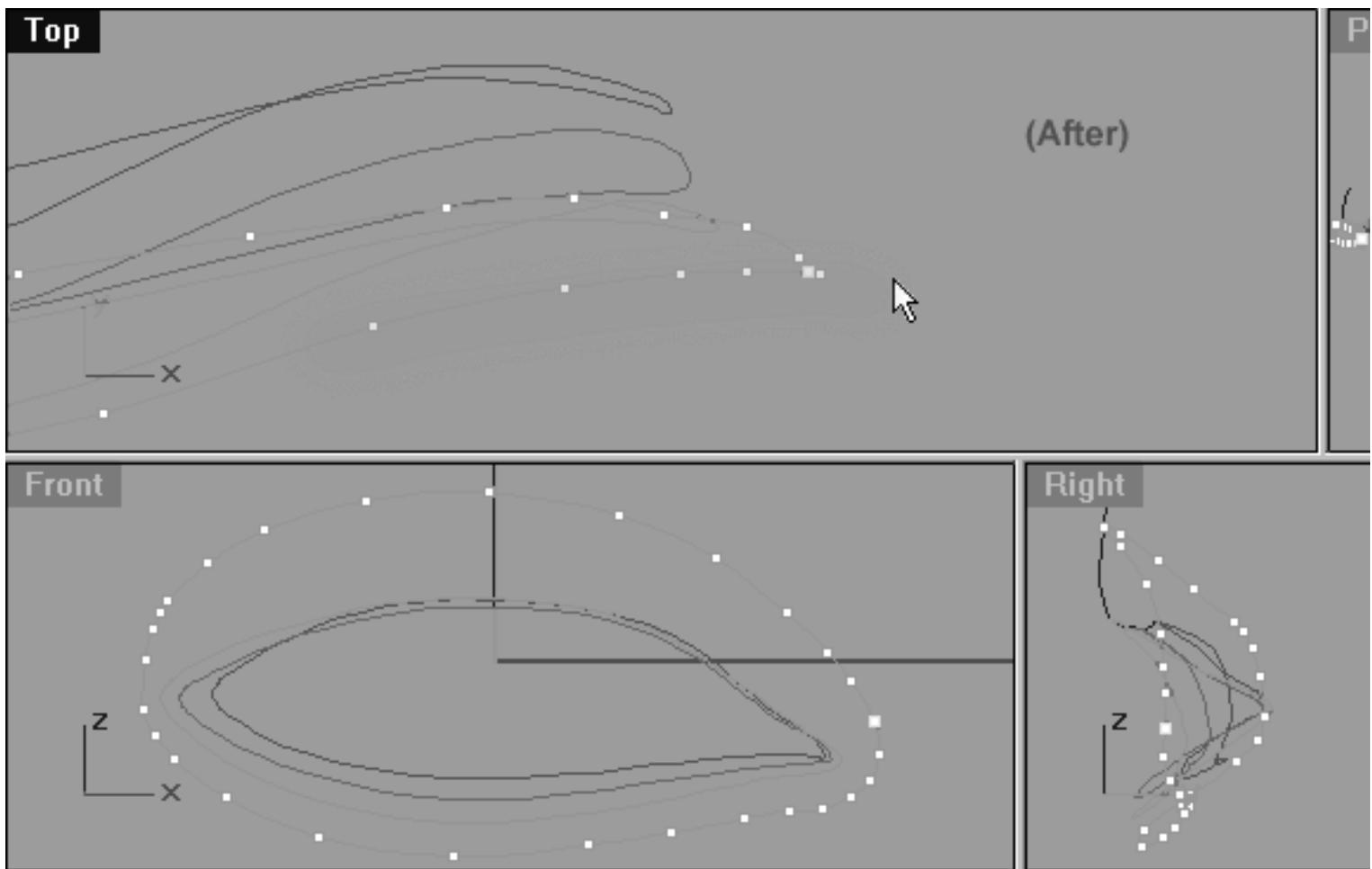


*This **All Viewport** screenshot shows the 2nd point clockwise from the 12 o'clock position has now been selected and prior to being moved downward along the Y axis in the **Top Viewport**.*

## Helper Table

Point	Approximate Units Moved
2 o'clock	Y: 0.183 (down)
Next point clockwise	Y: 0.523 (down)
Next point clockwise	Y: 0.562 (down)
Next point clockwise	Y: 0.593 (down)
Next point clockwise	Y: 0.450 (down)

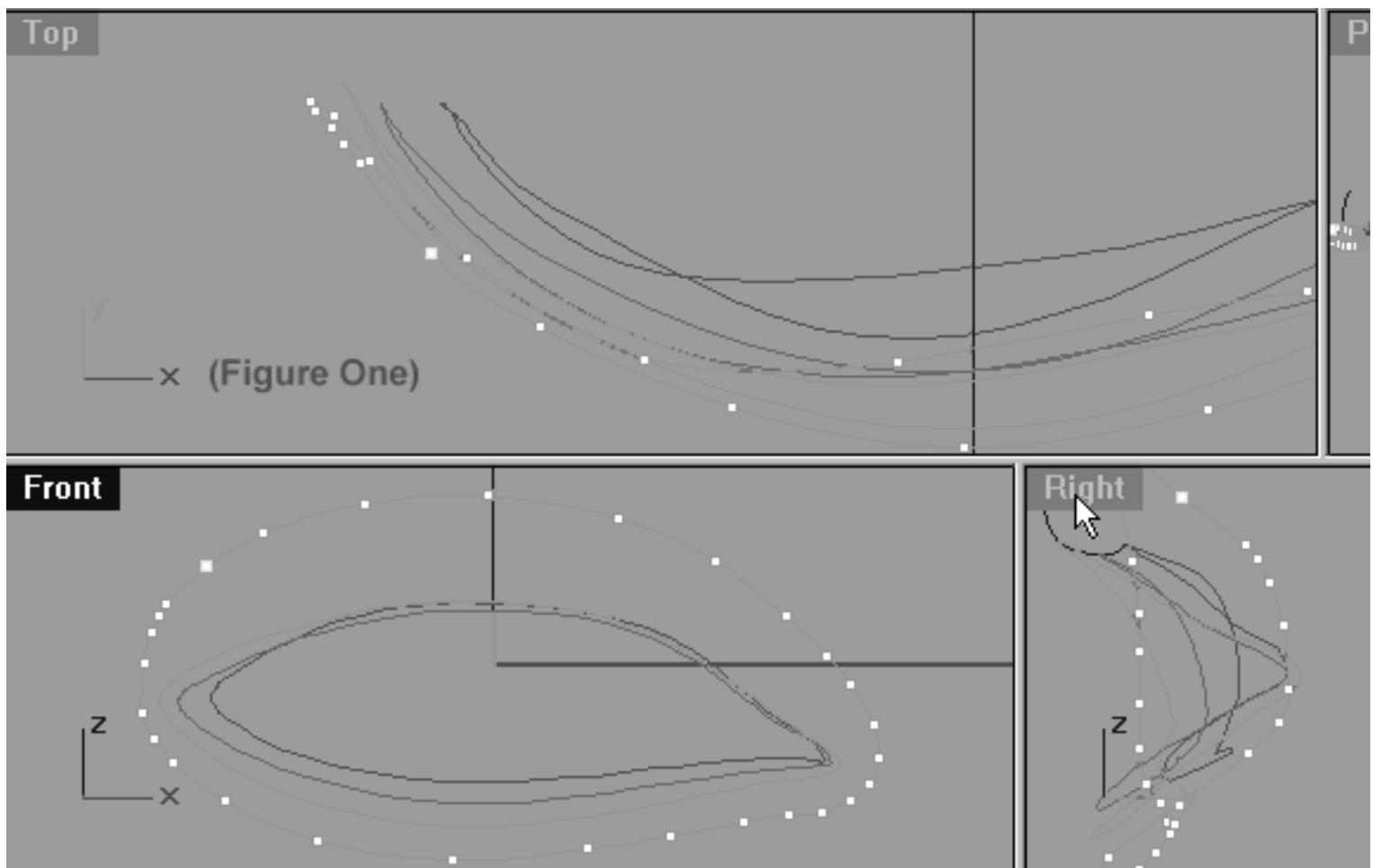




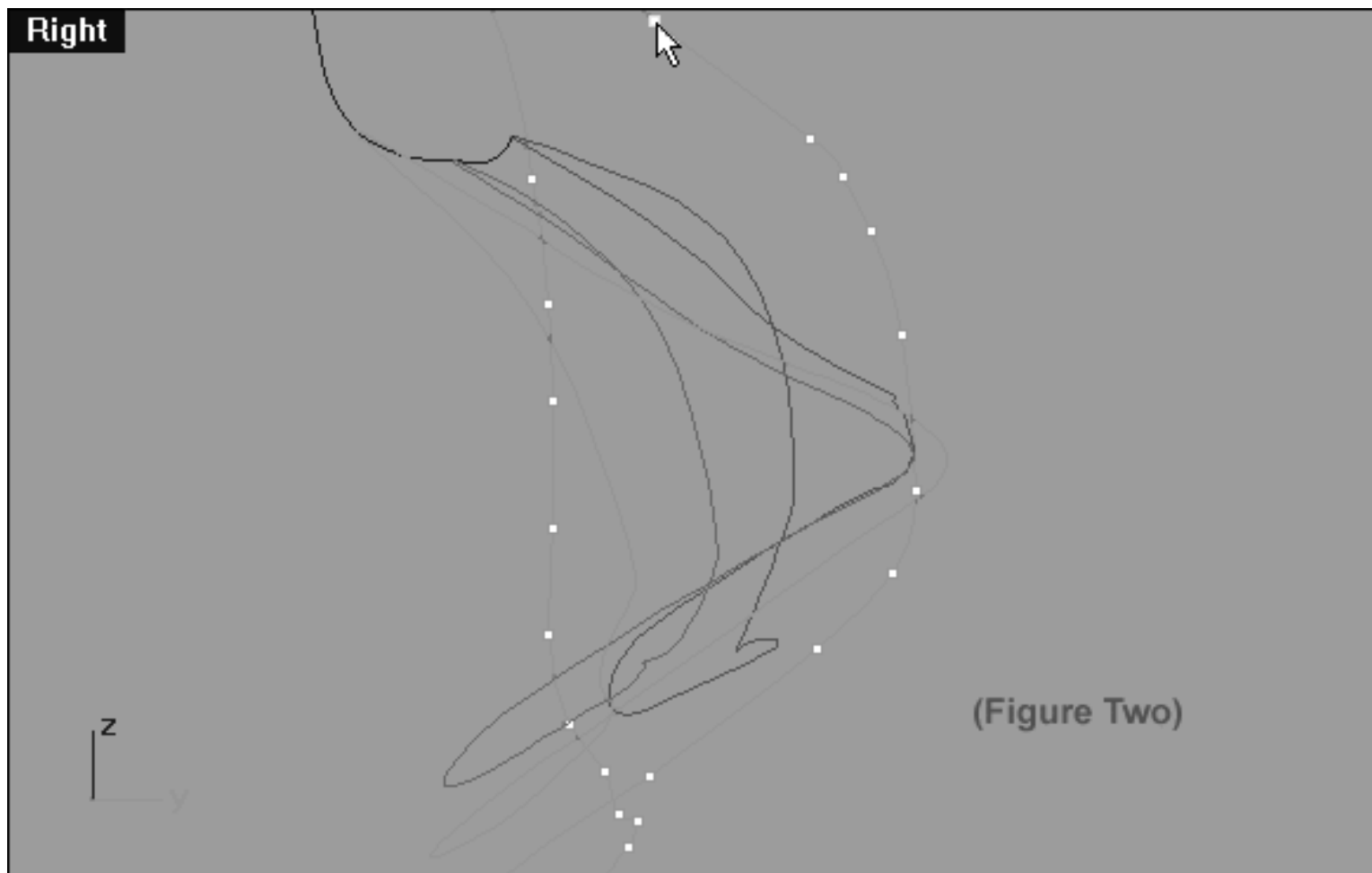
This **All Viewport** screenshot shows all the remaining points (with the exception of the corner) have now been moved downward along the Y axis in the **Top Viewport** and are now resting at their new locations (highlighted in green).

## Upper Row, Left Side

- In the Front Viewport, working anti-clockwise, select the 3rd point from the 12 o'clock position on the upper row, left side of the curve -- see the screenshot below entitled: (Figure One).
- Next, switch to the Right Viewport and maximise it. Then pan the view so that the selected point is clearly visible -- see the screenshot below entitled: (Figure Two).
- Now move the selected point outward along the Y axis -- see the screenshot below entitled: (Figure Three). Continue working on an incremental basis and repeat this procedure with next 8 points until you've created a gentle arcing shape as in the screenshot below entitled: (Figure Three).



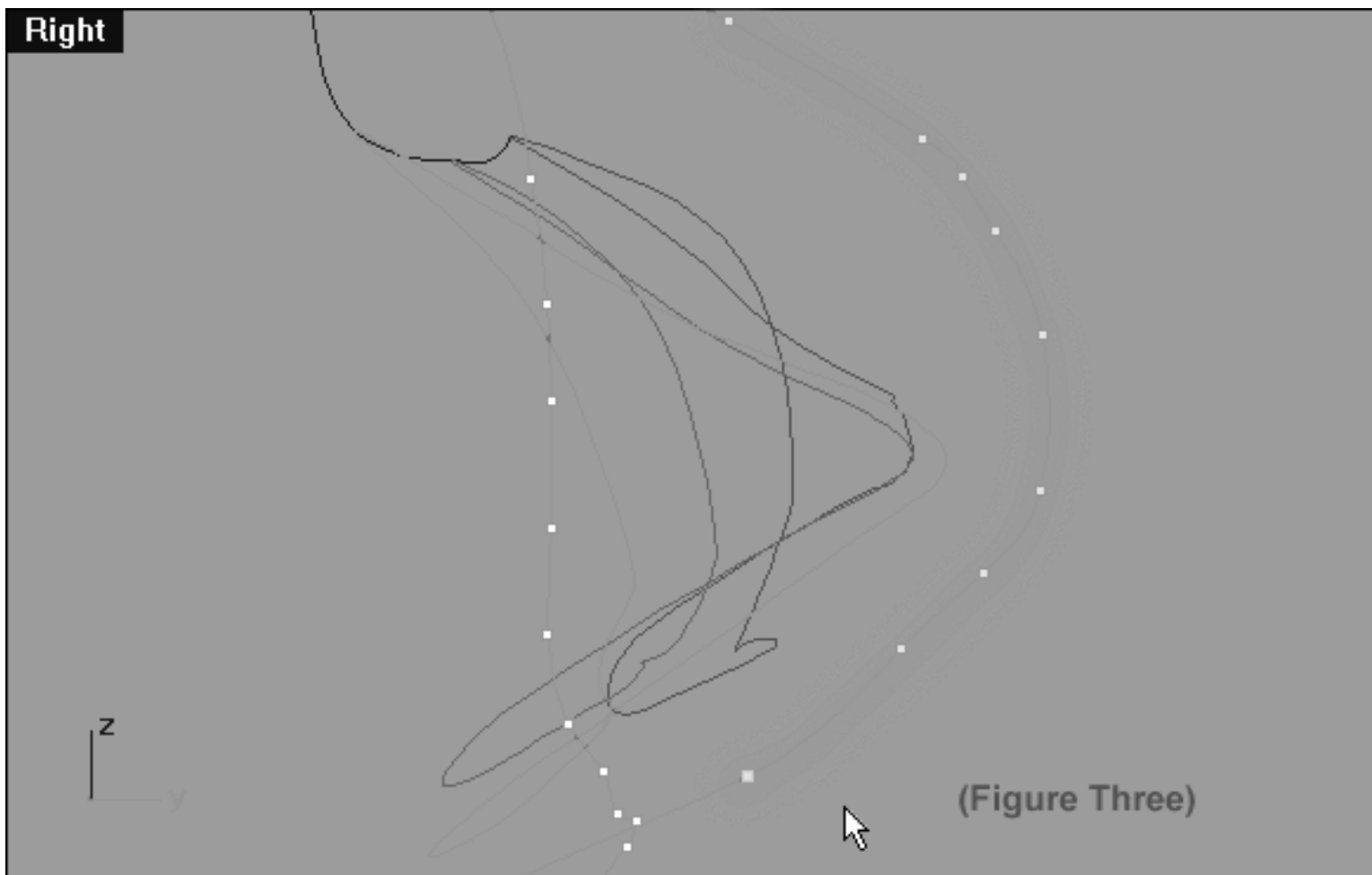
*This **All Viewport** screenshot shows the upper row, left side of the curve prior to any editing taking place. Notice, that the point at the 3rd point from the 12 o'clock position has been selected.*



This **Right Viewport** screenshot again shows curve prior to editing taking place. Notice, that the 3rd point from the 12 o'clock position is still selected and visible in this view.

### Helper Table

Point	Approximate Units Moved
3rd from 12 o'clock	Y: 0.905
Next point anti-clockwise	Y: 1.430
Next point anti-clockwise	Y: 1.539
Next point anti-clockwise	Y: 1.710
Next point anti-clockwise	Y: 1.823
Next point anti-clockwise	Y: 1.671
Next point anti-clockwise	Y: 1.247
Next point anti-clockwise	Y: 1.127
Next point anti-clockwise	Y: 1.206



This **Right Viewport** screenshot shows curve after editing has taken place. Notice, that a total of 9 points have been moved.



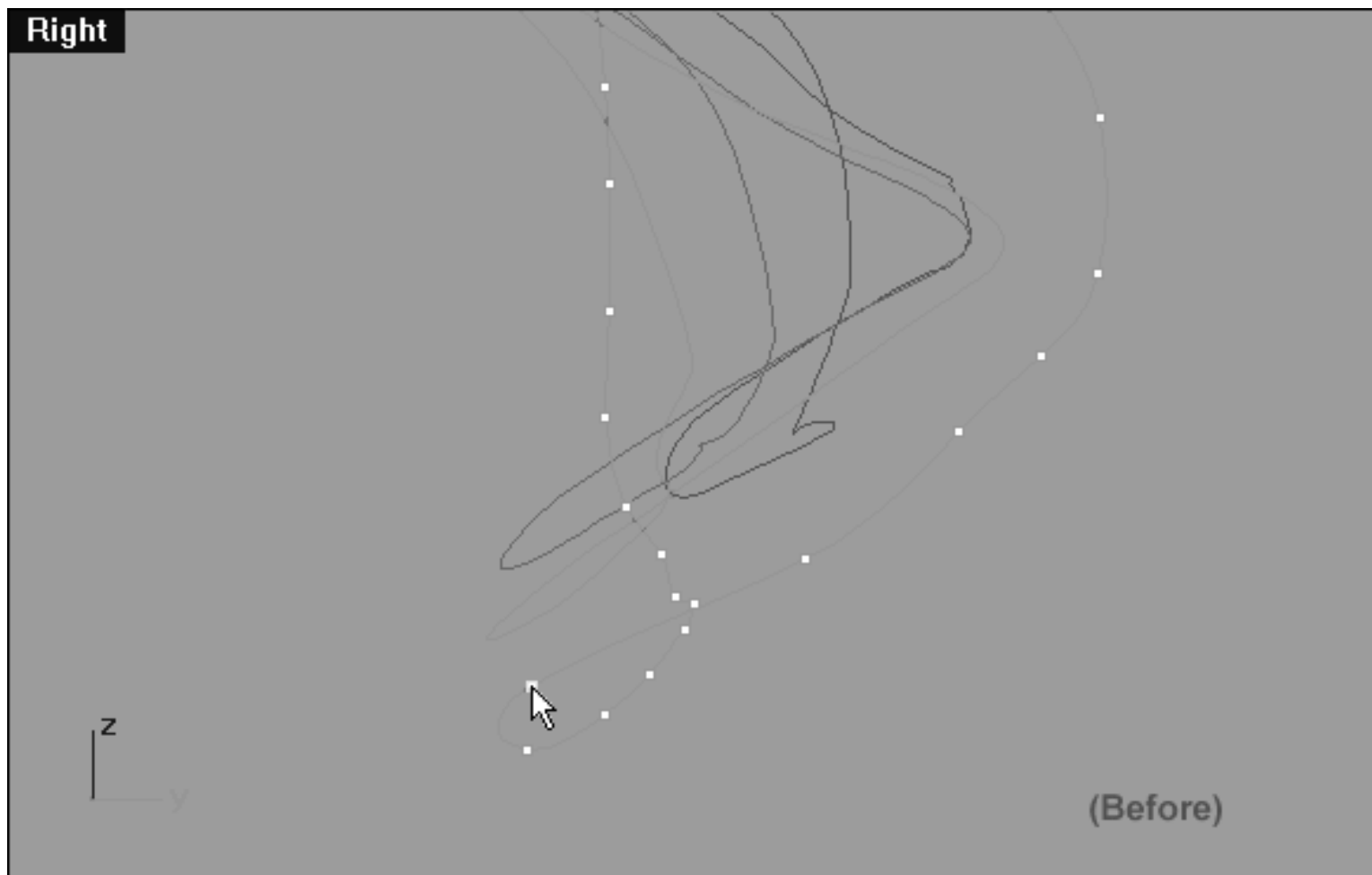
**View an example movie**

**Editing the 4th Eyelid Curve, Pt. 3** [Click Here](#)

## Details, details...

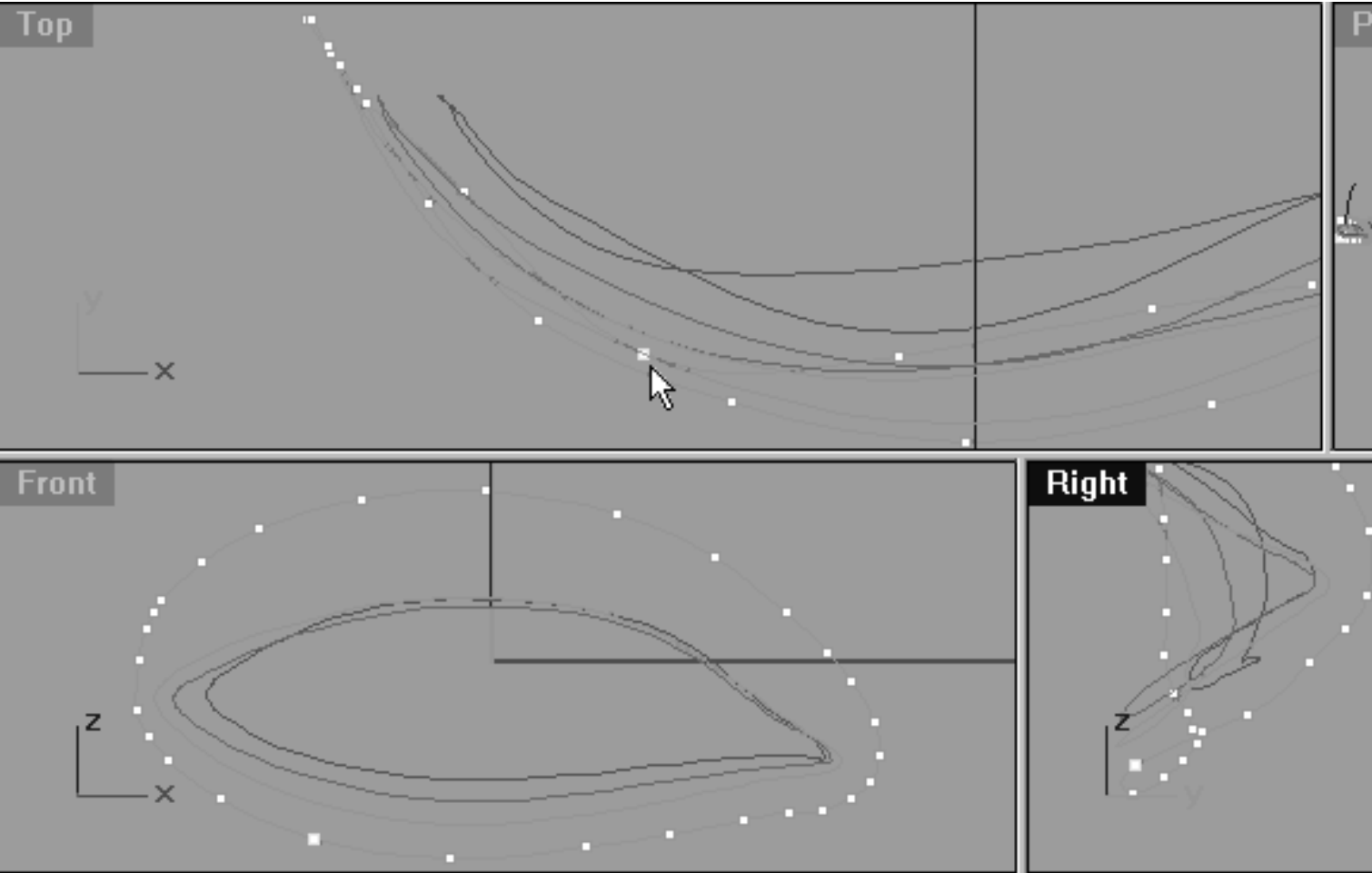
This curve is very nearly complete, all that remains is to sort out a few final details which we will now address.

- You should still be working within the **Right Viewport**.
- Pan the view so that points on the lower portion of the curve are clearly visible.
- Select the point shown in the screenshot below entitled: (Before).



This **Right Viewport** screenshot shows the lower portion of the curve prior to editing taking place. Notice, that the point that has been selected.

- Minimise the Right Viewport, once done the point at the 7 o'clock position (as seen in the Front Viewport) should now be selected as in the screenshot below.

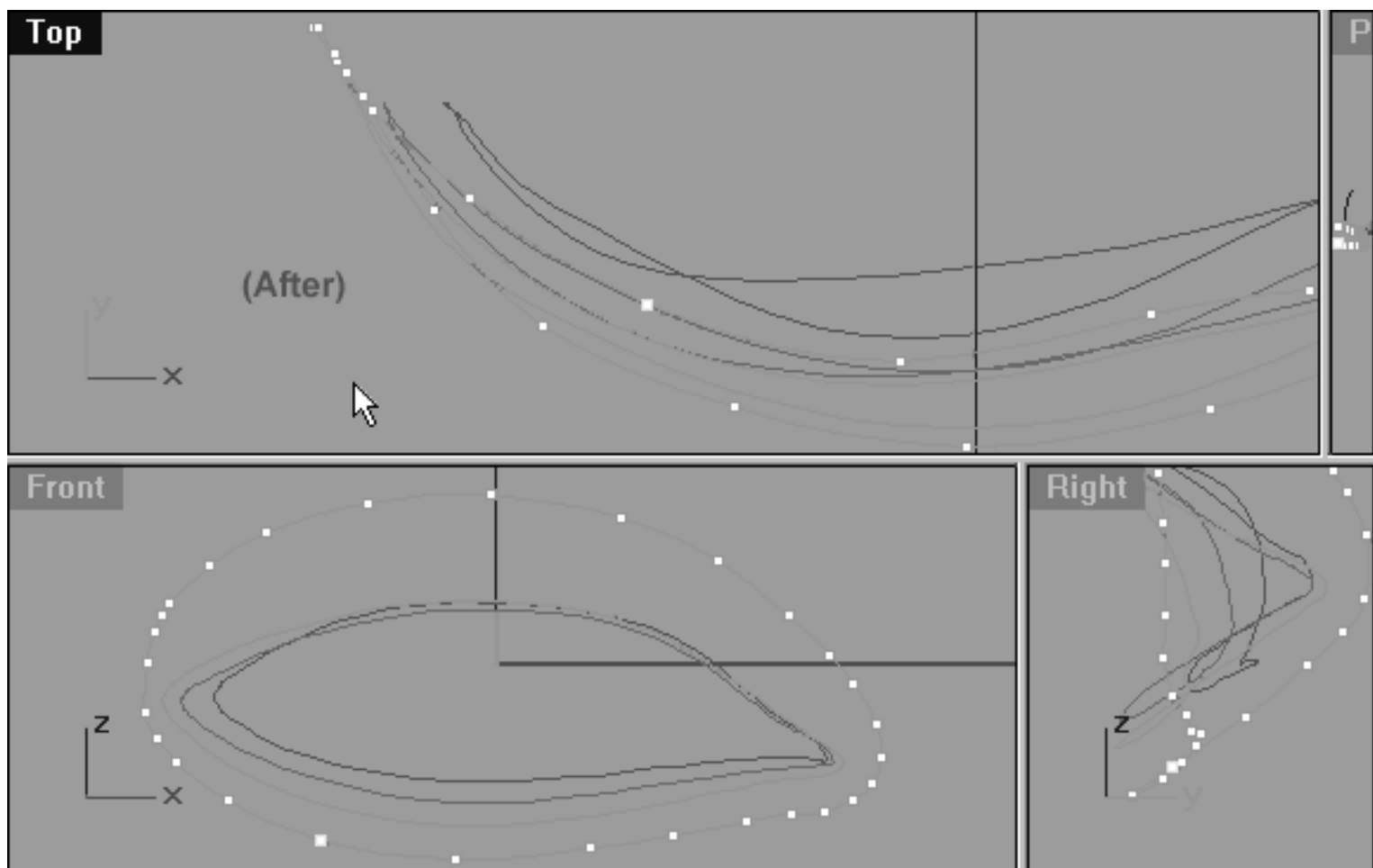


*This **All Viewport** screenshot shows curve prior to any editing. Confirm that the point you selected in the Right Viewport is the one located at the 7 o'clock position (as seen in the front view).*

- Next, move your cursor into the **Top Viewport** and while holding down the Shift key move the selected point upward along the Y axis until it is positioned as in the screenshot below entitled: (After).

**Helper Table**

Point	Approximate Units Moved
At 7 o'clock	Y: 1.127



This **All Viewport** screenshot shows curve after editing has taken place. Notice that the point located at the 7 o'clock position (as seen in the front view) has now been moved upward along Y axis in the Top Viewport.



**View an example movie**

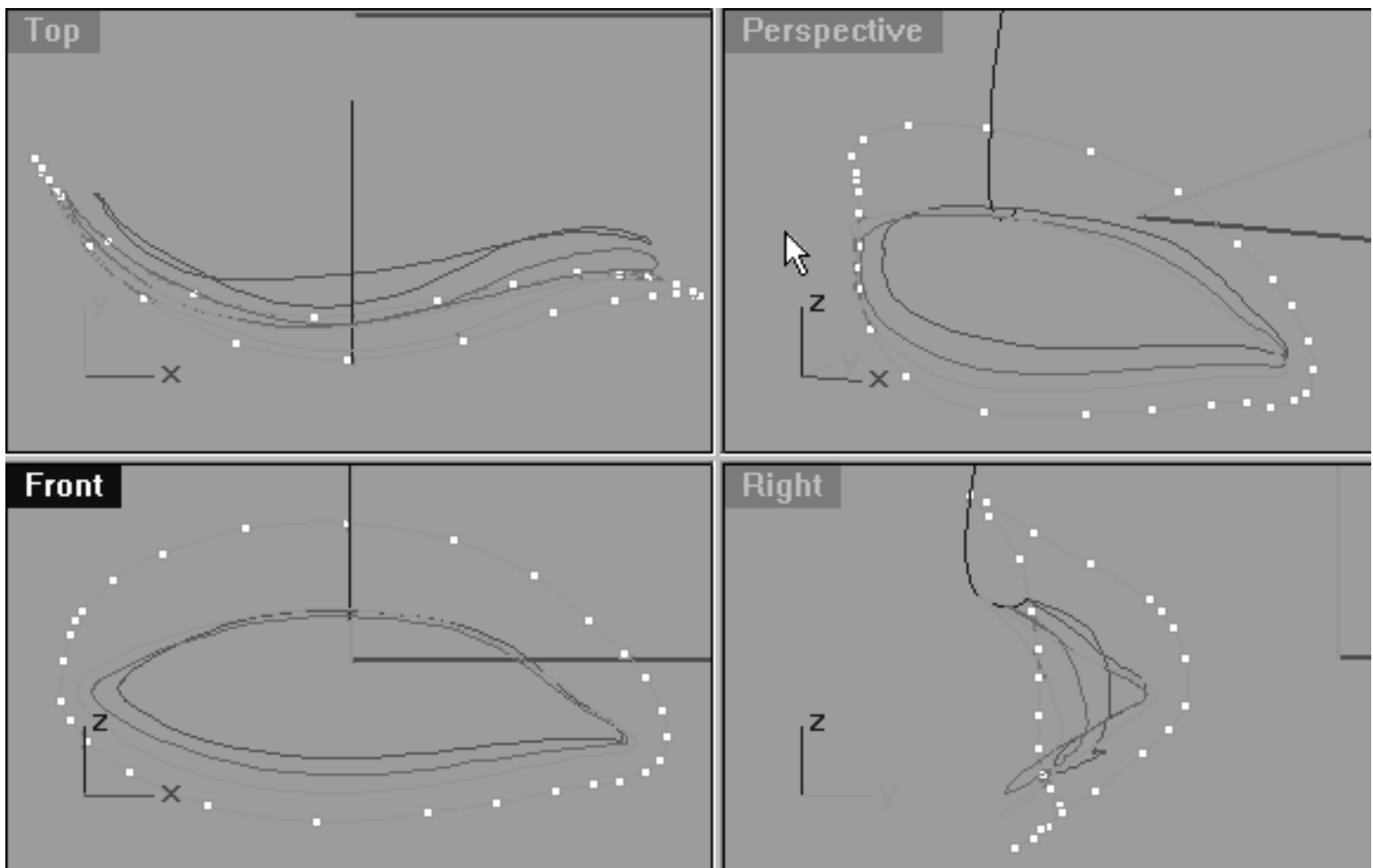
**Editing the 4th Eyelid Curve, Pt. 4** [Click Here](#)

Congratulations, the 4th Eyelid Curve has now been completed! As ever, you should some take a little extra time to carefully inspect the curve in order to clean up, refine and adjust points as required.

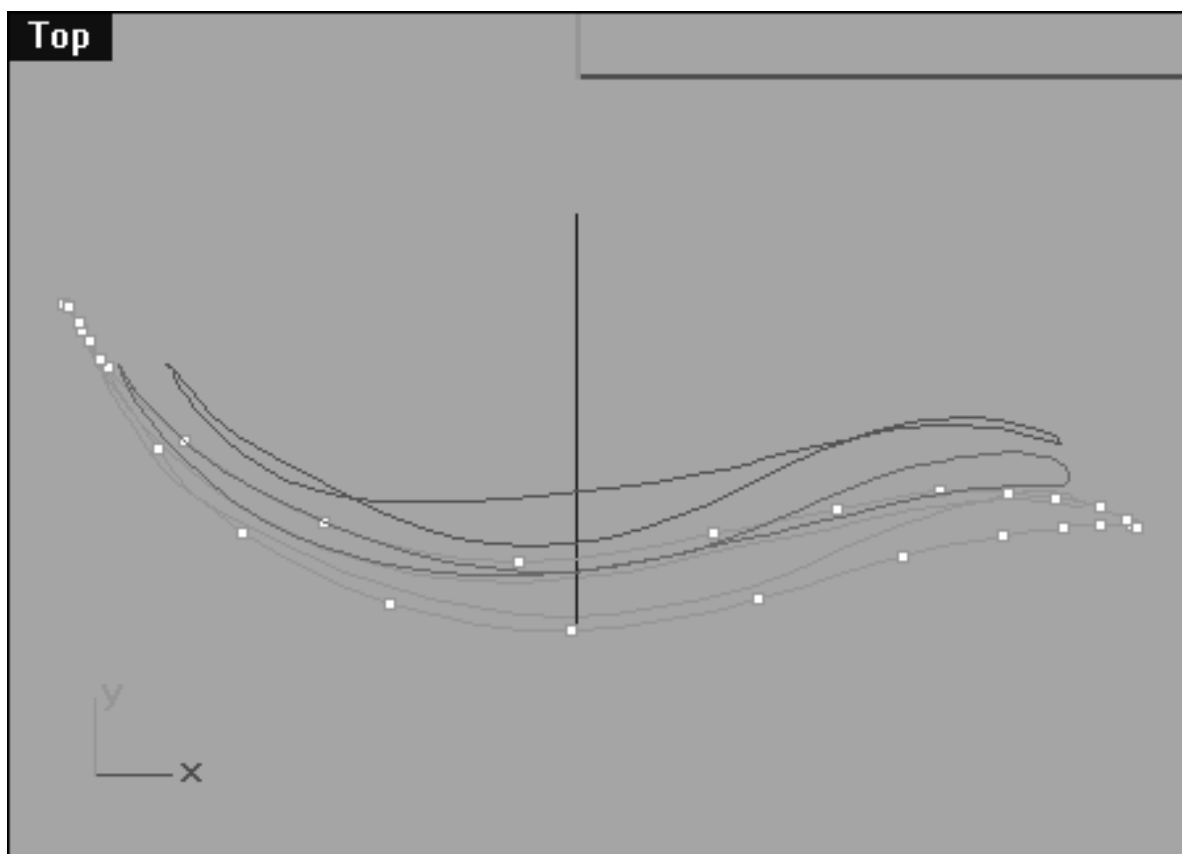
I think that you'll agree that now that we are opening up the curves and making them larger overall the job of editing is becoming far less difficult.

Your monitor should now resemble the screenshot below...

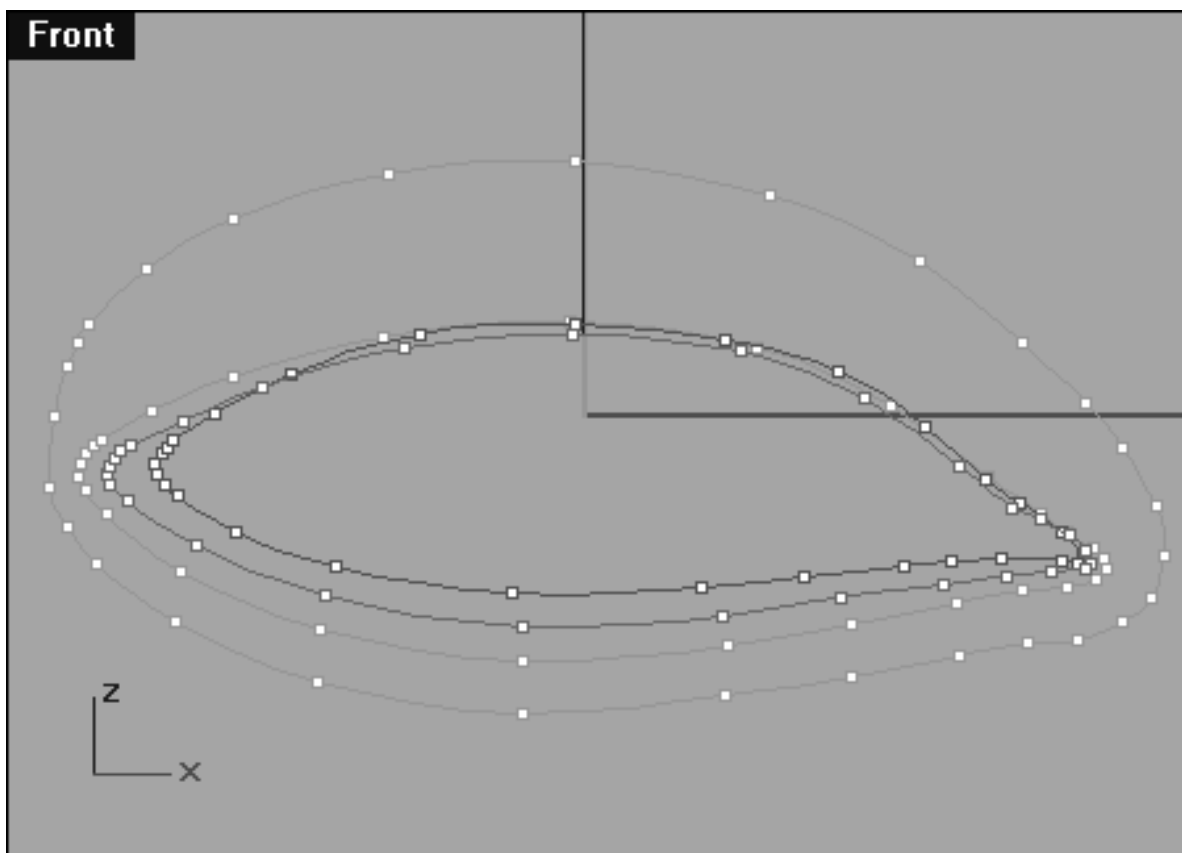




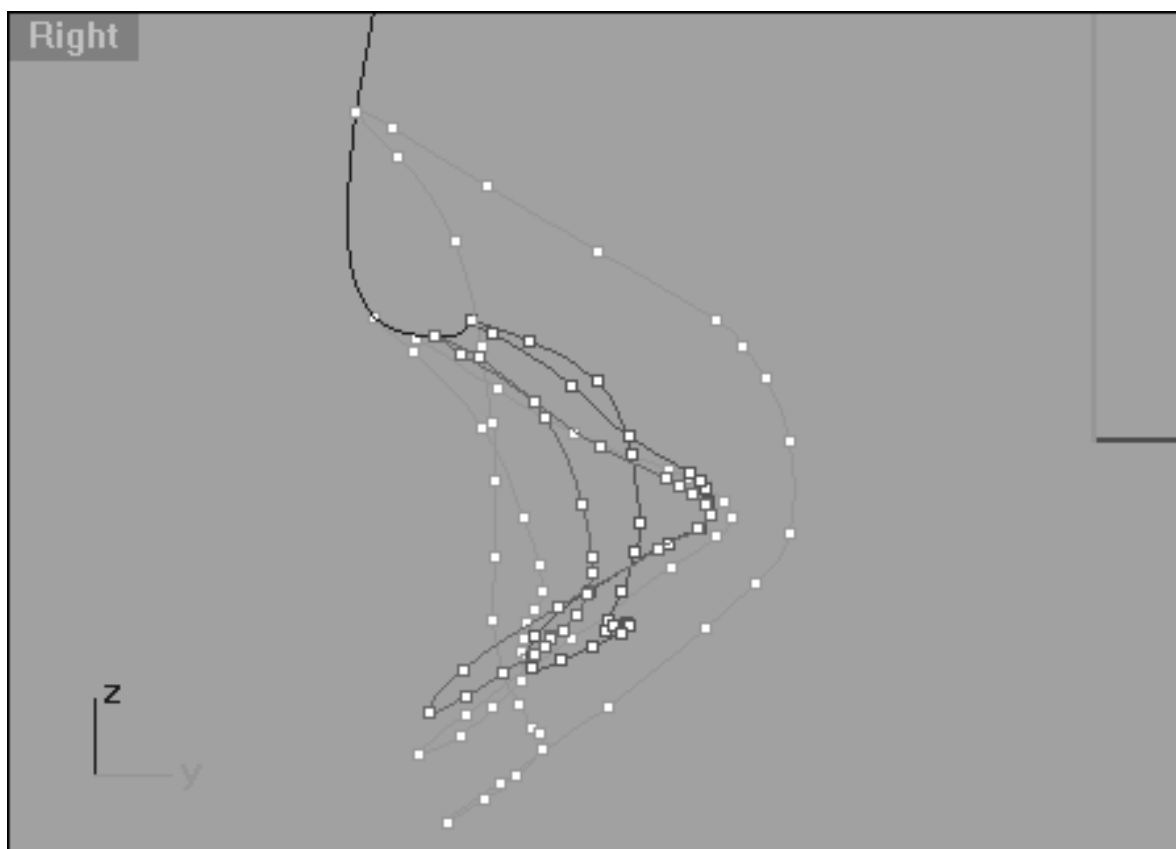
*This **All Viewport** screenshot shows the now fully completed and refined 4th Eyelid Curve. Observe the relationships in all views between the points and carefully study the relationships between all 3 curves themselves.*



This **Top Viewport** screenshot shows the now fully completed and refined 4th Eyelid Curve.



This **Front Viewport** screenshot shows the now fully completed and refined 4th Eyelid Curve. The points on Eyelid Curves 1, 2 & 3 have also been unlocked and displayed so that you can study their placement and relationships to each other.



This **Right Viewport** screenshot shows the now fully completed and refined 4th Eyelid Curve. The points on Eyelid Curves 1, 2 & 3 have also been unlocked and displayed so that you can study their placement and relationships to each other.

## Snap It Up

You can now feel free to check your work against ours and see how close you've come. To do this, open the Edit Layers dialogue box and turn **ON** the layer entitled: **Eyelid\_guide\_04**, then press **OK** to **Exit**. Then in **Any Viewport** select the **Eyelid\_guide\_04** curve and display its edit points. Once done, reopen the Edit Layers dialogue box and set the **Eyelid\_guide\_04** layer to **LOCK**, press **OK** to **Exit**. You can now compare the results and refine the specific areas where you've gone off track. You can then turn on the **Osnaps, Point** and snap each of the points on the curve you've created to those of the guide curve.

## Shutting Down the Scene

- Rearrange the viewports to a normal 4 view pattern.
- Confirm that no Osnaps are currently active, disable any that are.
- Display any currently hidden objects, type the command: Show at the command line and press Enter.
- Turn off any edit points that may be currently displayed.
- Unlock any currently locked objects -- type **UNLOCK** at the command line and press **Enter**.

- Open the Edit Layers Dialogue box and locate the layer entitled **SCENE START UP**. Make it the currently active layer by clicking in the "check" field -- a check mark should appear in the column, when it has press **APPLY**. Once done, the layer entitled **SCENE START UP** should now have become the active layer and should be **ON**.
  - The Layer entitled: Photopoints should be **ON**.
  - Turn off the layers entitled: **Eyelid Curves, Eyelid\_02, Eyelid\_03, Eyelid\_04** and **Eyelid\_Xsection** and press **APPLY**.
  - With the exception of those mentioned, all other layers should be **OFF** -- press **OK** to Exit.
  - Perform a Zoom Extents All.
  - **SAVE YOUR WORK..!**
- 

Go to the [NEXT LESSON](#)

RETURN to the Top of page -- [Click Here](#)

Written by Joseph R. Saltzman.

Co-produced in association with Steven Ståhlberg  
©1998-1999 Cinemagic Productions Limited. All Rights Reserved.

Duplication of this document including images and text by any means is expressly forbidden without prior written consent of Cinemagic Productions Limited.

Web Site: <http://www.cmagic.co.uk> Telephone: +44 (0)1753 733 190 Fax: +44 (0)1753 736 619 email: [cmagic@cmagic.co.uk](mailto:cmagic@cmagic.co.uk)

qat260199

# MOVIE EDITING THE 4TH EYELID CURVE PART ONE

To **PLAY** the example movie, double click below:

To **RETURN** to the tutorial -- [click here](#).

# MOVIE EDITING THE 4TH EYELID CURVE PART TWO

To **PLAY** the example movie, double click below:

To **RETURN** to the tutorial -- [click here](#).

# MOVIE EDITING THE 4TH EYELID CURVE PART THREE

To **PLAY** the example movie, double click below:

To **RETURN** to the tutorial -- [click here](#).



# MOVIE EDITING THE 4TH EYELID CURVE PART FOUR

To **PLAY** the example movie, double click below:

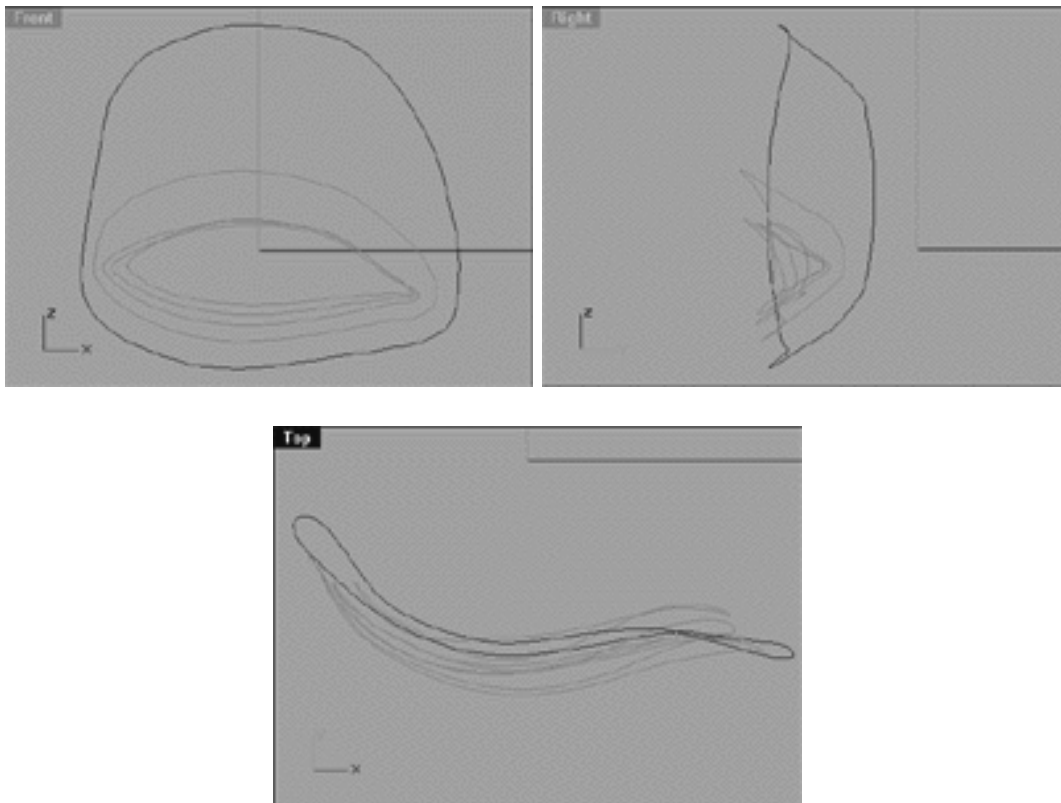
To **RETURN** to the tutorial -- [click here](#).

**RETURN** to previous page -- [Click Here](#)

**GOTO** the [NEXT LESSON](#)



## CREATING THE 5TH EYELID CURVE




---


## Contents:

- [Scene Setup](#)
- [Creating the 5th Eyelid Curve](#)
- [Editing the 5th Eyelid -- Lower Row, Right Side](#)
- [Example Movie - Create & Edit the 5th Eyelid Curve, Pt 1](#)
- [Lower Row, Left Side](#)
- [Open Wide -- Right Side](#)
- [Open Wide -- Left Side](#)

- [Upper Row, Right Side](#)
  - [Just Call Me Stretch, Right Side](#)
  - [Example Movie - Editing the 5th Eyelid Curve, Pt 2](#)
  - [Upper Row, Left Side](#)
  - [Just Call Me Stretch, Left Side](#)
  - [Lower Row, Right Side \(2\)](#)
  - [Example Movie - Editing the 5th Eyelid Curve, Pt 3](#)
  - [Upper Row -- Right Side \(2\)](#)
  - [Upper Row, Left Side \(2\)](#)
  - [Example Movie - Editing the 5th Eyelid Curve, Pt 4](#)
  - [Lower Row -- Left Side \(2\)](#)
  - [Example Movie - Editing the 5th Eyelid Curve, Pt 5](#)
  - [Snap It Up](#)
  - [Shutting Down the Scene](#)
- 


## Scene Setup

- If you've not done so already start a Rhinoceros session by **double clicking** on the desktop icon  the application will begin.
- Choose File, Open from the menu bar and double click on **START\_A.3DM** in the file list, it will load and open.
- Confirm at the Lower Status Bar the currently active layer is entitled SCENE START UP. If it is active proceed to the next step, if it's not then make it active by left clicking on the layer box, highlighting the correct layer and clicking on it.
- Again, at the Layers Box on the Lower Status Bar this time right click on the box, the Edit Layers Dialogue box will open. Confirm the following switches have been enabled or disabled:
- The Layer entitled: Eyelid\_Curves should be ON.
- The Layer entitled: Eyelid\_02 should be ON.
- The Layer entitled: Eyelid\_03 should be ON.
- The Layer entitled: Eyelid\_04 should be ON.
- The Layer entitled: Eyelid\_Xsection should be ON.

- The Layer entitled: Photopoints should be OFF.
- The Layer entitled: SCENE START UP should be ON.
- All other layers should be set to OFF.
- When you've finished making your changes ( if any ) click on OK.
- Confirm that the grid display in the viewports has been disabled, if not turn it off now.
- Confirm that no Osnaps are currently enabled, if any are disable them.
- Confirm that no edit points are currently displayed, if any are hide them.
- Zoom out all the viewports by selecting the Zoom Extents/Zoom Extents All Views icon  or by typing the command: **ZoomExtentsAll** at the command line and pressing ENTER.


## Creating the 5th Eyelid Curve

Now let's create the 5th Eyelid curve. Once again we will do this from a copy of 4th Eyelid curve that we made in the previous lesson.

- If you've not done so already make sure the 1st, 2nd & 3rd Eyelid curve objects are visible but LOCKED. If not, lock them by selecting the objects -- they will highlight and then typing the command: Lock at the command line.
- The Cross section curve should also be visible, select it and display its edit points.
- Create a new layer entitled: Eyelid\_05, set the layer colour to blue and make it active.
- Maximise the **Right Viewport** and select the 4th Eyelid Curve by left clicking on it -- it will highlight.
- From the toolbar choose the Copy Icon  or type: Copy at the command line.
- The system will respond with the following prompt at the command line: **Point to copy from (Vertical InPlace):**
- Type IN at the command line and press ENTER to complete the operation. A duplicate of the curve has now been created.

- Activate Osnaps End / Point.



- From the toolbar choose the Move Icon  and snap your cursor to the end point of the highlighted curve. Once done, move the object along the Z axis and snap to the 6th point of the cross section curve.





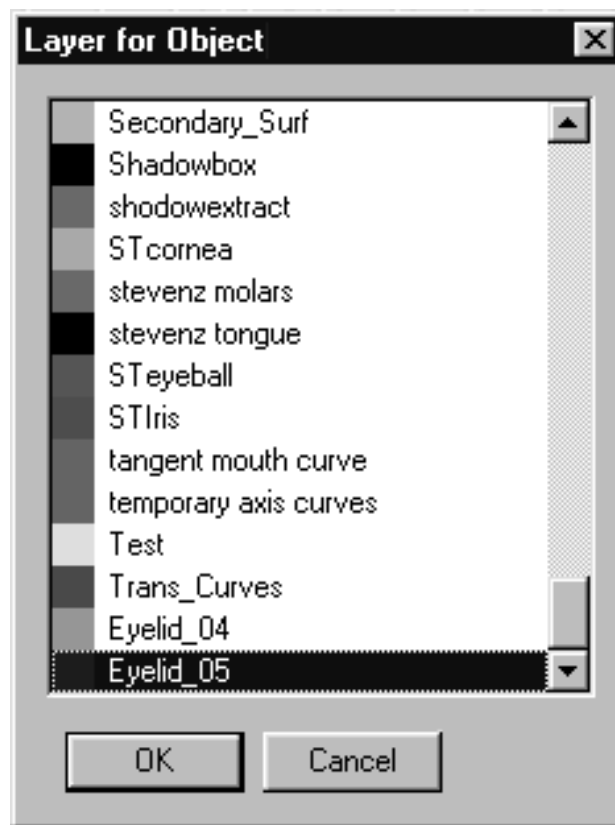
*This **Right Viewport** screenshot shows the duplicate of the 4th eyelid curve prior to being moved along the Z axis.*



This **Right Viewport** screenshot shows the duplicate of the 4th eyelid curve after to being moved along the Z axis and snapped to the 6th point on the cross section curve.

- Now be certain to assign the newly duplicated and moved curve to the currently active layer, in this case (Eyelid\_05). With the moved curve still selected, choose from the toolbar the Edit

Layers Icon  and then select the change layers icon  from the fly out, the Layer for Object dialogue will appear as in the screenshot below:



*This screenshot shows the Layer for Object dialogue box*

- Locate the layer entitled: Eyelid\_05 in the list, highlight it and then either double click on it or press OK to complete the operation. Once done, the copied curve should turn blue thus indicating it is now on the correct layer as in the screenshot below.





This **Right Viewport** screenshot shows the duplicated and moved curve has now been assigned to the correct layer (*Eyelid\_05*).

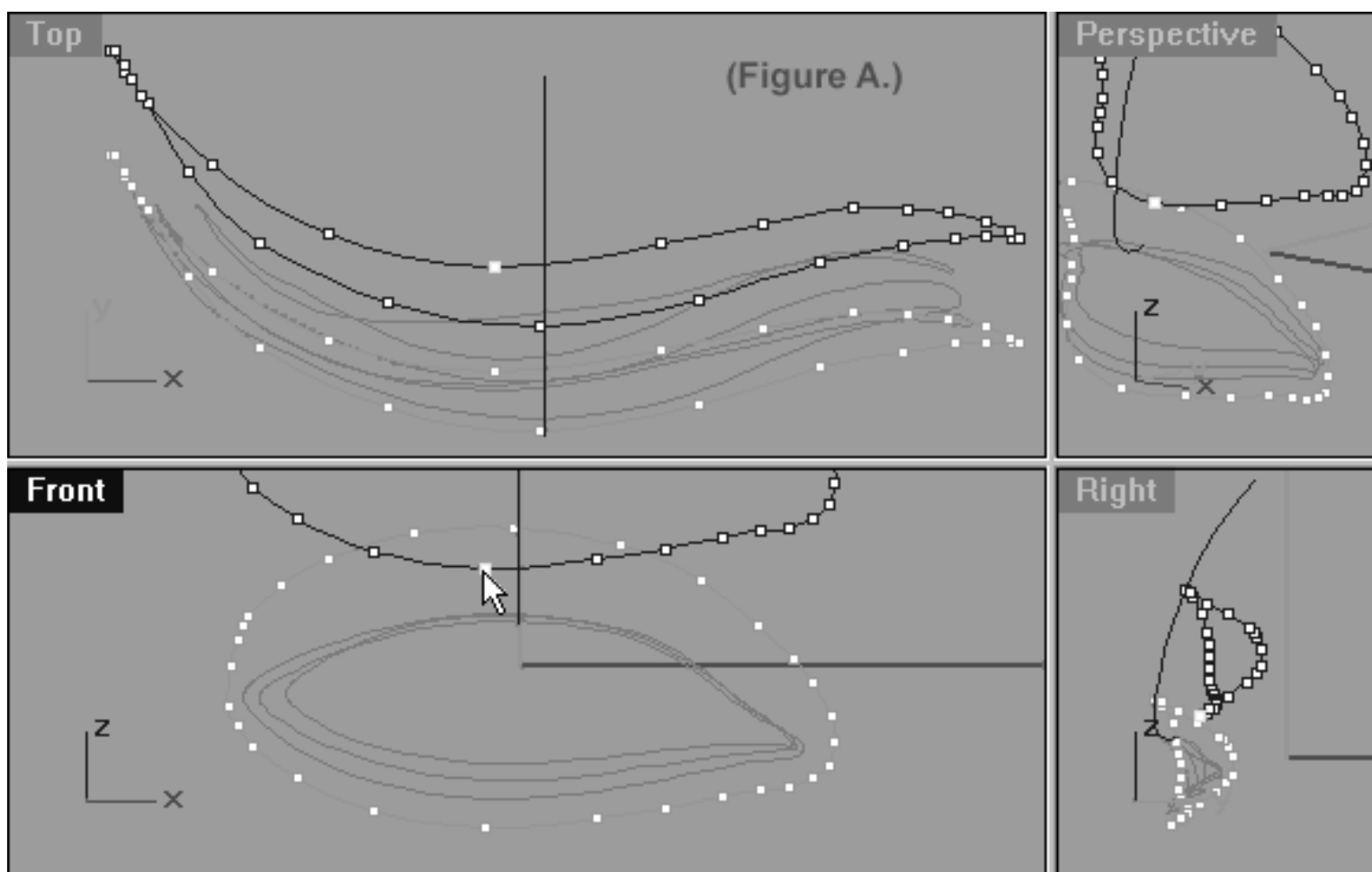
## Editing the 5th Eyelid Curve

### Lower Row, Right Side

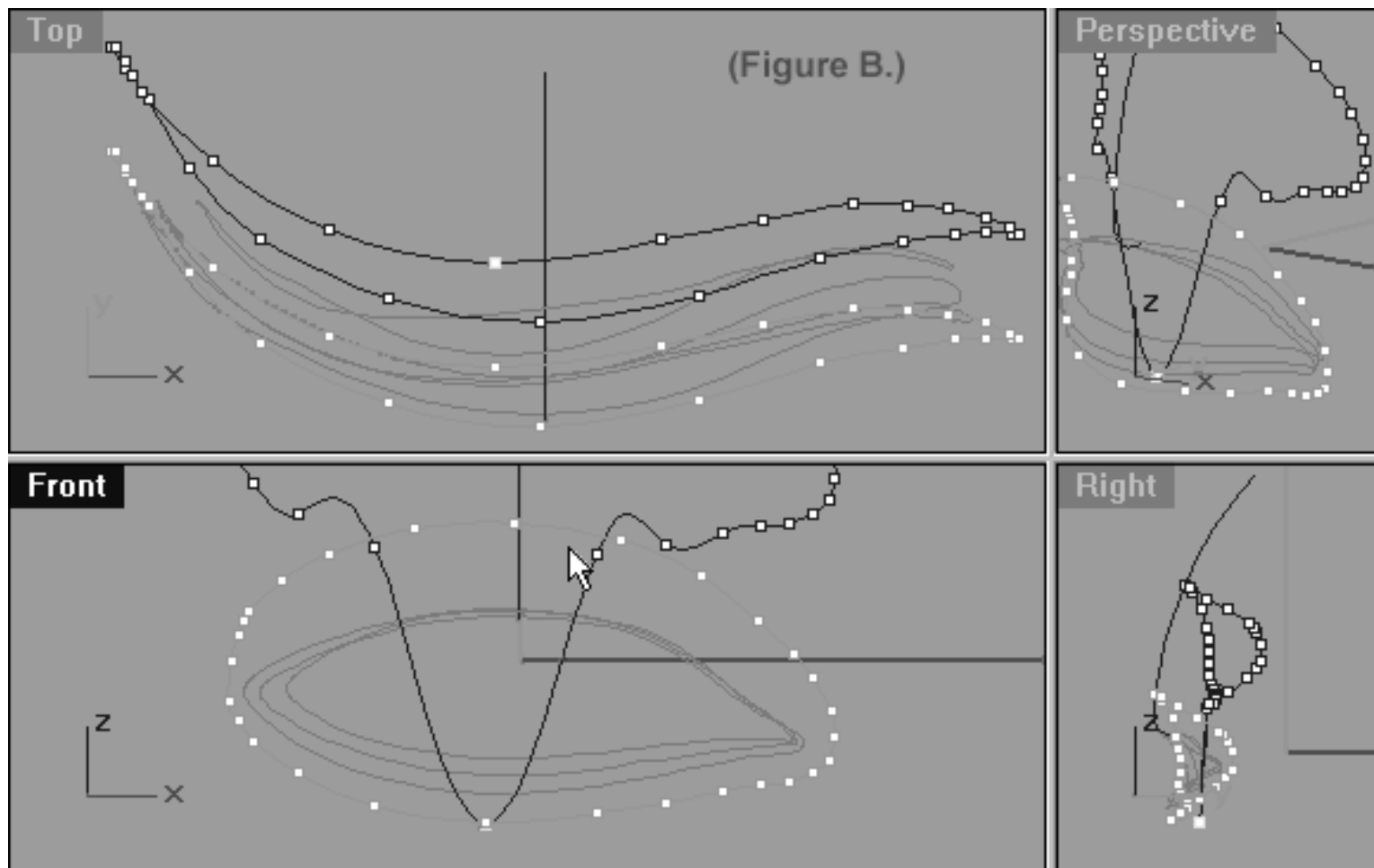
Now let's start moving some points...

- Minimise the **Right Viewport**.
- Temporarily turn off the edit points and hide the cross section curve.
- Disable any currently active Osnaps.
- In Any Viewport, select the 4th Eyelid Curve by left clicking on it -- it will highlight. Once done, display its edit points and then Lock its layer to prevent it being damaged.
- Select the 5th Eyelid curve and display its edit points.

- In the **Front Viewport** and select the point at the **6 o'clock** position on the lower row -- it will highlight (see Figure A. Below).
- Now whilst holding down the Shift key move the point downward along the Z axis until it is roughly aligned with its sister point on the 4th curve. (see Figure B. Below).
- Working in an anti-clockwise manner repeat this procedure with the following 7 lower row points. Your aim should again be to create a shape similar to the screenshot below (see Figure C. Below).
- Refer to the helper table for further guidance.



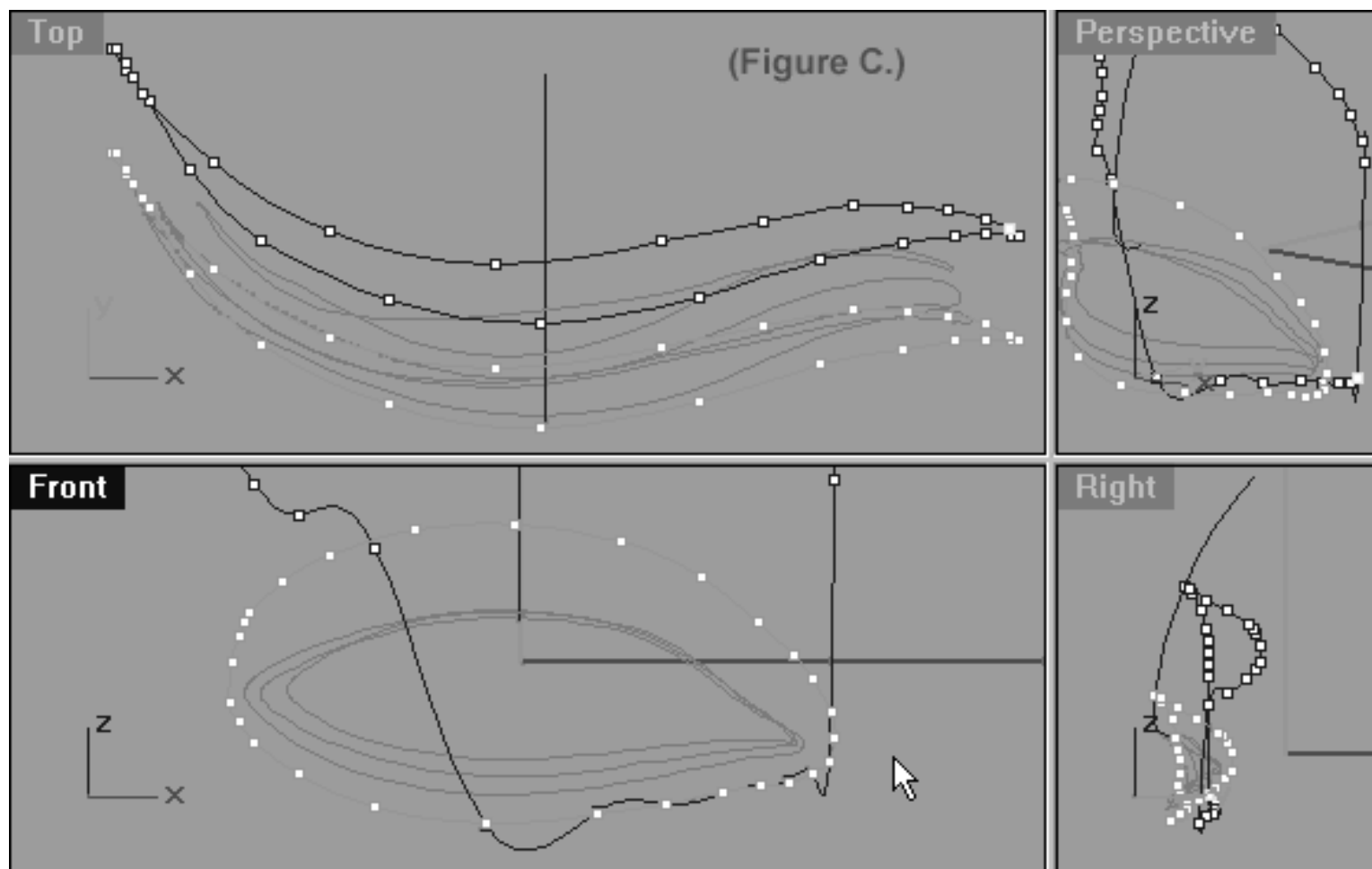
*This **All Viewport** screenshot shows the 5th Eyelid Curve (Eyelid\_05) prior to any editing taking place on the lower row. Notice that the point at roughly the 6 o'clock position has been selected and is now ready to be moved downward along the Z axis.*



This **All Viewport** screenshot shows the 5th Eyelid Curve (Eyelid\_05) after the 1st stage of initial editing has taken place on the lower row.

### Helper Table

Point	Approximate Units Moved
6 o'clock	Z: 13.081
Next point anti-clockwise	Z: 13.082
Next point anti-clockwise	Z: 13.097
Next point anti-clockwise	Z: 13.105
Next point anti-clockwise	Z: 13.093
Next point anti-clockwise	Z: 13.105
Next point anti-clockwise	Z: 13.100
Next point anti-clockwise	Z: 13.103



This **All Viewport** screenshot shows the 5th Eyelid Curve (Eyelid\_05) after the last stage of initial editing has taken place on the lower row. Notice that a total of 8 points have now been moved.



**View an example movie**

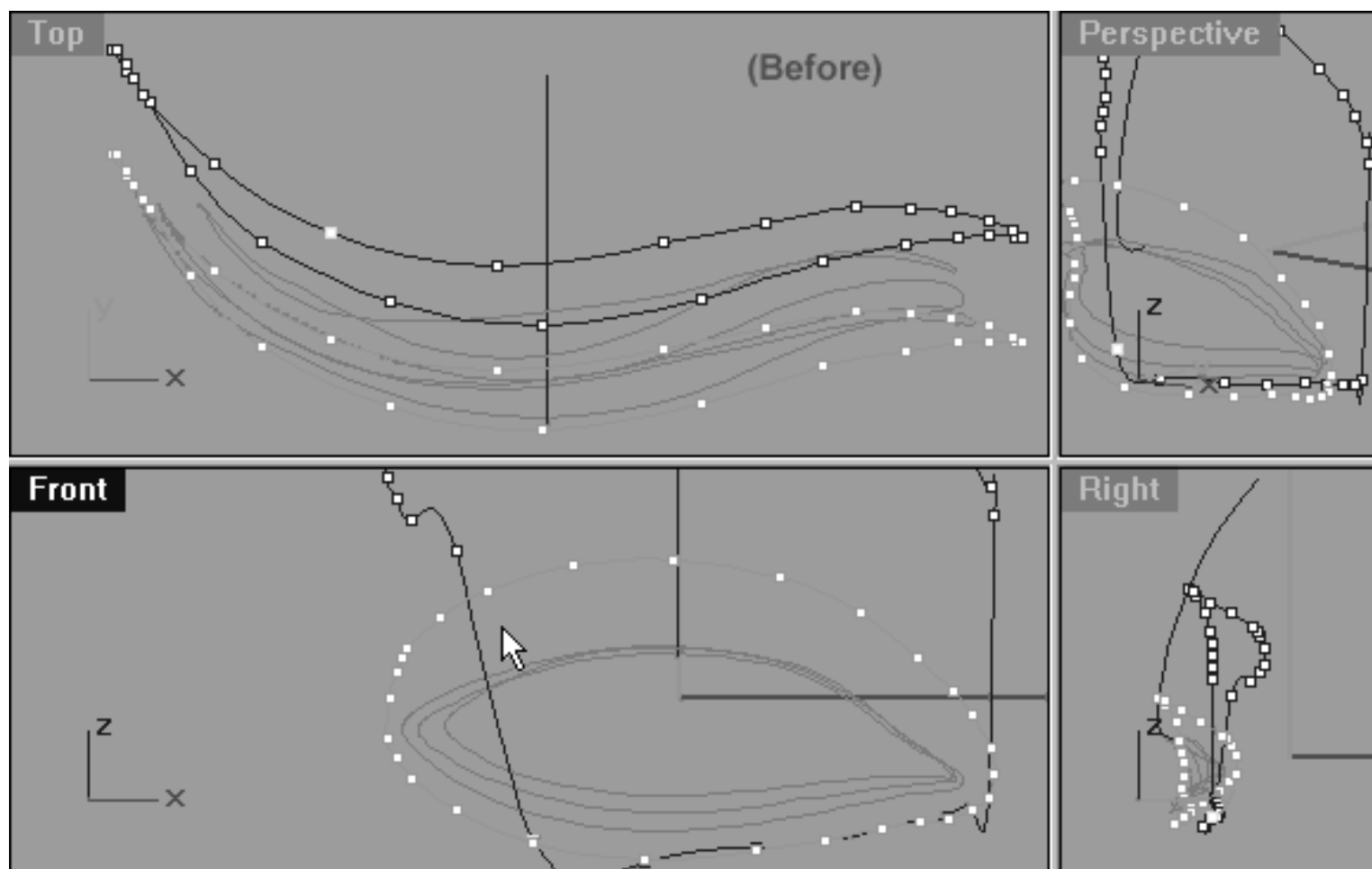
**Creating and editing the 5th Eyelid Curve, Part 1** [Click Here](#)

## Lower Left Side

Now let's start moving some points on the opposite side...

- Still working in the **Front Viewport**, this time select the point at the **7 o'clock** position on the lower row, left side -- it will highlight.
- Now whilst holding down the Shift key, move the point downward along the Z axis until it is aligned with its sister (see screenshot below entitled: Before).
- Working in a clockwise manner repeat this procedure with the following 4 lower row points. Your aim should again be to create a gentle arcing shape -- (see screenshot below entitled: After).

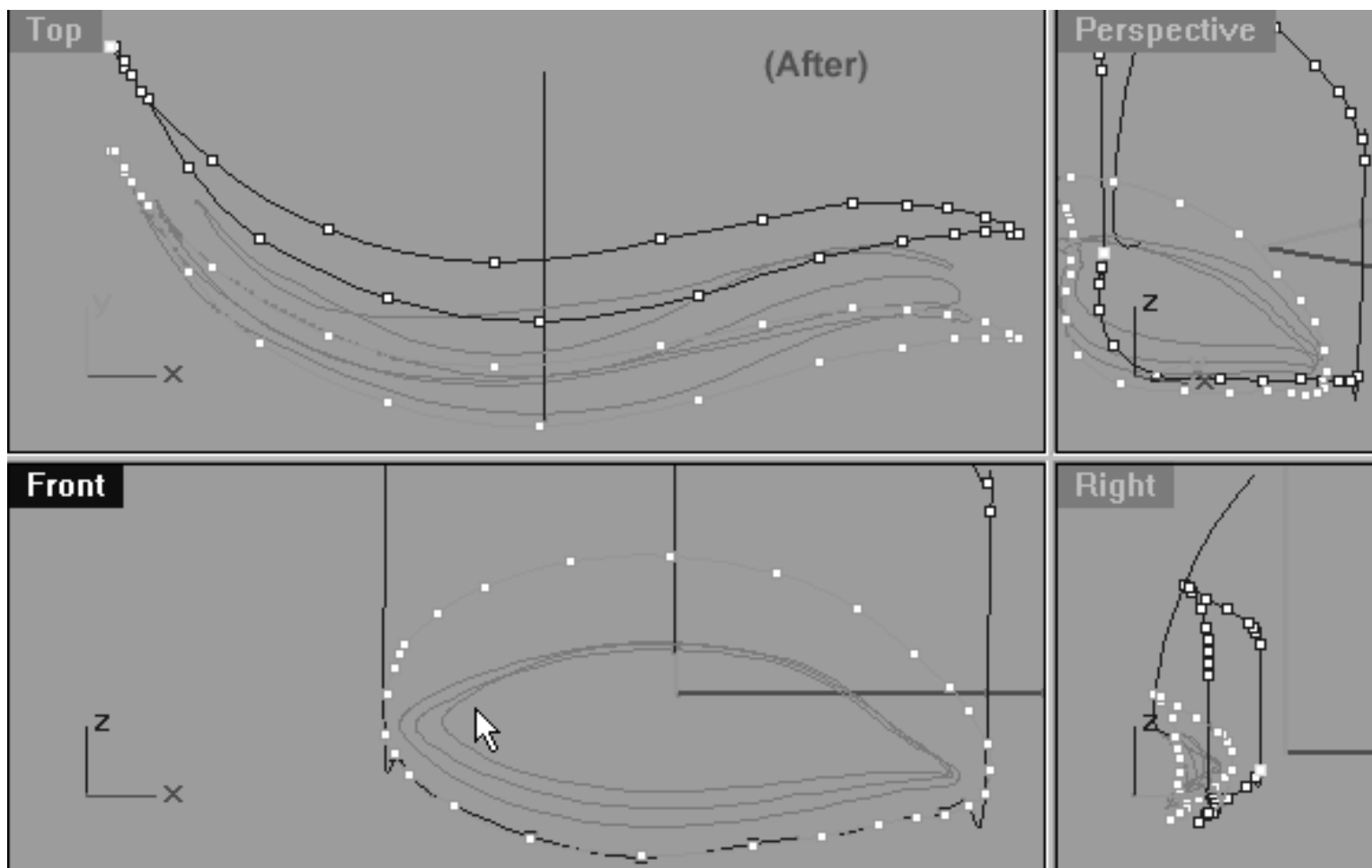
- Refer to the helper table for further guidance.



*This **All Viewport** screenshot shows the 5th Eyelid Curve (Eyelid\_05) lower row, left side. Notice that the point at roughly the 7 o'clock position (as seen from front view) has been selected and moved downward along the Z axis where it is now aligned with its sister point on the 4th curve.*

## Helper Table

Point	Approximate Units Moved
7 o'clock	Z: 13.087
Next point clockwise	Z: 13.089
Next point clockwise	Z: 13.094
Next point clockwise	Z: 13.077
Next point clockwise	Z: 13.090

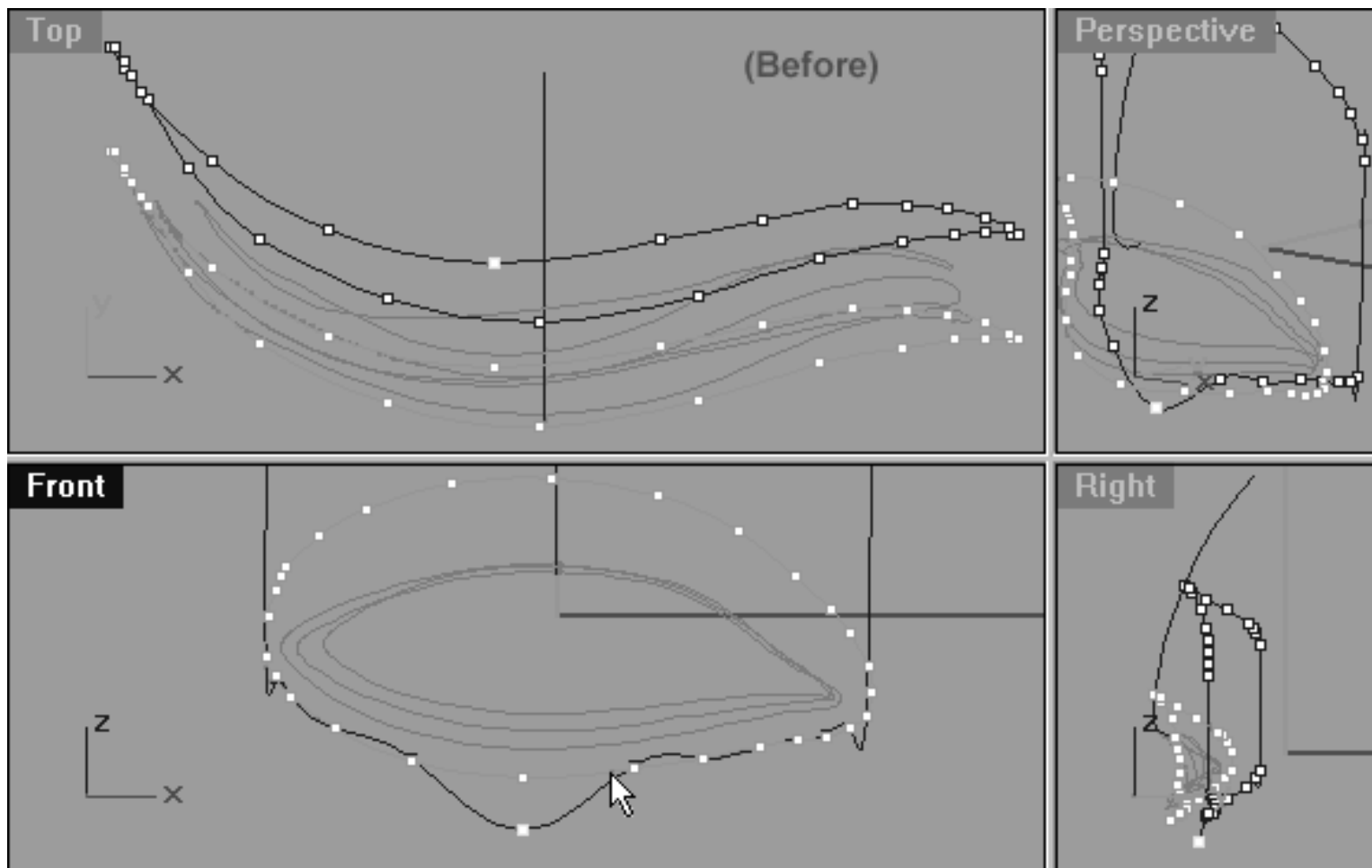


This **All Viewport** screenshot shows the 5th Eyelid Curve (Eyelid\_05) after editing has taken place on the lower row, left side. Notice that a total of 5 points were moved this time round.

## Open Wide -- Right Side

Now let's open up the curve and make it larger in the Front View...

- In the Front Viewport select the point at the 6 o'clock position and whilst holding down the Shift key move it downward along the Z axis -- (see screenshot below entitled: Before).
- Once done, continue working in a anti-clockwise manner and repeat the procedure with the next 7 points.
- When complete your monitor should resemble the screenshot below entitled: (After).
- Refer to the helper table for further guidance.

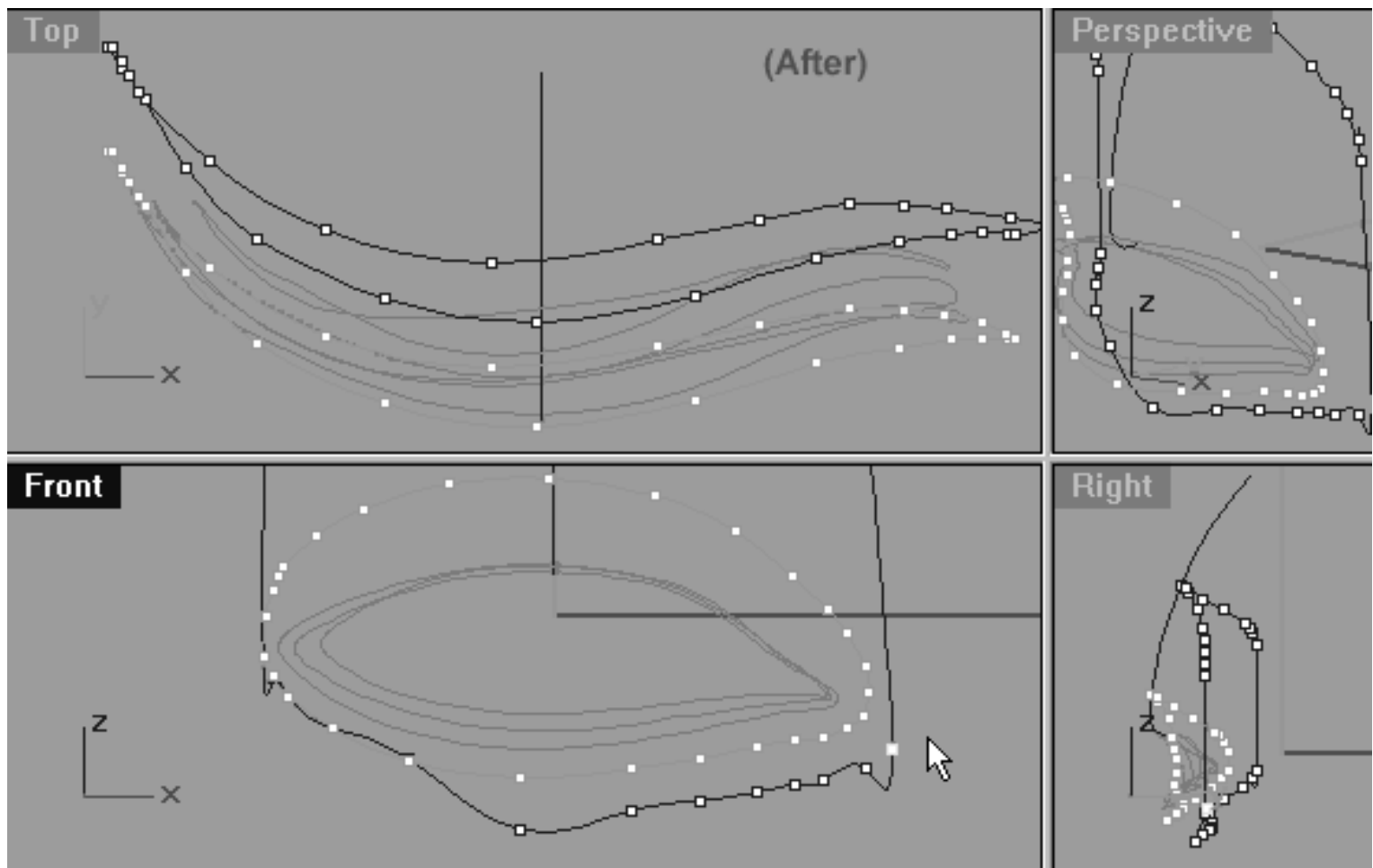


This **All Viewport** screenshot shows the 5th Eyelid Curve (Eyelid\_05) lower row, right side. Notice that the point at roughly the 6 o'clock position (as seen from front view) has been selected and moved downward.

## Helper Table

Point	Approximate Units Moved
6 o'clock	Z: 2.494, X: 0.331 (left)
Next point anti-clockwise	Z: 2.371, X: 0.349 (left)
Next point anti-clockwise	Z: 2.316, X: 0.327 (left)
Next point anti-clockwise	Z: 2.398, X: 0.185 (left)
Next point anti-clockwise	Z: 2.456, X: 0.118 (left)
Next point anti-clockwise	Z: 2.259, X: 0.099 (right)
Next point anti-clockwise	Z: 1.954, X: 0.945 (right)
Next point anti-clockwise	Z: 1.139, X: 1.568 (right)



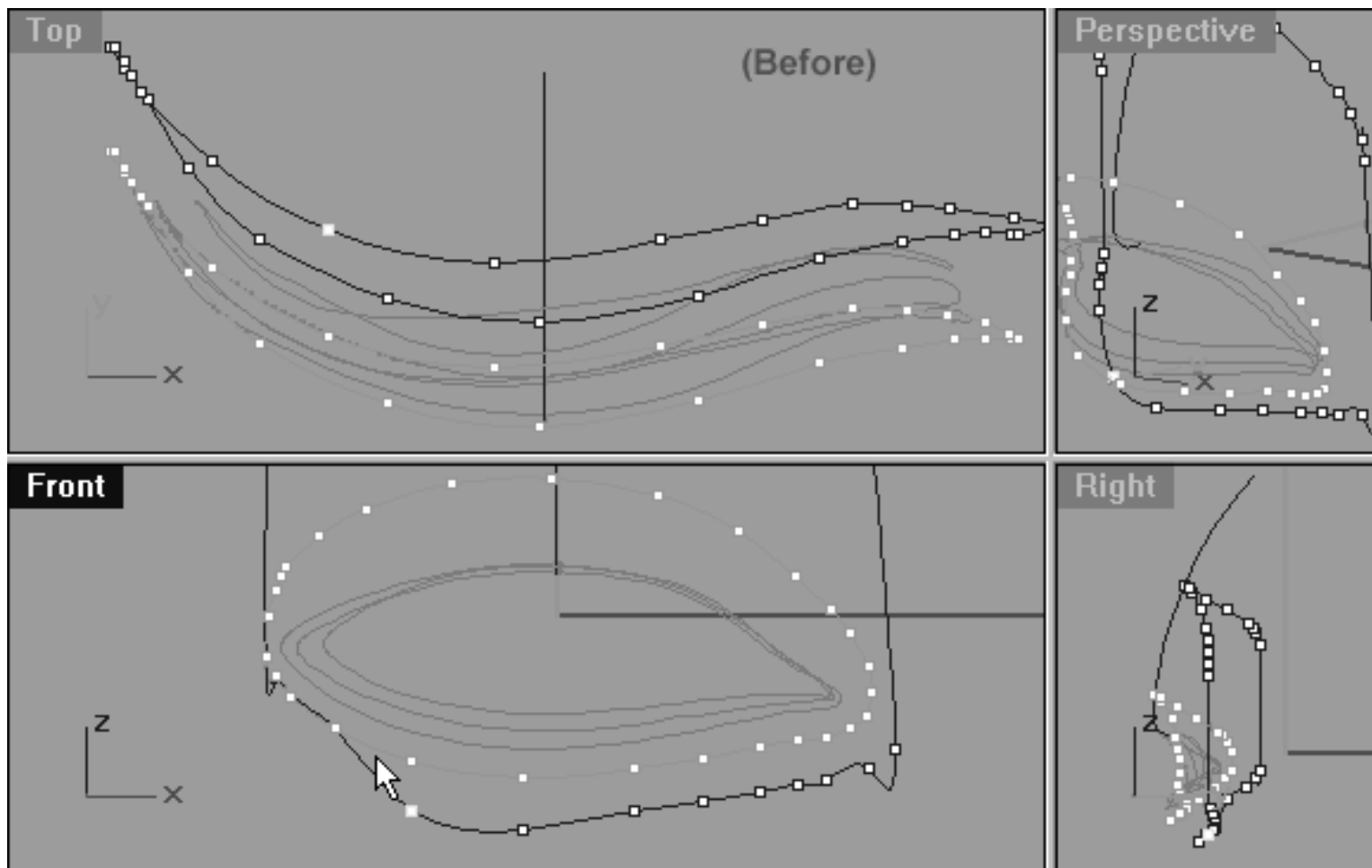


This **All Viewport** screenshot shows the 5th Eyelid Curve (Eyelid\_05) after editing has taken place on the lower row, right side. Notice that a total of 8 points were moved this time round.

## Open Wide -- Left Side

Now we do almost the same thing again only this time on the opposite side...

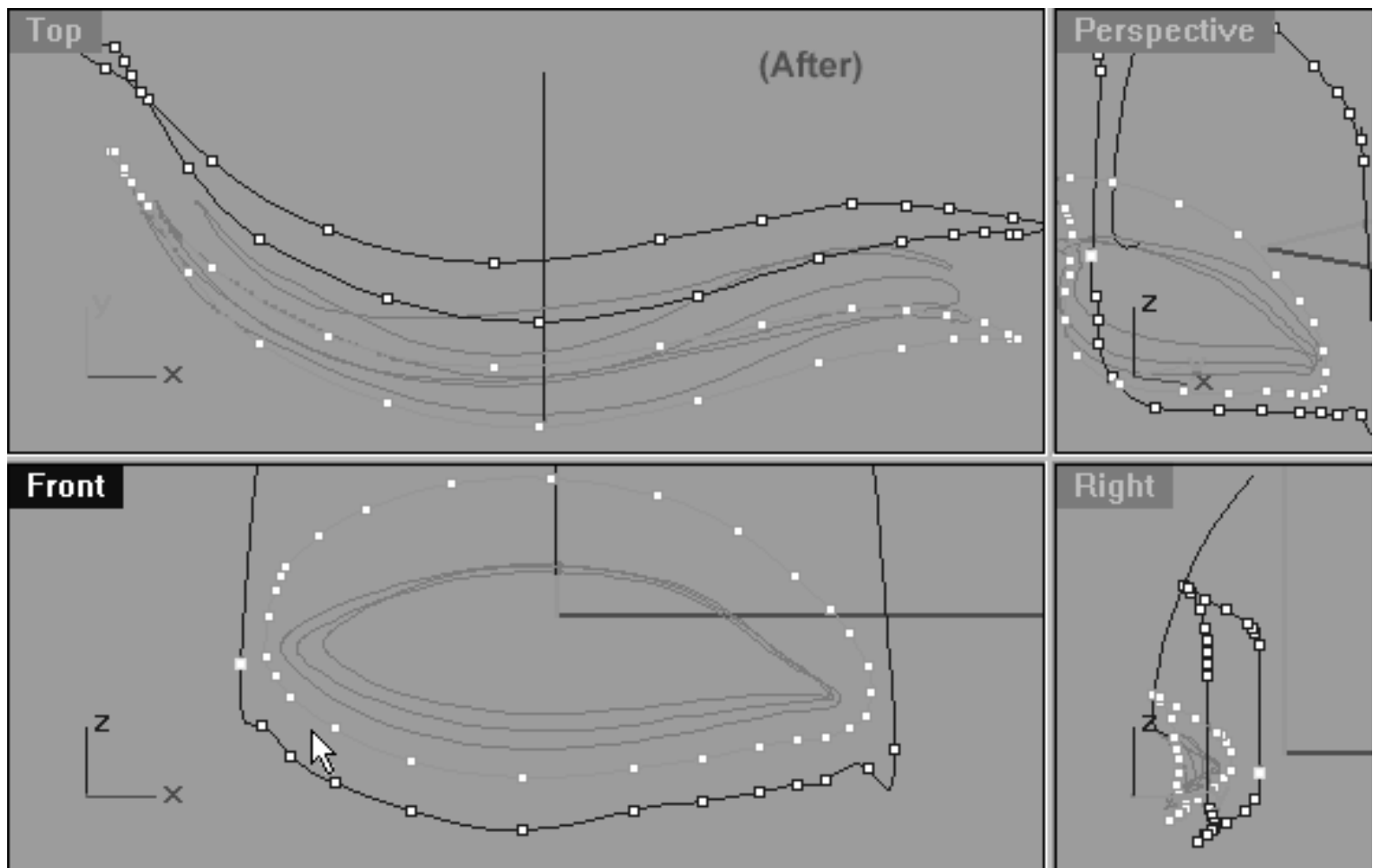
- In the Front Viewport select the point at the 7 o'clock position and whilst holding down the Shift key move it downward along the Z axis -- (see screenshot below entitled: Before).
- Once done, continue working in a clockwise manner and repeat the procedure with the next 4 points.
- When complete your monitor should resemble the screenshot below entitled: (After).
- Refer to the helper table for further guidance.



This **All Viewport** screenshot shows the 5th Eyelid Curve (Eyelid\_05) lower row, left side. Notice that the point at roughly the 7 o'clock position (as seen from front view) has been selected and moved downward.

### Helper Table

Point	Approximate Units Moved
7 o'clock	Z: 2.525, X: 0.330 (left)
Next point clockwise	Z: 2.585, X: 0.416 (left)
Next point clockwise	Z: 2.721, X: 0.612 (left)
Next point clockwise	Z: 2.307, X: 1.042 (left)
Next point clockwise	Z: 0.249, X: 1.352 (left)

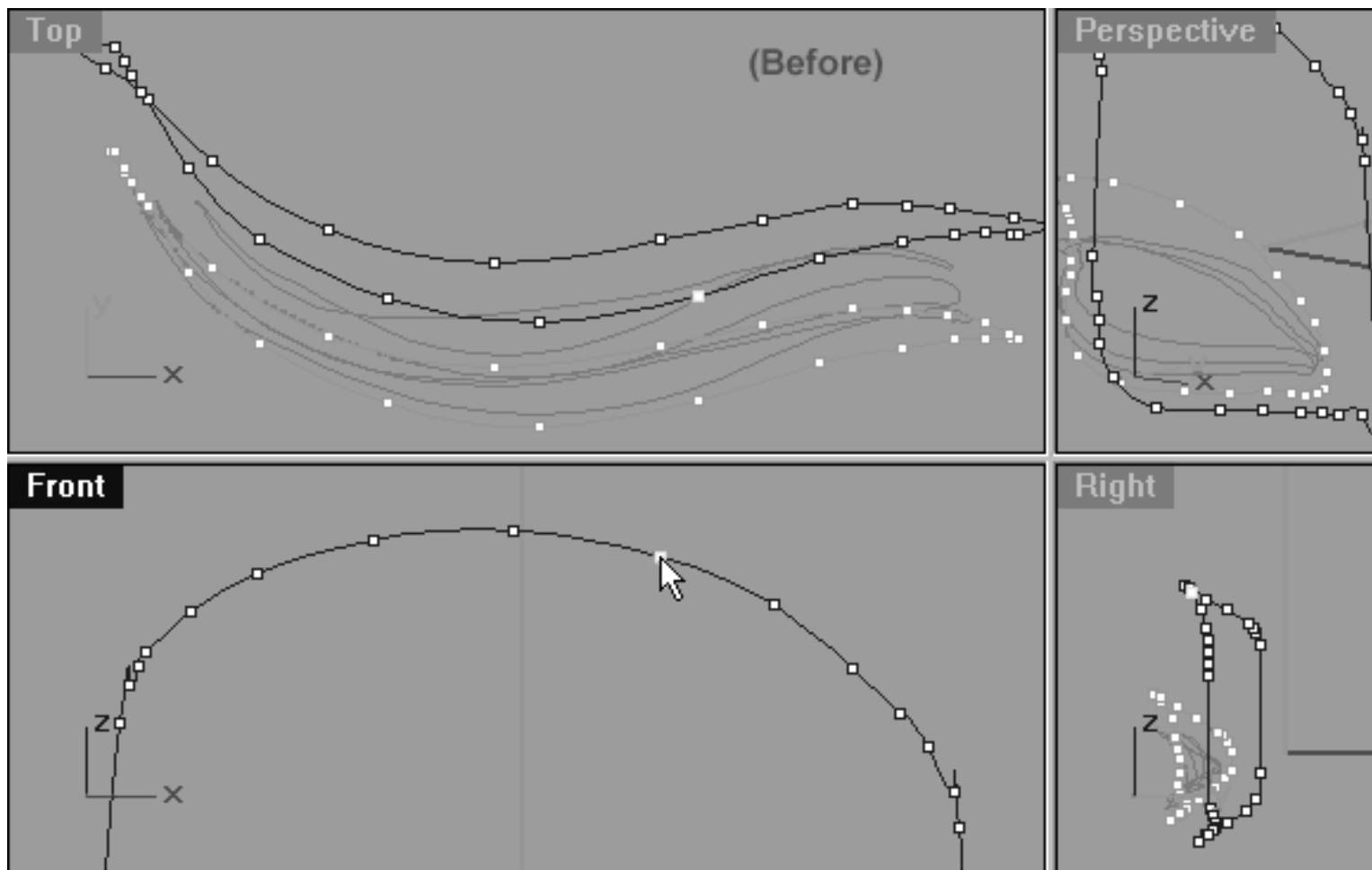


This **All Viewport** screenshot shows the 5th Eyelid Curve (Eyelid\_05) after editing has taken place on the lower row, left side. Notice that a total of 5 points were moved this time round.

## Upper Row, Right Side

It's time to refine the point placement and spacing on the upper row, right side.

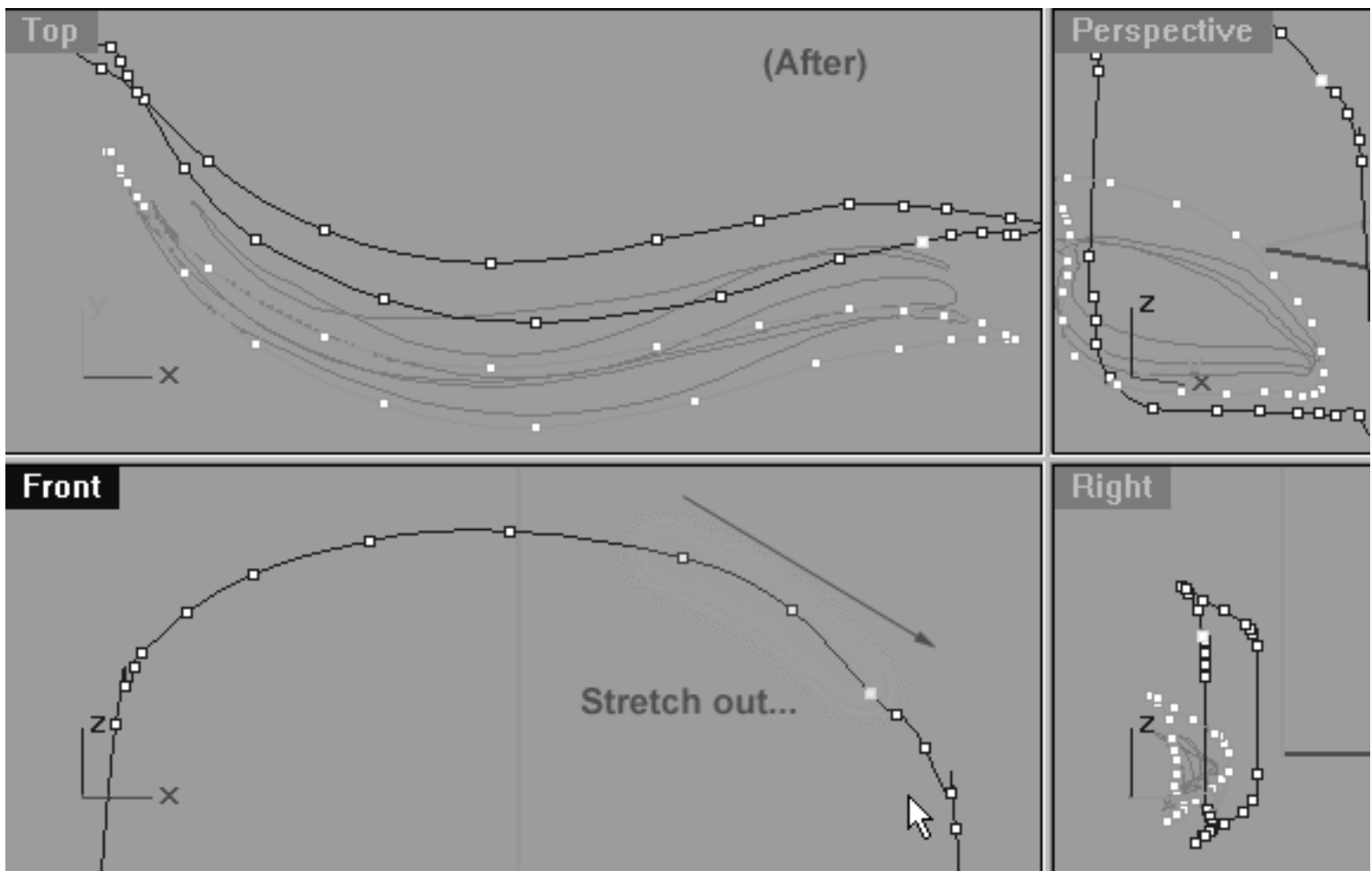
- In the **Front Viewport**, select the point at the 1 o'clock position (see screenshot below entitled: Before).
- Next, slide the point outward along the X axis and at the same time slightly downward or upward as required along the Z (see screenshot below entitled: After).
- Once done, continue working in a clockwise manner and repeat the procedure with the next 2 points only. When complete your monitor should resemble the screenshot below (After).
- Refer to the helper table for further guidance.



This **All Viewport** screenshot shows the point at the 1 o'clock position has now been selected and is ready to be moved outward along the X axis and downward slightly along the Z (as seen from the Front View).

## Helper Table

Point	Approximate Units Moved
1 o'clock	X: 0.543 (right), Z: 0.086 ( <b>up</b> )
Next point clockwise	X: 0.539 (right), Z: 0.150 (down)
Next point clockwise	X: 0.527 (right), Z: 1.026 (down)



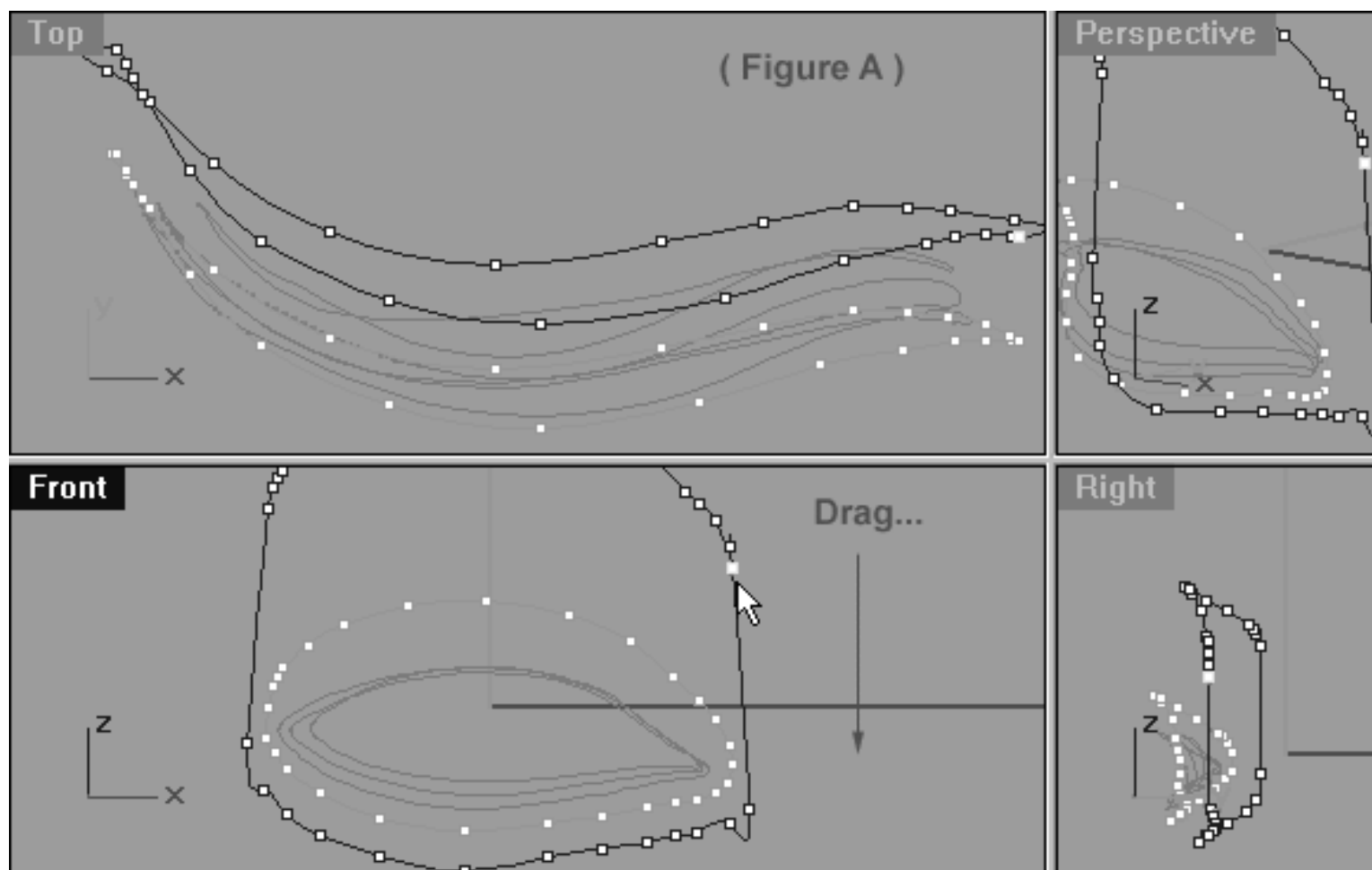
This **All Viewport** screenshot shows that starting with the point at the 1 o'clock position a total of 3 points (highlighted in green) have now been moved outward along the X axis and downward or upward as required slightly along the Z (as seen from the Front View).

## Just Call Me Stretch Right Side

It's now important for us to adjust the spacing of the points even further on this side and we will do this by stretching them out quite a bit along the Z axis in the front view.

- In the **Front Viewport**, start with the point at the 12 o'clock position and using your eyes only work in a clockwise direction along the upper row until you've located the last point before the big gap, when you've done so select it (see Figure A below).
- Next, whilst holding down the Shift key drag the point downward along the Z axis until it is roughly parallel with the 6th point from the 12 o'clock position on the **4th eyelid curve** (see Figure B below). **\*Hint** -- not only should the point be moved downward along the Z axis but also outward slightly along X too, don't forget to hold down the Shift key.
- Once done, start working your way anti-clockwise (backwards) along the points in an incremental manner repeating the procedure and dragging each one downward until you've stretched out a total of 4 points (see Figure C below).

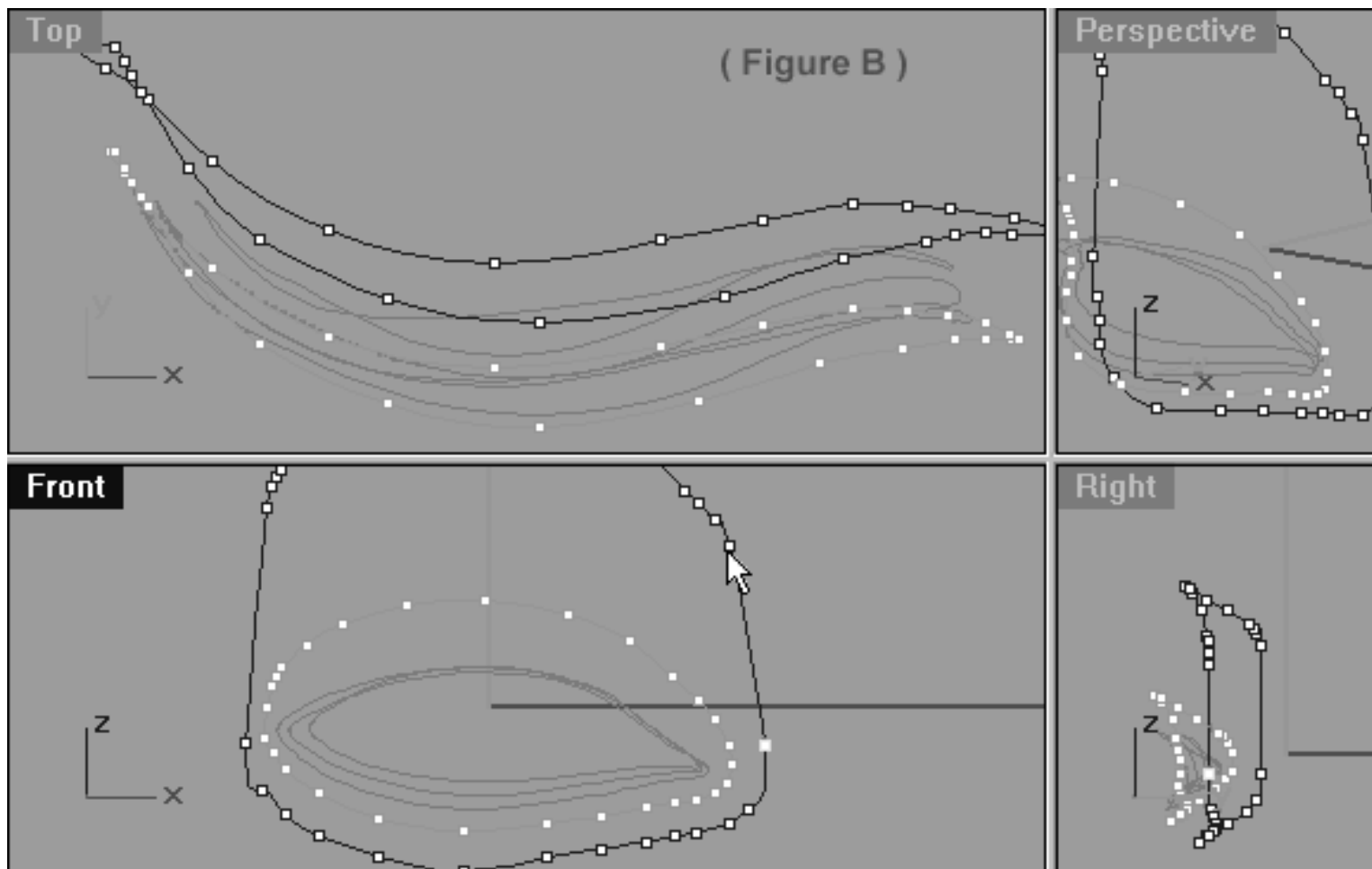
- Refer to the helper table for further guidance.



*This **All Viewport** screenshot shows the last point before the large gap has now been selected and is ready to be moved downward along the Z axis and outward slightly along the X (as seen from the Front View).*

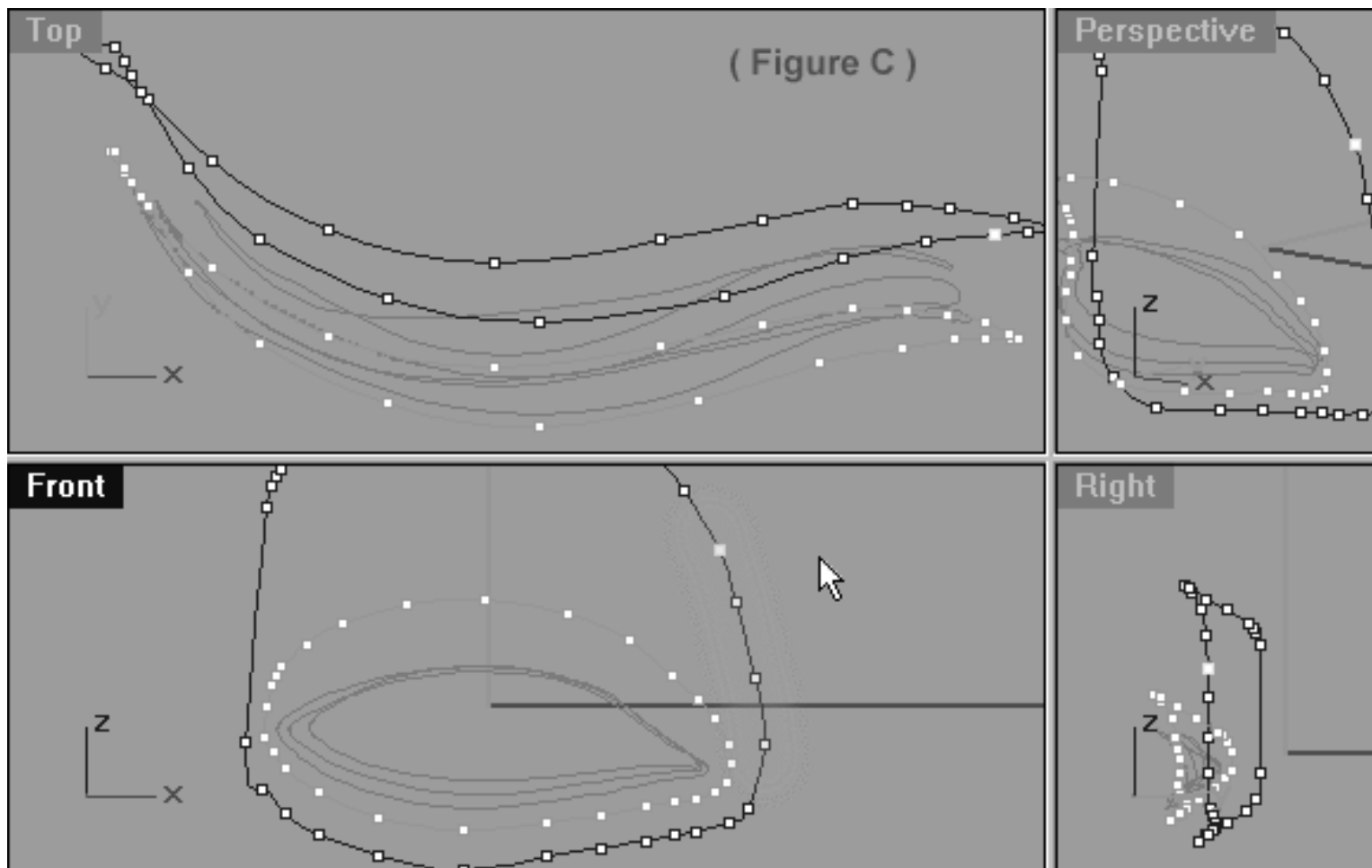
## Helper Table

Point	Approximate Units Moved
Point before gap	Z: 11.667, X: 1.844 (right)
Next point anti-clockwise	Z: 8.734, X: 1.635 (right)
Next point anti-clockwise	Z: 5.187, X: 1.256 (right)
Next point anti-clockwise	Z: 2.998, X: 0.973 (right)



*This **All Viewport** screenshot shows the last point before the large gap has now been moved downward along the Z axis and outward slightly along the X (as seen from the Front View). \*Hint -- the cursor shows the point to be dragged downward next.*





This **All Viewport** screenshot shows that a total of 4 points have now been moved downward along the Z axis and outward slightly along the X (as seen from the Front View).



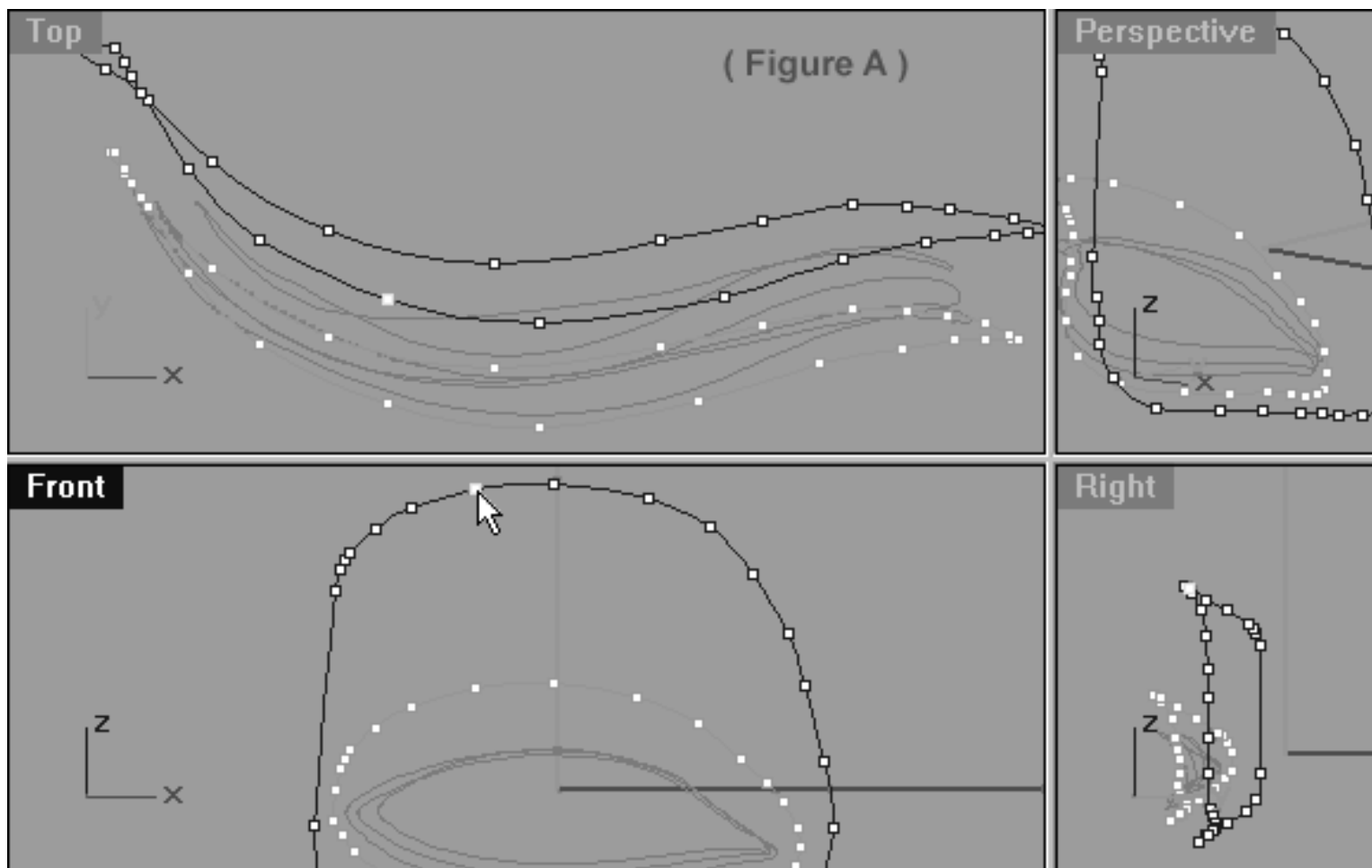
**View an example movie**

**Editing the 5th Eyelid Curve, Pt. 2 [Click Here](#).**

## Upper Row, Left Side

It's time to refine the point placement and spacing on the upper row, left side.

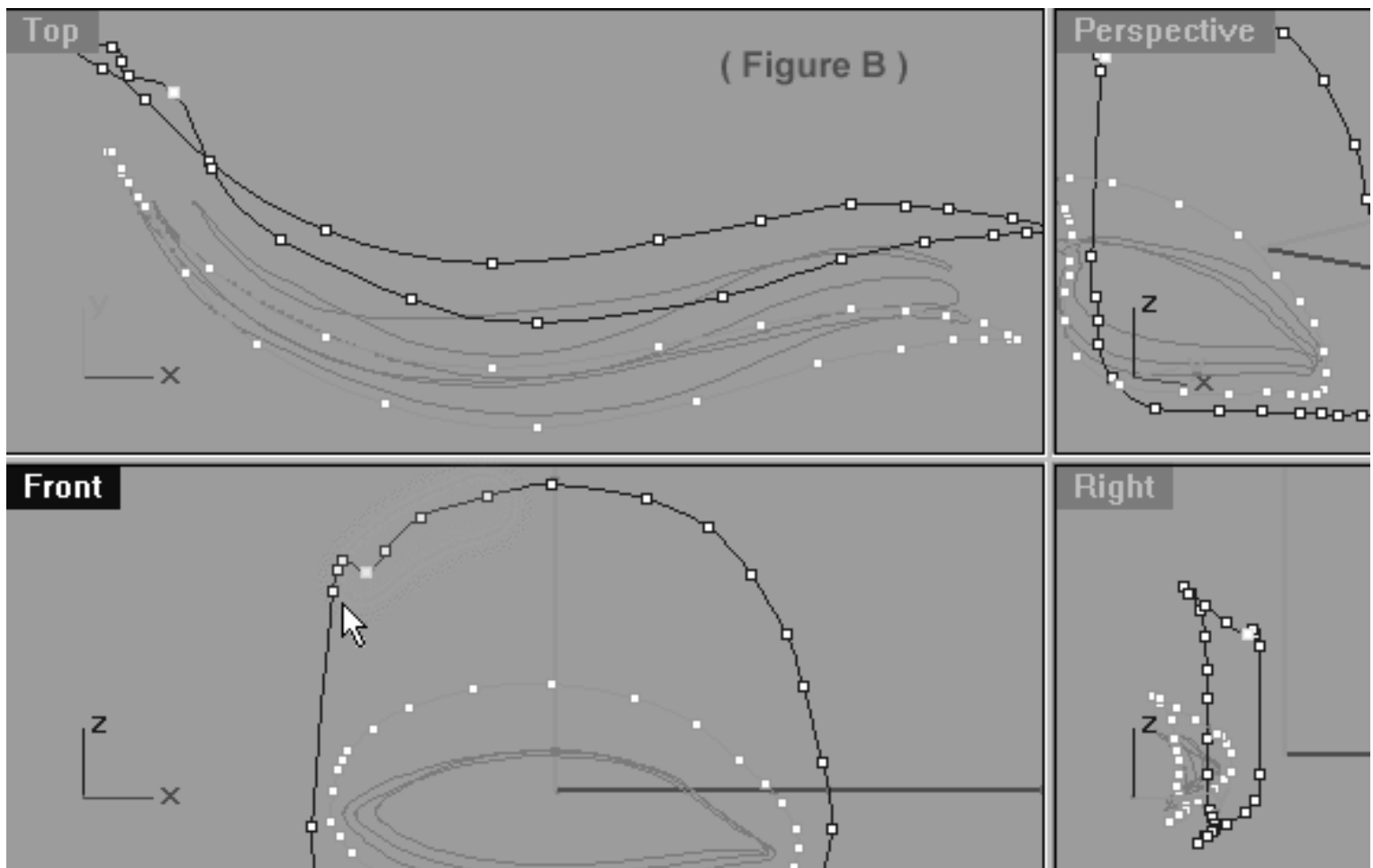
- In the **Front Viewport**, select the point at the 11 o'clock position (see Figure A Below).
- Next, whilst holding down the Shift key slide the point downward along the Z axis. Next, move the point ever so slightly inward along the X (see Figure B below).
- Once done, continue working anti-clockwise and repeat the procedure with the next 3 points (see figure B below).
- Refer to the helper table for further guidance.



This **All Viewport** screenshot shows the point at the 11 o'clock position has now been selected and is ready to be moved downward along the Z axis and inward very slightly along the X (as seen from the Front View).

### Helper Table

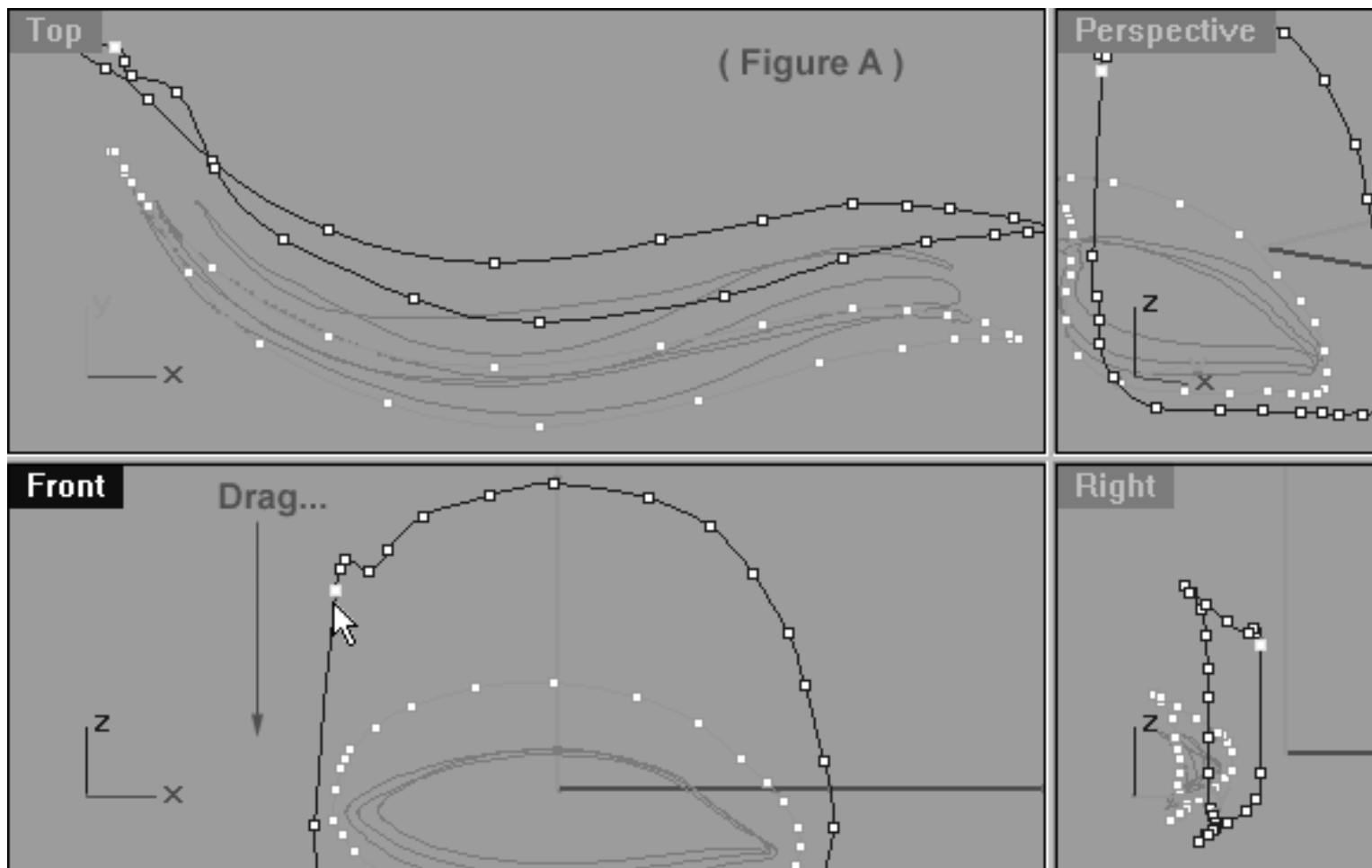
Point	Approximate Units Moved
11 o'clock	Z: 0.145, X: 0.791 (right)
Next point anti-clockwise	Z: 0.433, X: 0.674 (right)
Next point anti-clockwise	Z: 1.031, X: 0.435 (right)
Next point anti-clockwise	Z: 2.119, X: 0.235 (right)



This **All Viewport** screenshot shows that a total of 4 points have now been moved downward along the Z axis and inward slightly along the X (as seen from the Front View).

## Just Call Me Stretch -- Left Side

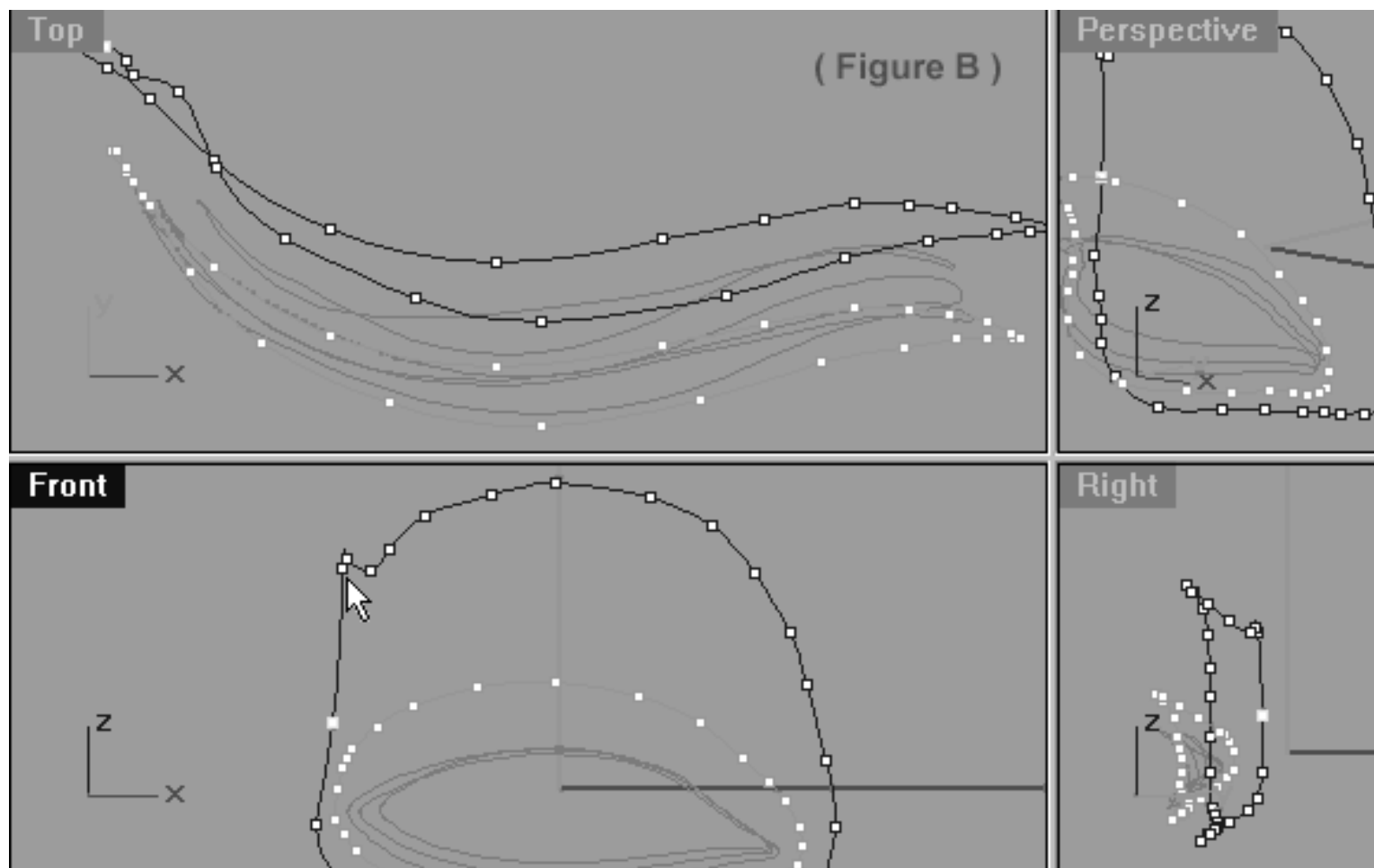
- In the **Front Viewport**, start with the point at the 12 o'clock position and using your eyes only work in a anti-clockwise direction along the upper row until you've located the last point before the big gap, when you've done so select it (see Figure A below).
- Next, whilst holding down the Shift key, drag the point downward along the Z axis until it is roughly parallel with the 3rd point from the 12 o'clock position on the **4th eyelid curve** (see Figure B below). **\*Hint** -- not only should the point be moved downward along the Z axis but also outward slightly along X too, don't forget to hold down the shift key.
- Once done, start working your way clockwise (backwards) along the points in an incremental manner repeating the procedure and dragging each one downward until you've stretched out a total of 3 points (see Figure C below).
- Refer to the helper table for further guidance.



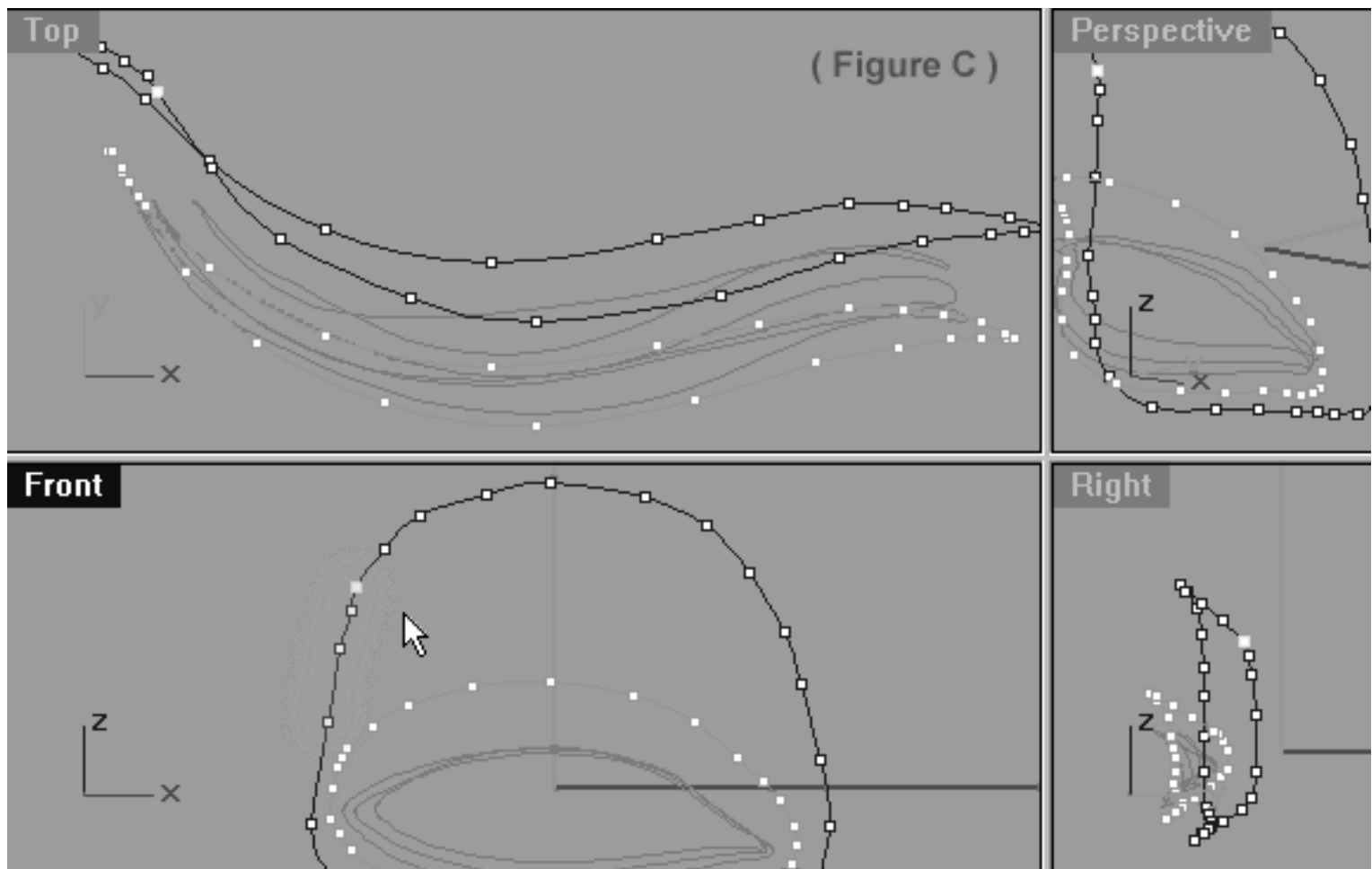
This **All Viewport** screenshot shows the last point before the large gap has now been selected and is ready to be moved downward along the Z axis and outward slightly along the X (as seen from the Front View).

### Helper Table

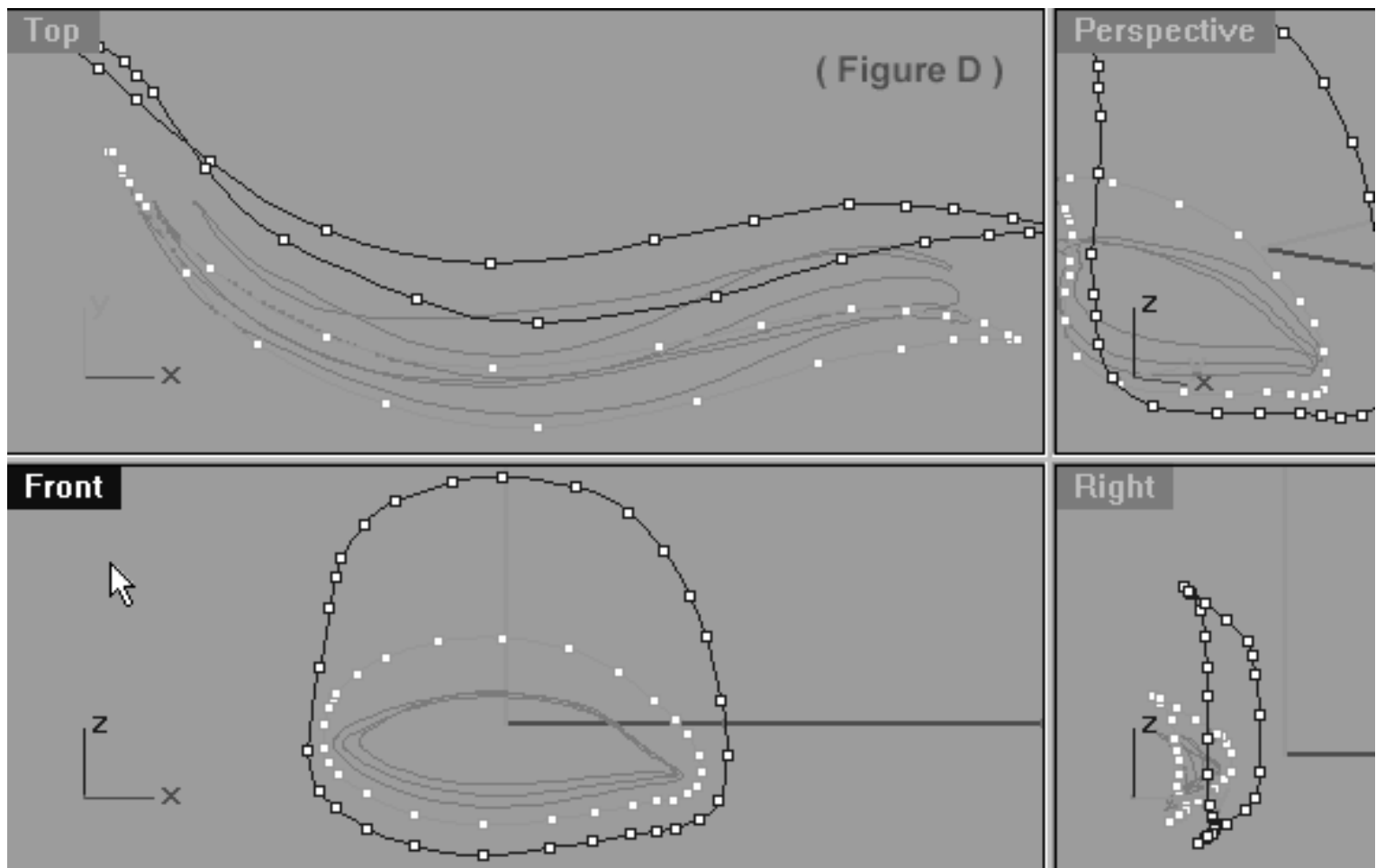
Point	Approximate Units Moved
Last point before gap	Z: 8.416, X: 0.656 (left)
Next point anti-clockwise	Z: 4.865, X: 0.143 (left)
Next point anti-clockwise	Z: 3.112, X: 0.097 (right)



This **All Viewport** screenshot shows the last point before the large gap has now been moved downward along the Z axis and outward slightly along the X (as seen from the Front View). \*Hint -- the cursor shows the point to be dragged downward next.



*This **All Viewport** screenshot shows that a total of 3 points have now been moved downward along the Z axis and outward slightly along the X (as seen from the Front View).*

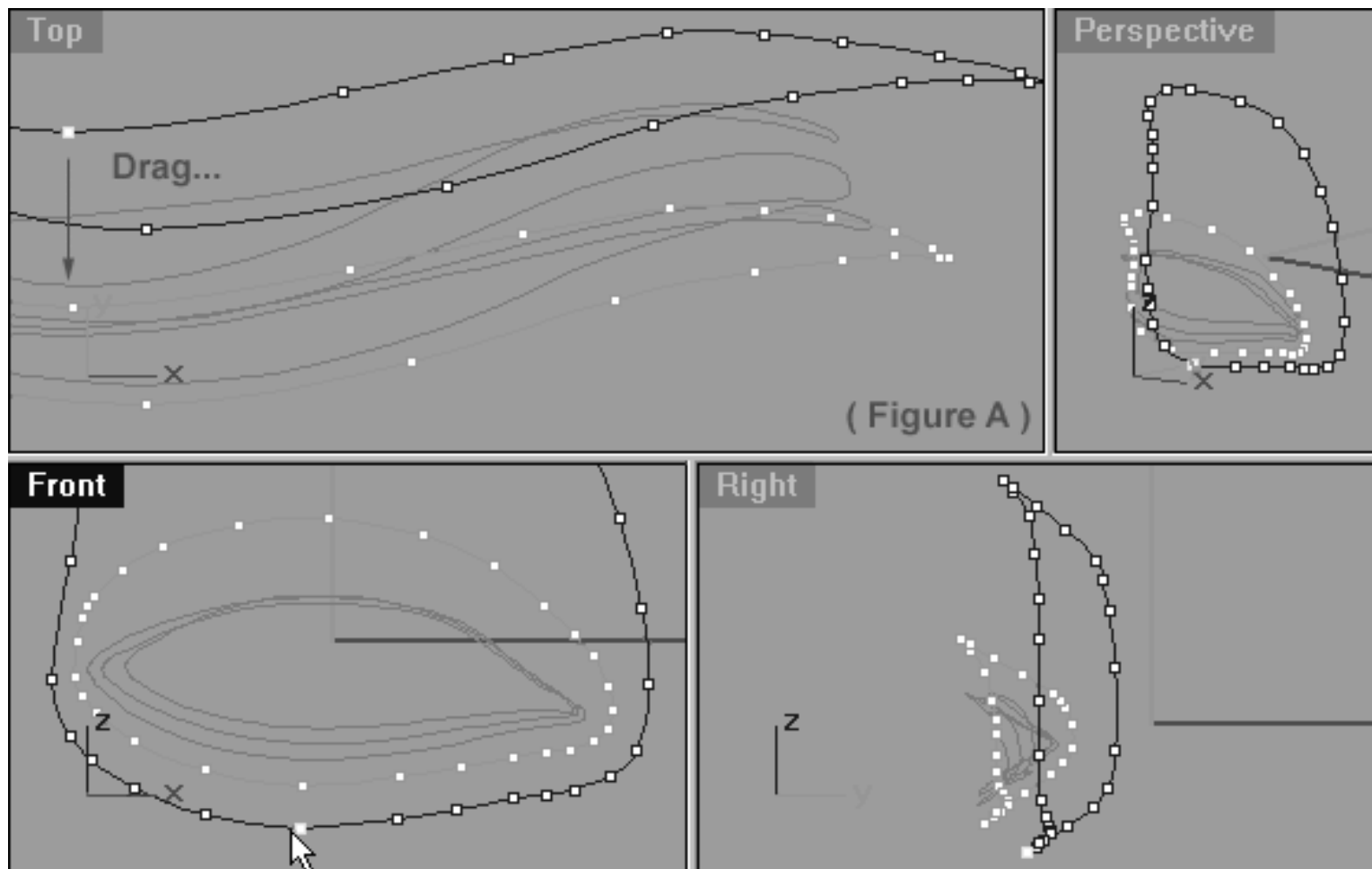


This **All Viewport** screenshot shows how the curve should look after some very minor further refinement and clean up. Observe that the area that we've just edited is a bit less lumpy and bumpy than it was in (Figure C).

## Lower Row, Right Side

- Begin by rearranging your viewports so that you can clearly see the Top, Front and Right viewports all at the same time, something similar to the screenshot below entitled: (Figure A).
- In the Front Viewport select the point at the 6 o'clock position on the lower curve -- see the screenshot below entitled: (Figure A). Once done, move your cursor into the Top Viewport and while holding down the Shift Key move it downward along the Y axis.
- Continue working in an anti-clockwise direction and repeat this procedure with the next 7 lower row points until you've created a shape similar to that of the screenshot below entitled: (Figure B).
- Refer to the helper table for further guidance.

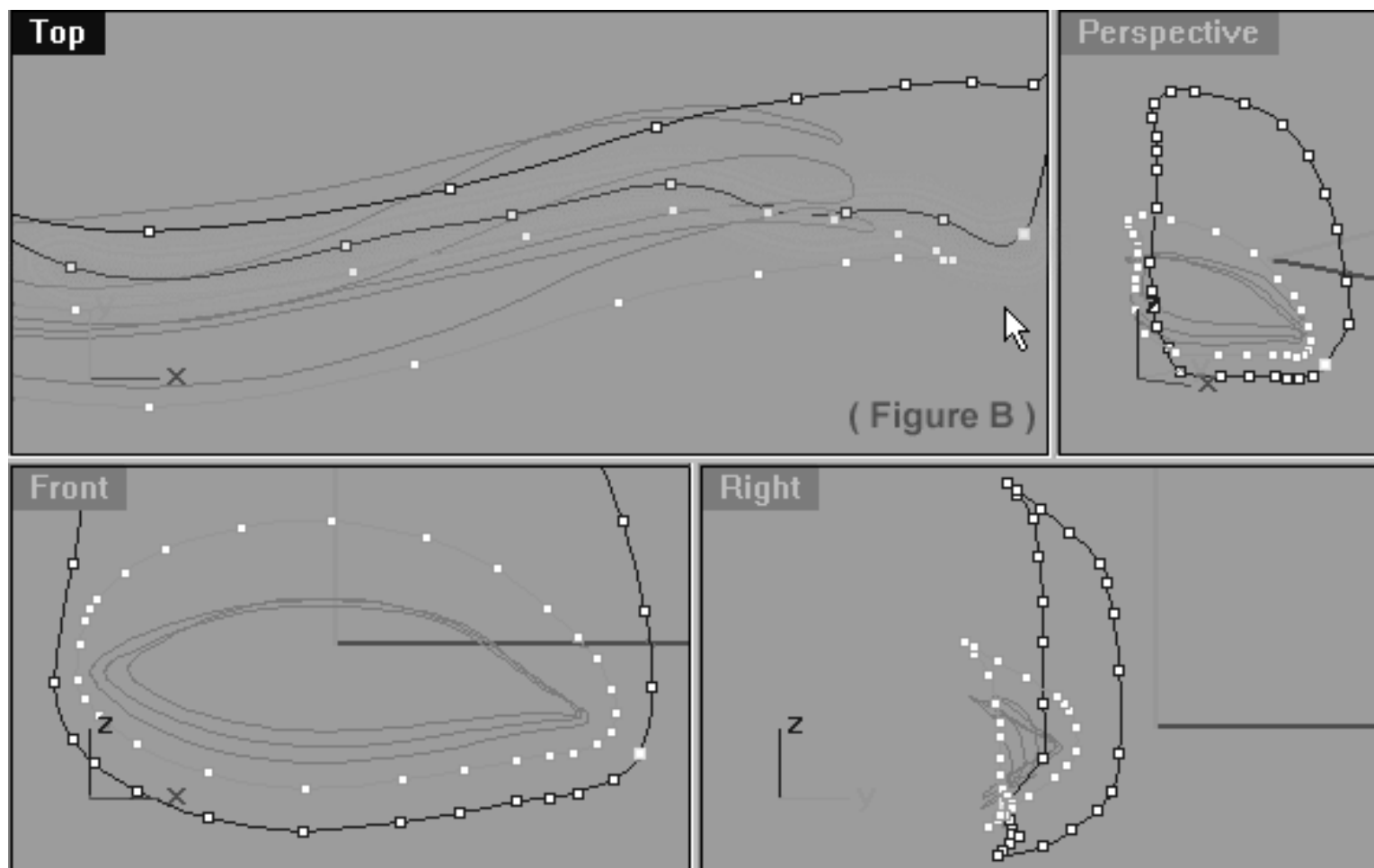




*This **All Viewport** screenshot shows the lower row, right side of the curve prior to any editing taking place. Notice, that the point at the 6 o'clock position has been selected and is ready to be moved.*

## Helper Table

Point	Approximate Units Moved
6 o'clock	Y: 2.814
Next point anti-clockwise	Y: 3.067
Next point anti-clockwise	Y: 3.128
Next point anti-clockwise	Y: 3.269
Next point anti-clockwise	Y: 3.458
Next point anti-clockwise	Y: 3.444
Next point anti-clockwise	Y: 3.464
Next point anti-clockwise	Y: 3.348



This **All Viewport** screenshot shows the lower row, right side of the curve after editing has taken place. Notice, that starting at the 6 o'clock position and working anti-clockwise the next 7 lower row points have been moved downward along the Y axis (as seen from the top view) and (highlighted in green). Observe the shape that this action has produced and its relationship to that of the other curves. Don't worry if it looks a little lumpy at the moment, we will fix that soon.

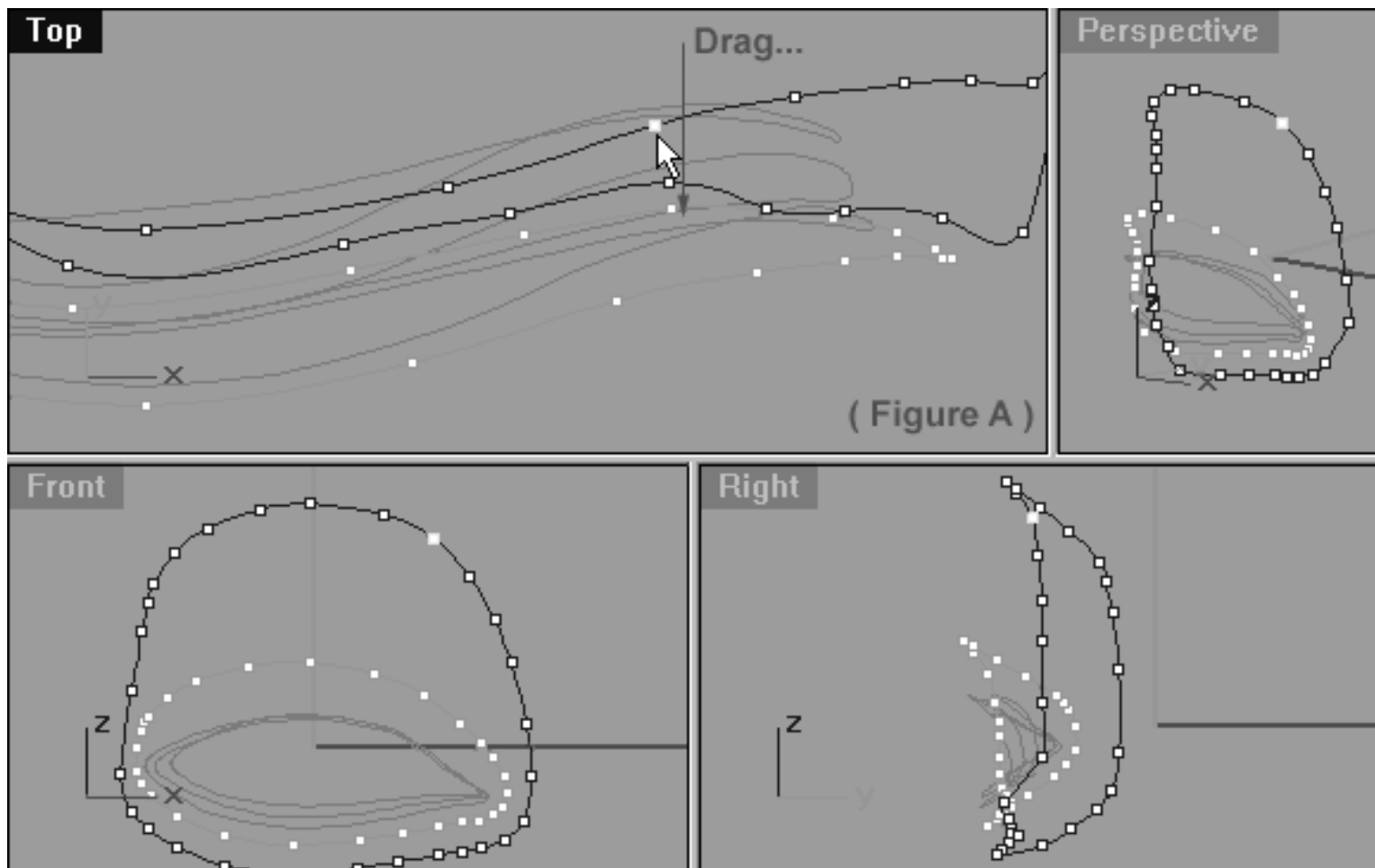


**View an example movie**

**Editing the 5th Eyelid Curve, Pt. 3** [Click Here](#)

## Upper Row -- Right Side

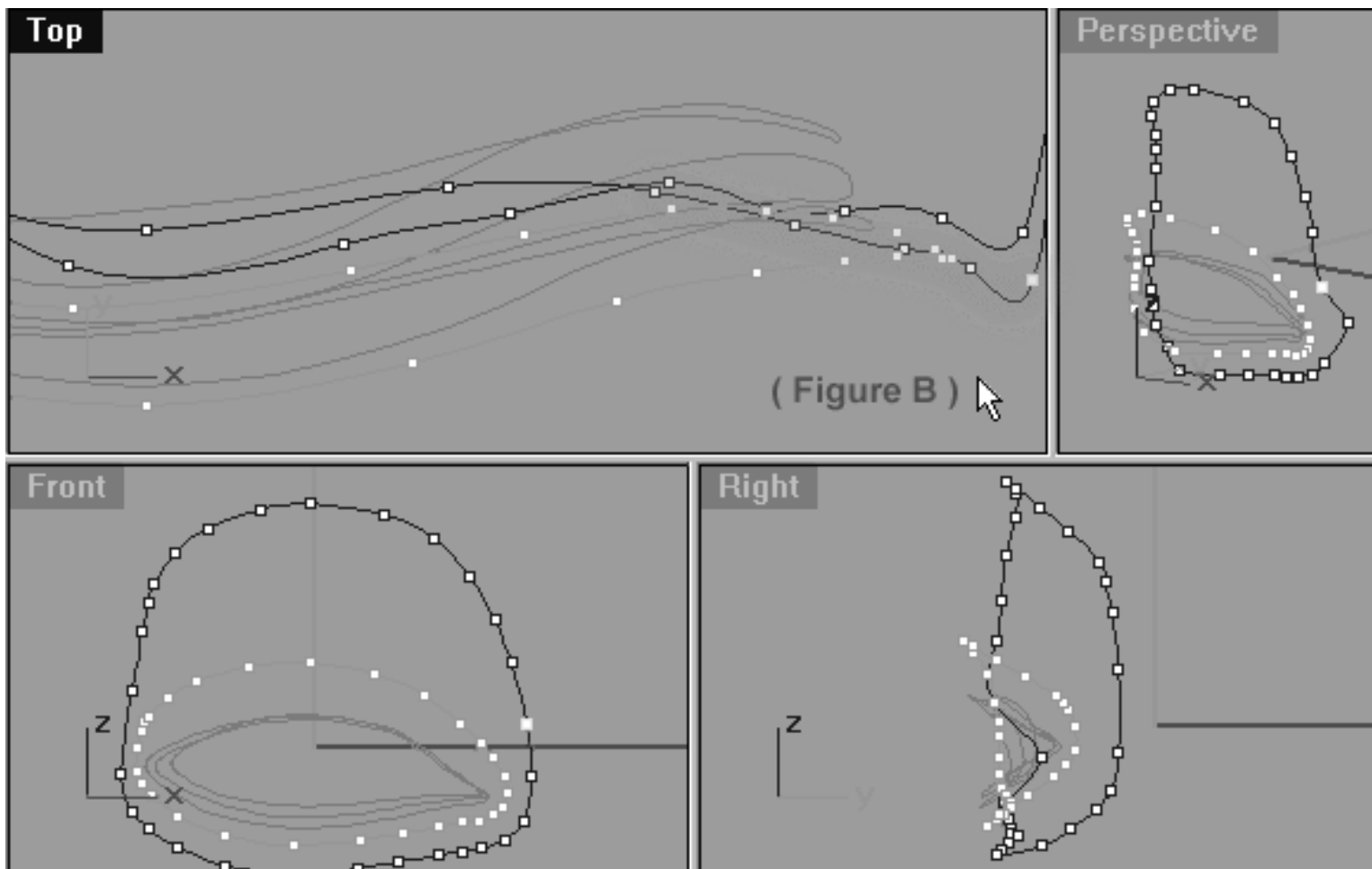
- In the Front Viewport and working in a clockwise direction locate the 2nd point from the 12 o'clock position on upper row, right side -- when you've done so select it (see Figure A below).
- Next, move your cursor into the Top Viewport and while holding down the Shift key move the point downward along the Y axis (see Figure B below).
- Once done, continue on in a clockwise direction and repeat the procedure with the next 4 points. When completed, your monitor should resemble the screenshot below (see Figure B).



This **All Viewport** screenshot shows the 2nd point from the 12 o'clock position has now been selected (as seen from the Front View) and is now ready to be moved downward along the Y axis while working in the **Top Viewport**.

## Helper Table

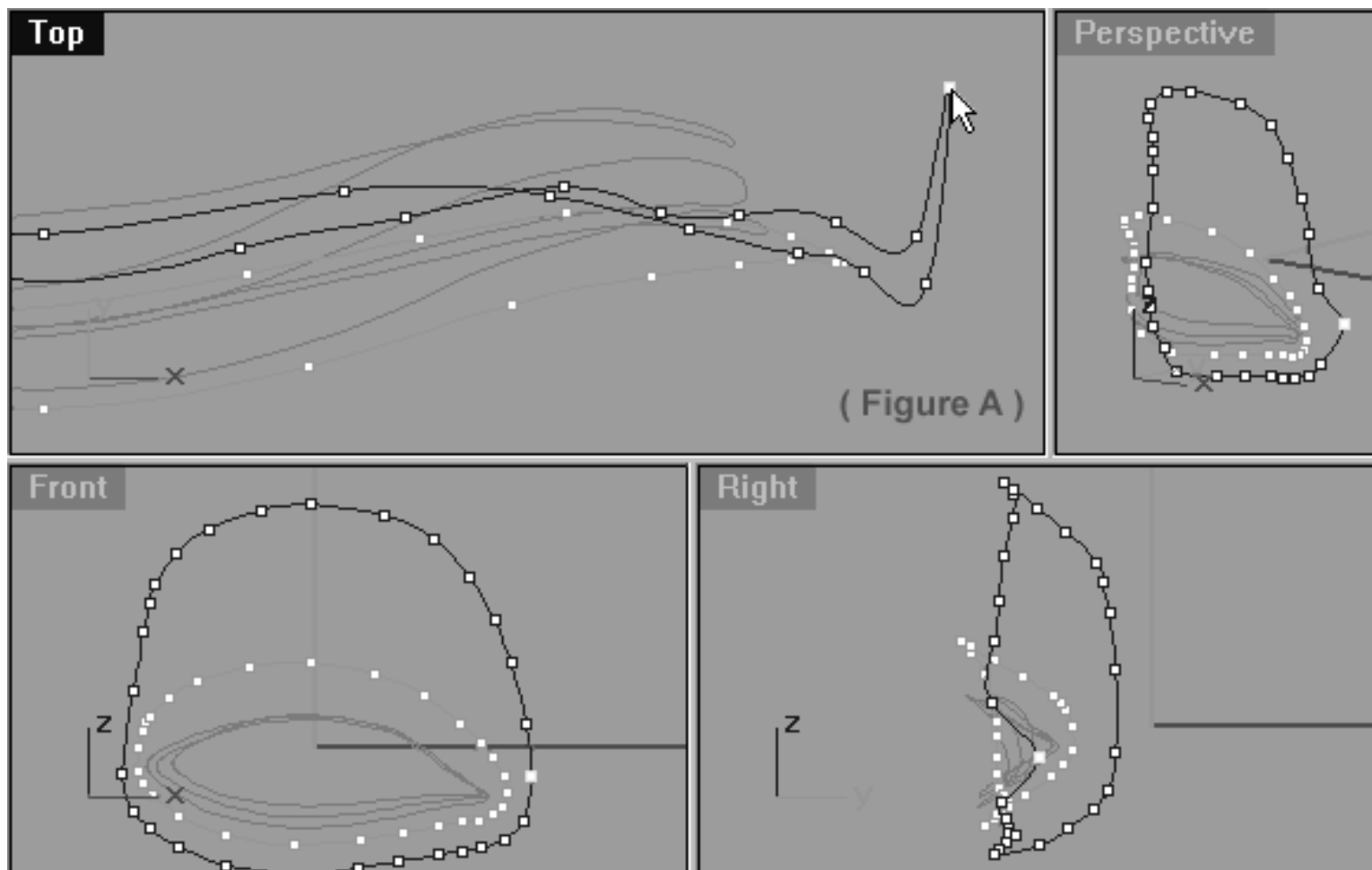
Point	Approximate Units Moved
2 o'clock	Y: 1.389
Next point clockwise	Y: 2.701
Next point clockwise	Y: 3.532
Next point clockwise	Y: 3.982
Next point clockwise	Y: 4.029



*This **All Viewport** screenshot shows the 2nd point from the 12 o'clock position has now been moved and is resting in the correct location. In addition, the next 4 points have now also been moved downward along the Y axis while working in the **Top Viewport**.*

It's now quite obvious that the corner point will now have to be sorted out -- let's do that now...

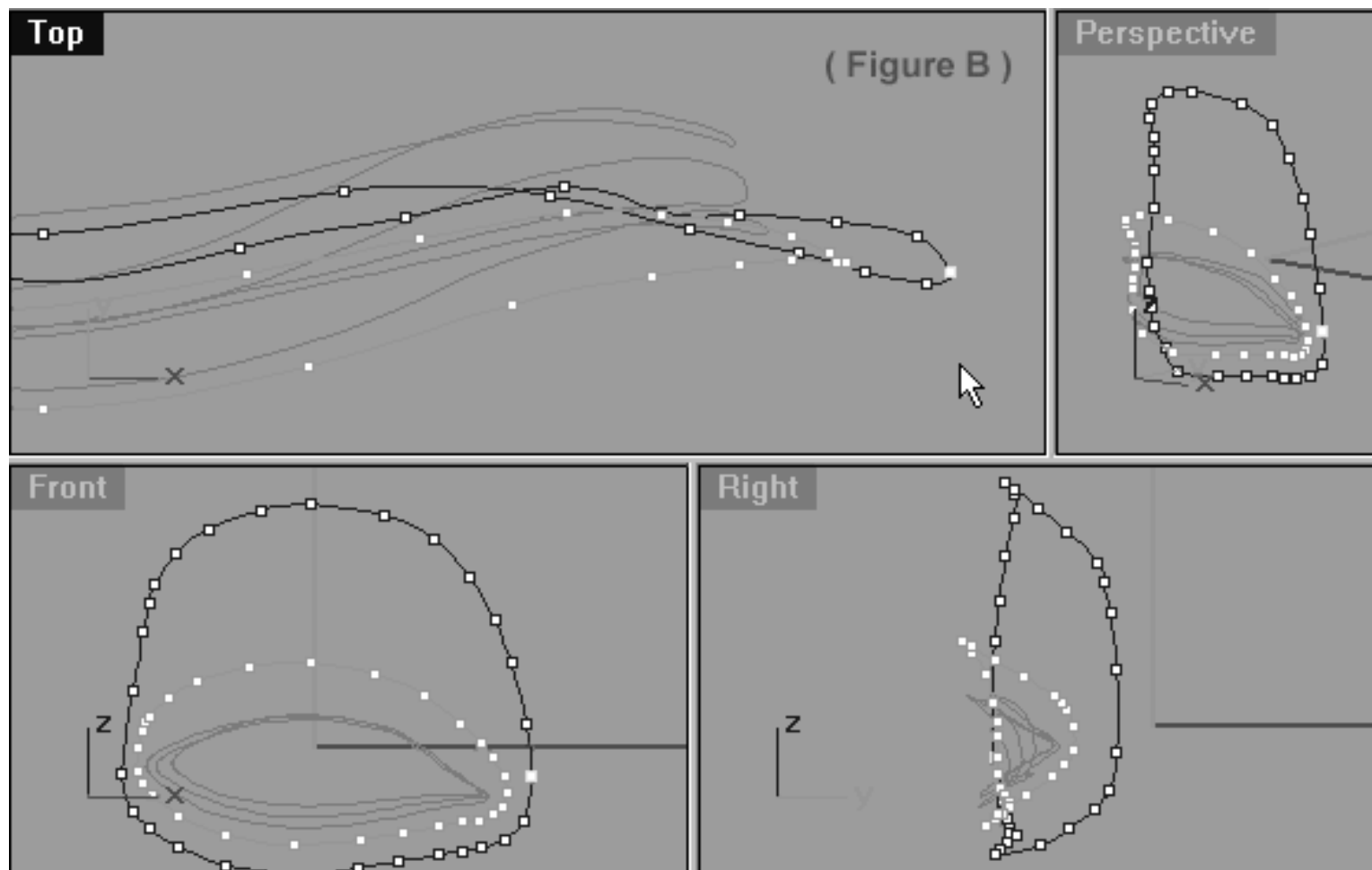
- Pan the Top Viewport so that the right side corner point is clearly visible and once done, select it (see Figure A below).
- Next, while holding down the shift key move the corner point downward along the Y axis (see Figure B below).
- Refer to the helper table for further guidance.



*This **All Viewport** screenshot shows that the right side corner point has now been selected and is ready to be moved downward along the Y axis in the Top Viewport.*

**Helper Table**

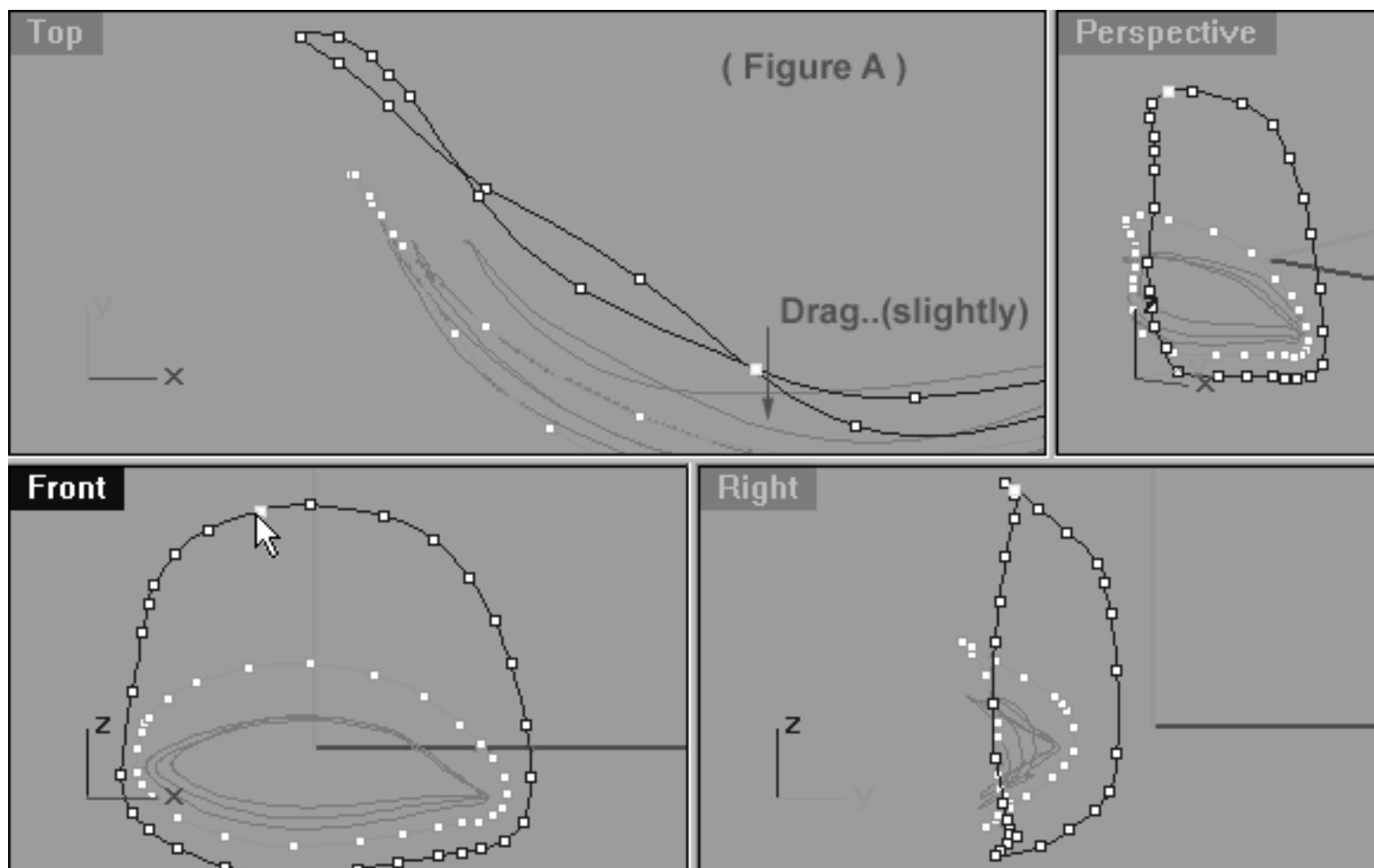
Point	Approximate Units Moved
Corner point	Y: 3.693



*This **All Viewport** screenshot shows that the right side corner point has now been moved downward along the Y axis in the Top Viewport and is now resting at the correct location.*

## Upper Row -- Left Side

- In the Front Viewport and working in a anti-clockwise direction locate the 1st point from the 12 o'clock position on upper row, left side -- when you've done so select it (see Figure A below).
- Next, move your cursor into the Top Viewport and while holding down the Shift key move the point downward along the Y axis (see Figure B below).
- Once done, continue on in a anti-clockwise direction and repeat the procedure with the next 6 points. When completed, your monitor should resemble the screenshot below (see Figure B).
- Refer to the helper table for further guidance.

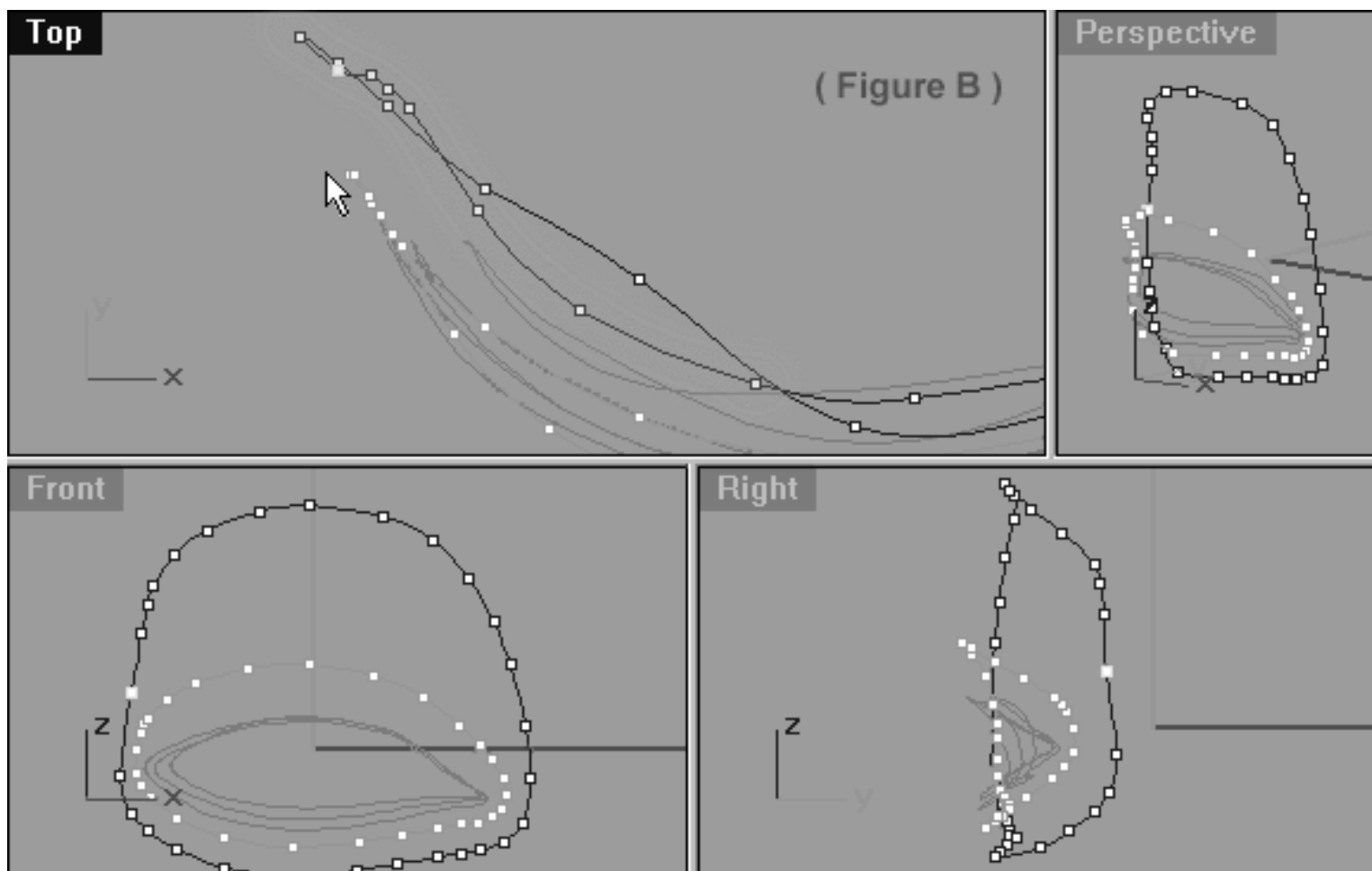


This **All Viewport** screenshot shows the 1st point from the 12 o'clock position on the left side has now been selected (as seen from the Front View) and is now ready to be moved downward slightly along the Y axis while working in the **Top Viewport**.

## Helper Table

Point	Approximate Units Moved
11 o'clock	Y: 0.398
Next point anti-clockwise	Y: 0.664
Next point anti-clockwise	Y: 0.380
Next point anti-clockwise	Y: 0.373
Next point anti-clockwise	Y: 0.444
Next point anti-clockwise	Y: 0.528
Next point anti-clockwise	Y: 0.818





*This **All Viewport** screenshot shows the 1st point from the 12 o'clock position has now been moved and is resting in the correct location. In addition, the next 6 points have now also been moved downward along the Y axis while working in the **Top Viewport**.*

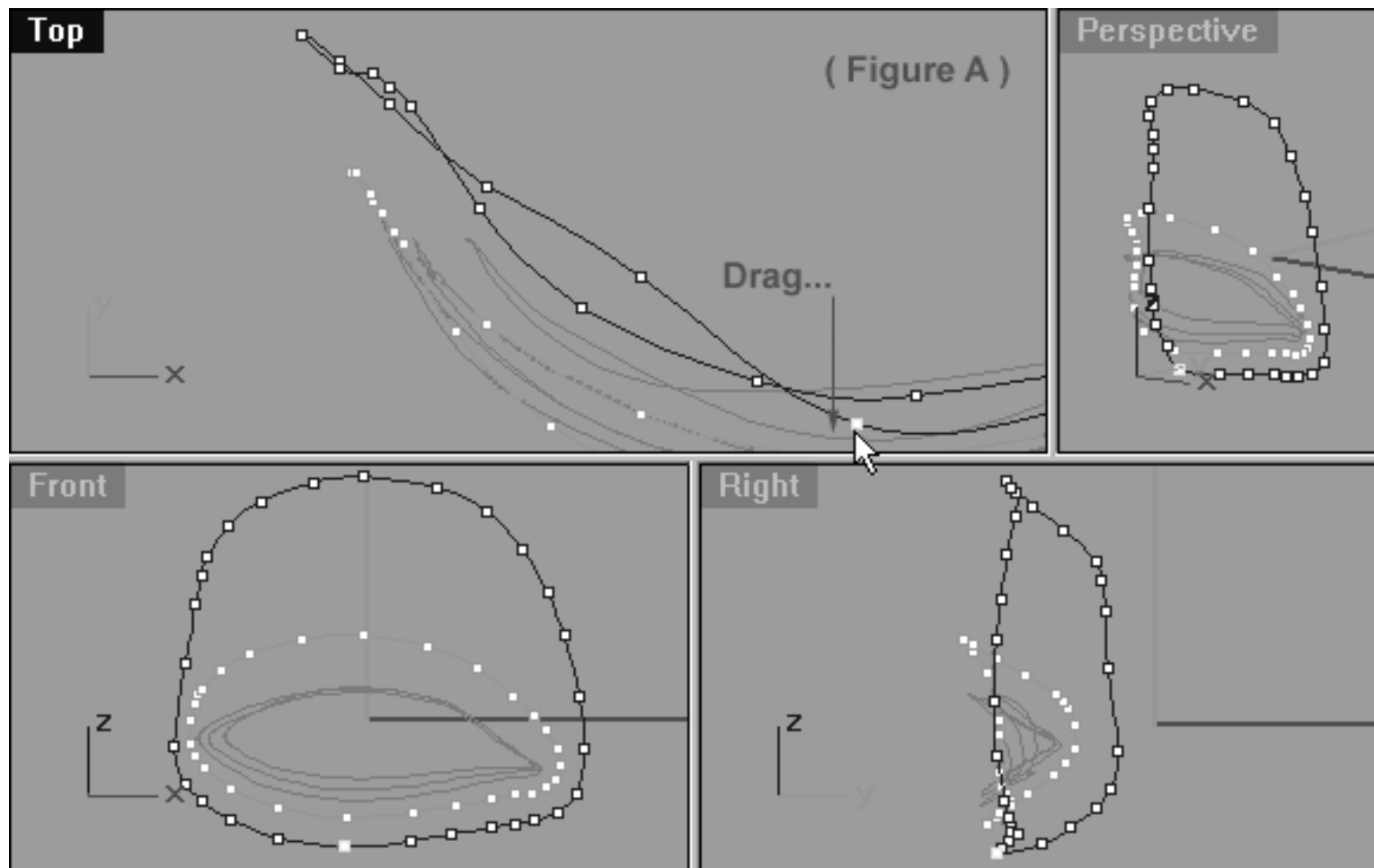


**View an example movie**

**Editing the 5th Eyelid Curve, Pt. 4 [Click Here](#)**

## Lower Row -- Left Side

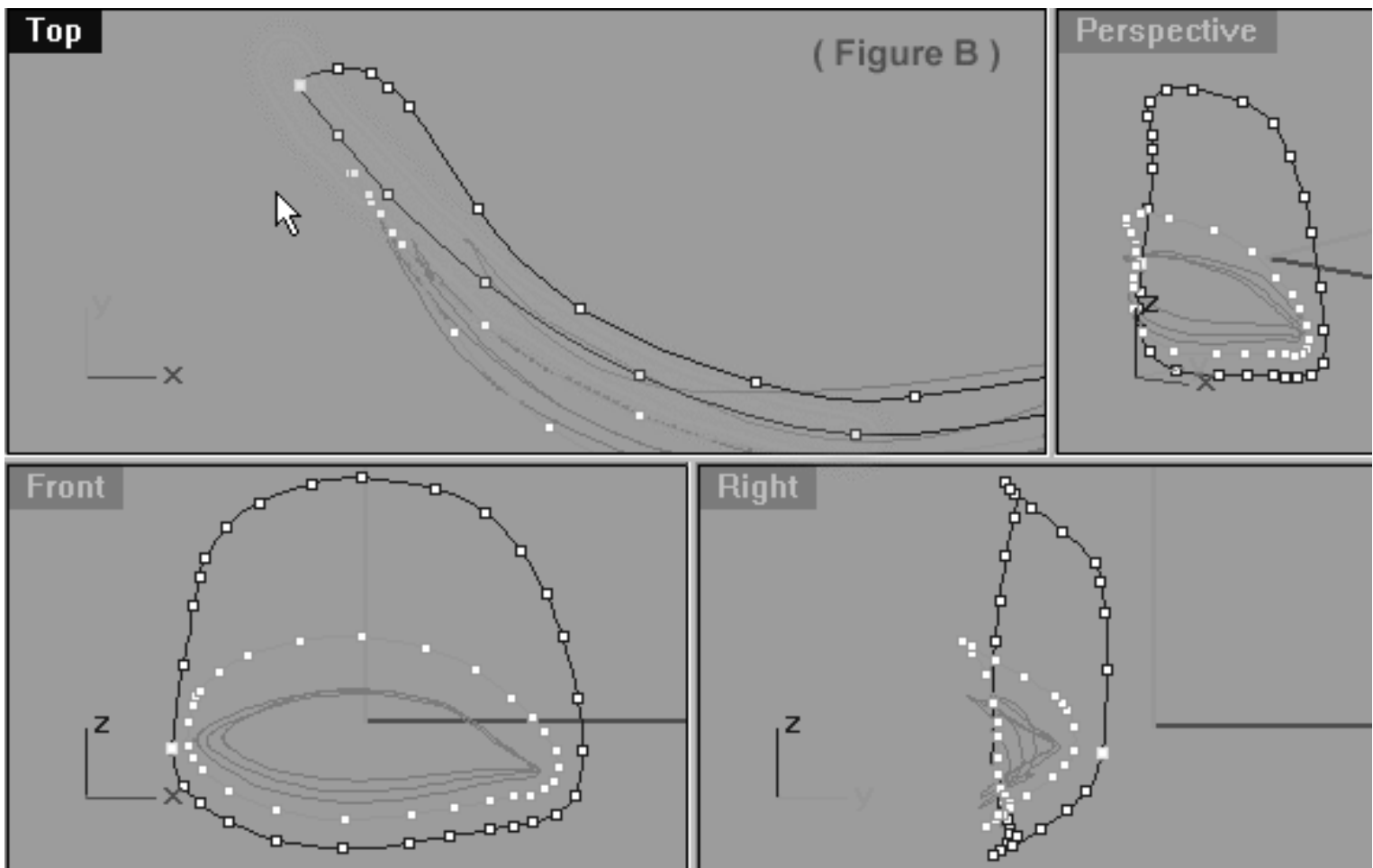
- In the Front Viewport and working in a clockwise direction locate the point at the 6 o'clock position on lower row, left side -- when you've done so select it (see Figure A below).
- Next, move your cursor into the Top Viewport and while holding down the Shift key move the point downward along the Y axis just a bit (see Figure B below).
- Once done, continue on in a clockwise direction and repeat the procedure with the next 5 points. When completed, your monitor should resemble the screenshot below (see Figure B).
- Refer to the helper table for further guidance.



This **All Viewport** screenshot shows the point 6 o'clock position on the lower row has now been selected (as seen from the Front View) and is now ready to be moved downward slightly along the Y axis while working in the **Top Viewport**.

## Helper Table

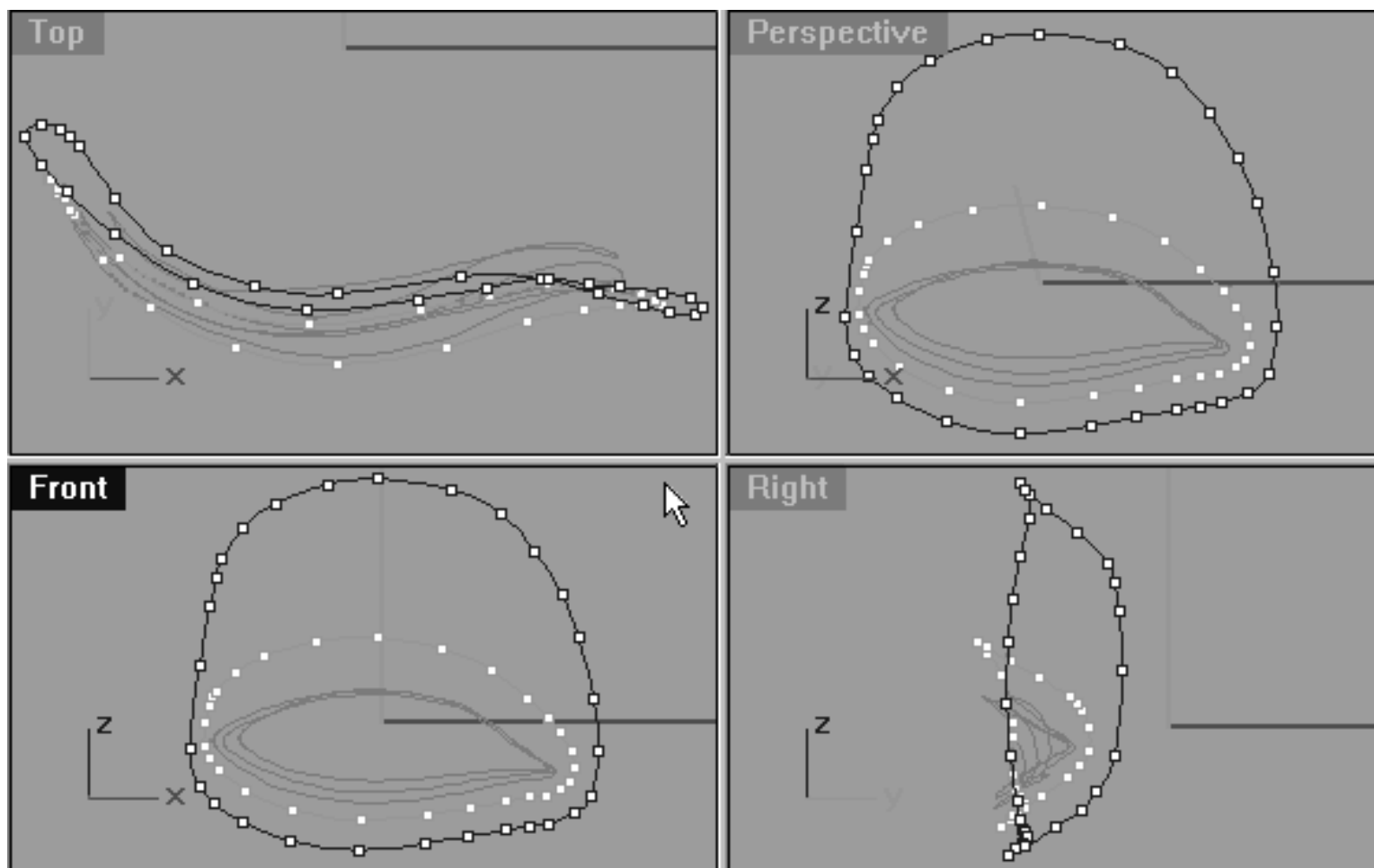
Point	Approximate Units Moved
6 o'clock	-trace-
Next point clockwise	Y: 2.604
Next point clockwise	Y: 2.406
Next point clockwise	Y: 2.331
Next point clockwise	Y: 2.210
Next point clockwise	Y: 1.392



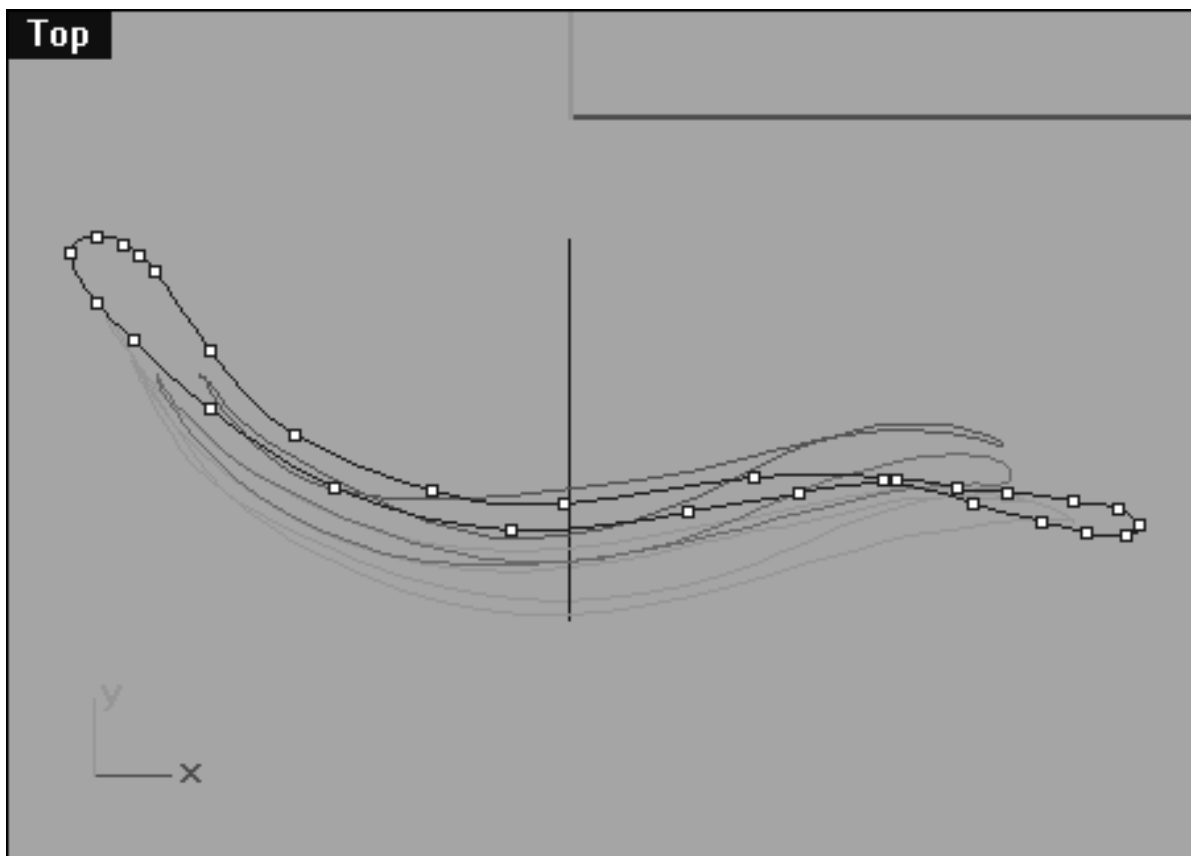
*This **All Viewport** screenshot shows the point at the 6 o'clock position has now been moved and is resting in the correct location. In addition, the next 5 points have now also been moved downward along the Y axis (highlighted in green) while working in the **Top Viewport**.*

Congratulations, the 5th Eyelid Curve has now been completed! As ever, you should some take a little extra time to carefully inspect the curve in order to clean up, refine and adjust points as required.

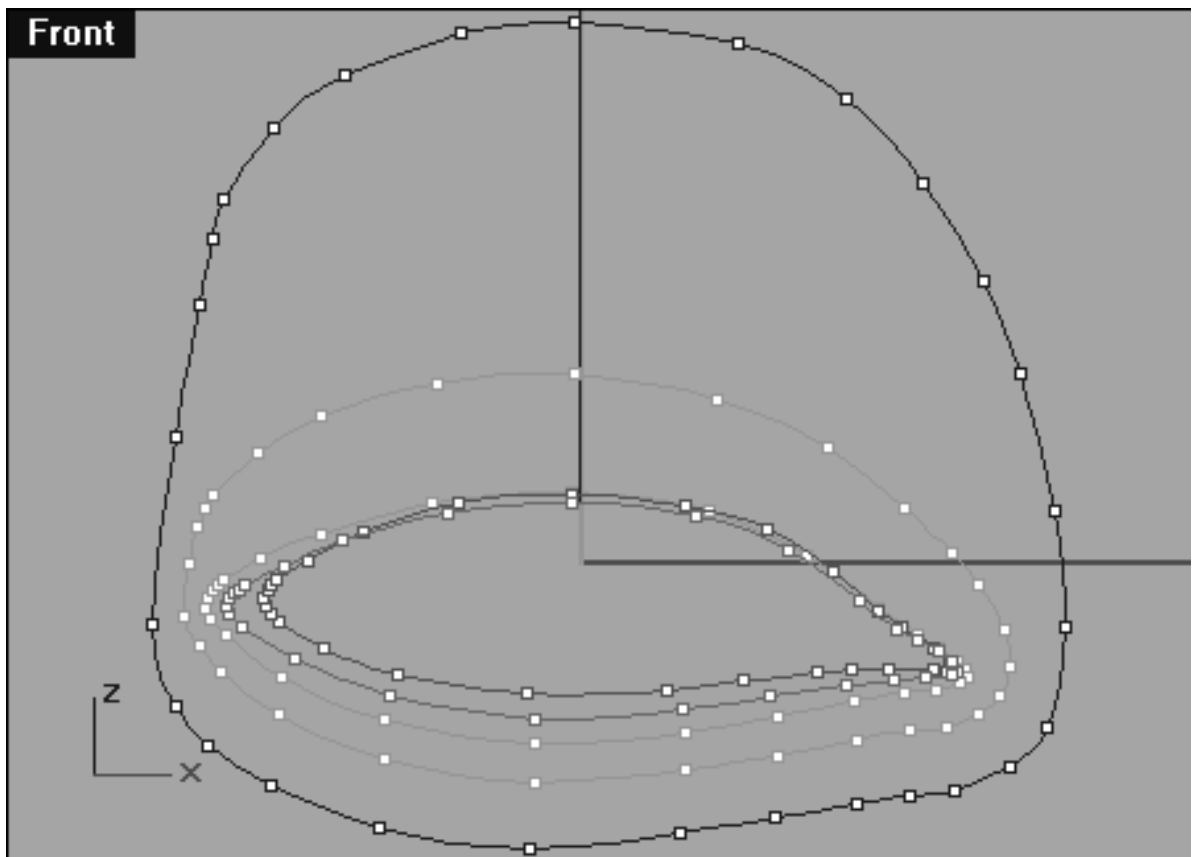
Your monitor should now resemble the screenshot below...



*This **All Viewport** screenshot shows the now fully completed and refined 5th Eyelid Curve. Observe the relationships in all views between the points and carefully study the relationships between all the curves themselves.*



This **Top Viewport** screenshot shows the now fully completed and refined 5th Eyelid Curve.



This **Front Viewport** screenshot shows the now fully completed and refined 5th Eyelid Curve. The points on Eyelid Curves 1, 2, 3 & 4 have also been unlocked and displayed so that you can study their placement and relationships to each other.



This **Right Viewport** screenshot shows the now fully completed and refined 5th Eyelid Curve. The points on Eyelid Curves 1, 2, 3 & 4 have also been unlocked and displayed so that you can study their placement and relationships to each other.

---



**View an example movie**

**Editing the 5th Eyelid Curve, Pt. 5** [Click Here](#)

---

## Snap It Up

You can now feel free to check your work against ours and see how close you've come. To do this, open the Edit Layers dialogue box and turn **ON** the layer entitled: **Eyelid\_guide\_05**, then press **OK** to **Exit**. Then in **Any Viewport** select the **Eyelid\_guide\_05** curve and display its edit points. Once done, reopen the Edit Layers dialogue box and set the **Eyelid\_guide\_05** layer to **LOCK**, press **OK** to **Exit**. You can now compare the results and refine the specific areas where you've gone off track. You can then turn on the **Osnaps, Point** and snap each of the points on the curve you've created to those of the guide curve.

---

# Shutting Down the Scene

- Rearrange the viewports to a normal 4 view pattern.
- Confirm that no Osnaps are currently active, disable any that are.
- Display any currently hidden objects, type the command: Show at the command line and press Enter.
- Turn off any edit points that may be currently displayed.
- Unlock any currently locked objects -- type **UNLOCK** at the command line and press **Enter**.
- Open the Edit Layers Dialogue box and locate the layer entitled **SCENE START UP**. Make it the currently active layer by clicking in the "check" field -- a check mark should appear in the column, when it has press **APPLY**. Once done, the layer entitled **SCENE START UP** should now have become the active layer and should be **ON**.
- The Layer entitled: Photopoints should be **ON**.
- Turn off the layers entitled: **Eyelid Curves, Eyelid\_02, Eyelid\_03, Eyelid\_04, Eyelid\_05, Eyelid\_guide\_05** and **Eyelid\_Xsection** and press **APPLY**.
- With the exception of those mentioned, all other layers should be **OFF** -- press **OK** to Exit.
- Perform a Zoom Extents All.
- **SAVE YOUR WORK..!**

---

Go to the [NEXT LESSON](#)

RETURN to the Top of page -- [Click Here](#)

Written by Joseph R. Saltzman.

Co-produced in association with Steven Ståhlberg  
©1998-1999 Cinemagic Productions Limited. All Rights Reserved.

Duplication of this document including images and text by any means is expressly forbidden without prior written consent of Cinemagic Productions Limited.  
Web Site: <http://www.cmagic.co.uk> Telephone: +44 (0)1753 733 190 Fax: +44 (0)1753 736 619 email: [cmagic@cmagic.co.uk](mailto:cmagic@cmagic.co.uk)

qat270699



# MOVIE EDITING THE 5TH EYELID CURVE PART ONE

To **PLAY** the example movie, double click below:

To **RETURN** to the tutorial -- [click here](#).

# MOVIE EDITING THE 5TH EYELID CURVE PART TWO

To **PLAY** the example movie, double click below:

To **RETURN** to the tutorial -- [click here](#).

# MOVIE EDITING THE 5TH EYELID CURVE PART THREE

To **PLAY** the example movie, double click below:

To **RETURN** to the tutorial -- [click here](#).

# MOVIE EDITING THE 5TH EYELID CURVE PART FOUR

To **PLAY** the example movie, double click below:

To **RETURN** to the tutorial -- [click here](#).

# MOVIE EDITING THE 5TH EYELID CURVE PART FIVE

To **PLAY** the example movie, double click below:

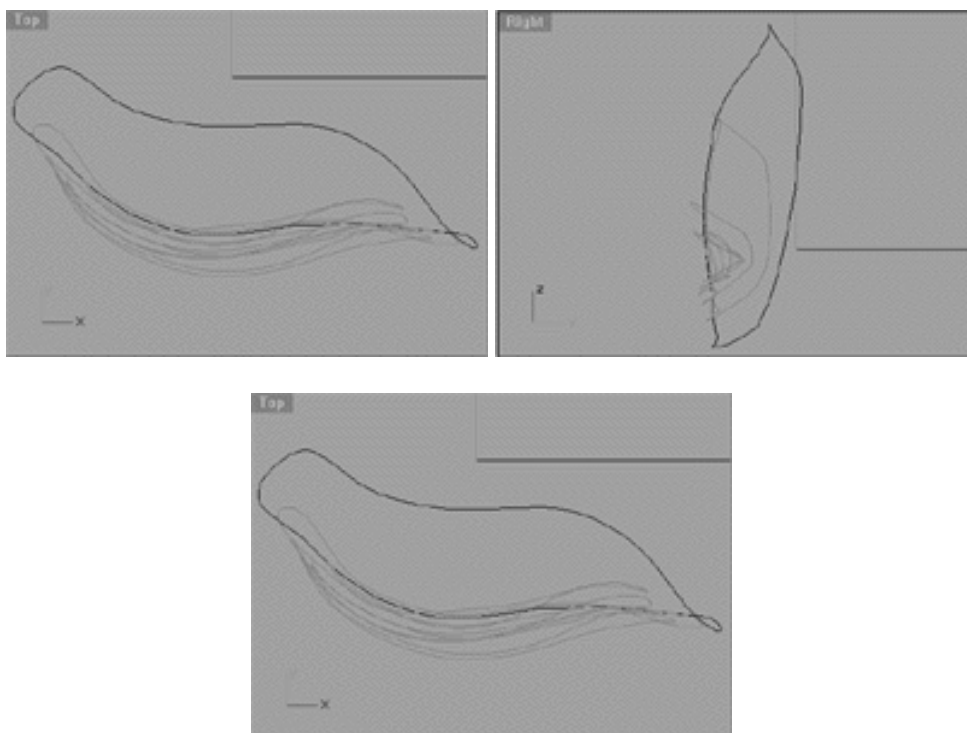
To **RETURN** to the tutorial -- [click here](#).

**RETURN** to previous page -- [Click Here](#)

**GOTO** the NEXT LESSON



## CREATING THE 6TH EYELID CURVE




## Contents:


- [Scene Setup](#)
- [Creating the 6th Eyelid Curve](#)
- [Editing the 6th Eyelid Curve, Lower Row, Right Side](#)
- [Lower Row, Left Side](#)
- [Example Move -- Creating and Editing the 6th Eyelid Curve, Pt 1](#)
- [Refine -- Right Side](#)
- [Refine -- Left Side](#)
- [Example Move -- Editing the 6th Eyelid Curve, Pt 2](#)
- [Upper Row, Right Side](#)
- [Upper Row, Left Side](#)
- [Stretching, Right Side](#)

- [Example Move -- Editing the 6th Eyelid Curve, Pt 3](#)
  - [Lower Row -- Right Side](#)
  - [Lower Row -- Left Side \(2\)](#)
  - [Upper Row, Right Side \(2\)](#)
  - [Example Move -- Editing the 6th Eyelid Curve, Pt 4](#)
  - [Upper Row -- Left Side \(2\)](#)
  - [Example Move -- Editing the 6th Eyelid Curve, Pt 5](#)
  - [Example Move -- Editing the 6th Eyelid Curve, Pt 6](#)
  - [Snap It Up](#)
  - [Shutting Down the Scene](#)
- 

## Scene Setup



- If you've not done so already start a Rhinoceros session by **double clicking** on the desktop icon  the application will begin.
- Choose File, Open from the menu bar and double click on **START\_A.3DM** in the file list, it will load and open.
- Confirm at the Lower Status Bar the currently active layer is entitled SCENE START UP. If it is active proceed to the next step, if it's not then make it active by left clicking on the layer box, highlighting the correct layer and clicking on it.
- Again, at the Layers Box on the Lower Status Bar this time right click on the box, the Edit Layers Dialogue box will open. Confirm the following switches have been enabled or disabled:
  - The Layer entitled: Eyelid\_Curves should be ON.
  - The Layer entitled: Eyelid\_02 should be ON.
  - The Layer entitled: Eyelid\_03 should be ON.
  - The Layer entitled: Eyelid\_04 should be ON.
  - The Layer entitled: Eyelid\_05 should be ON.
  - The Layer entitled: Eyelid\_Xsection should be ON.
  - The Layer entitled: Frozen should be LOCKED.
  - The Layer entitled: Photopoints should be OFF.
  - The Layer entitled: SCENE START UP should be ON.

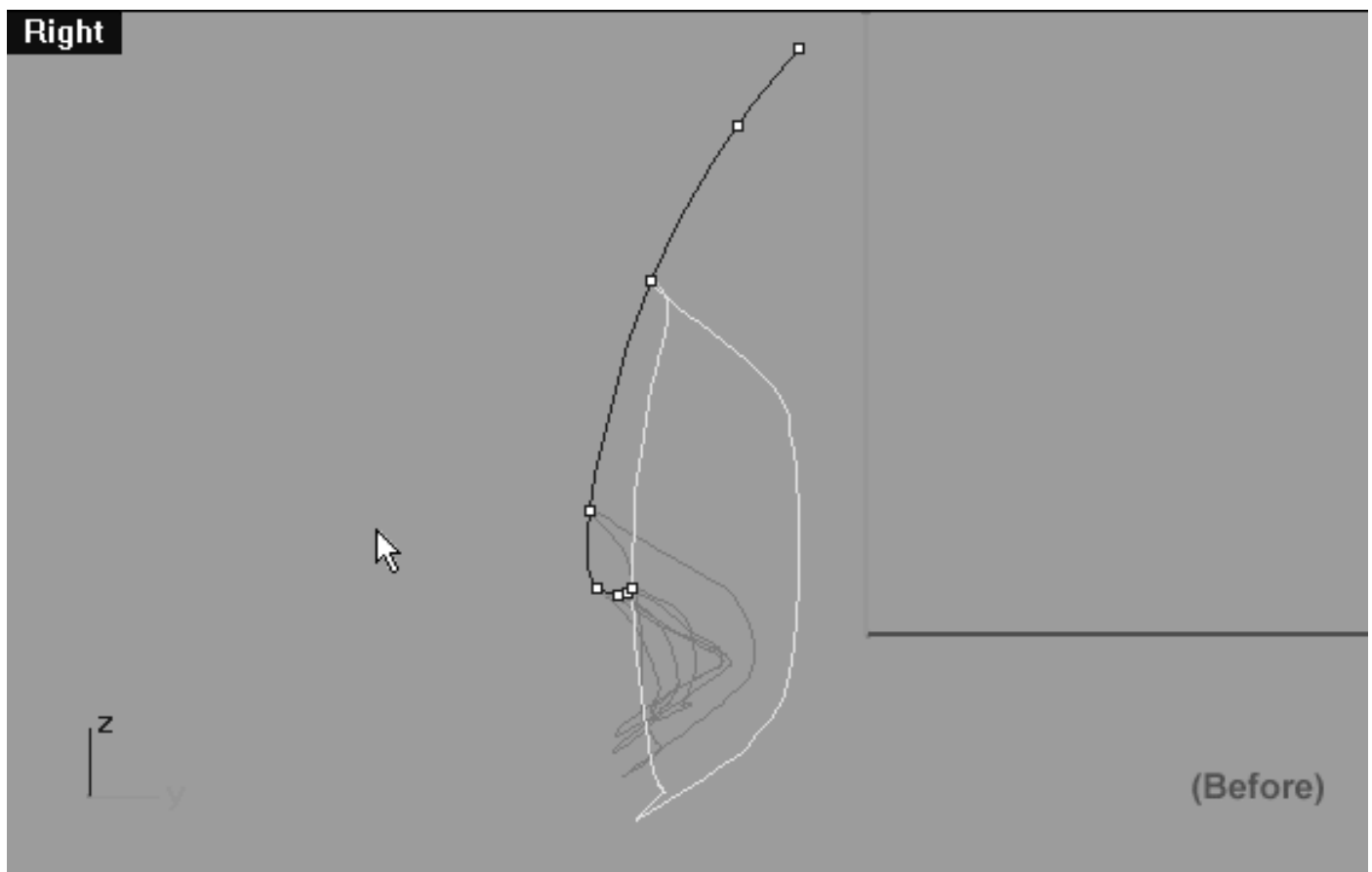


- All other layers should be set to OFF.
- When you've finished making your changes ( if any ) click on OK.
- Confirm that the grid display in the viewports has been disabled, if not turn it off now.
- Confirm that no Osnaps are currently enabled, if any are disable them.
- Confirm that no edit points are currently displayed, if any are hide them.
- Zoom out all the viewports by selecting the Zoom Extents/Zoom Extents All Views icon  or by typing **ZoomExtentsAll** at the command line and pressing ENTER.

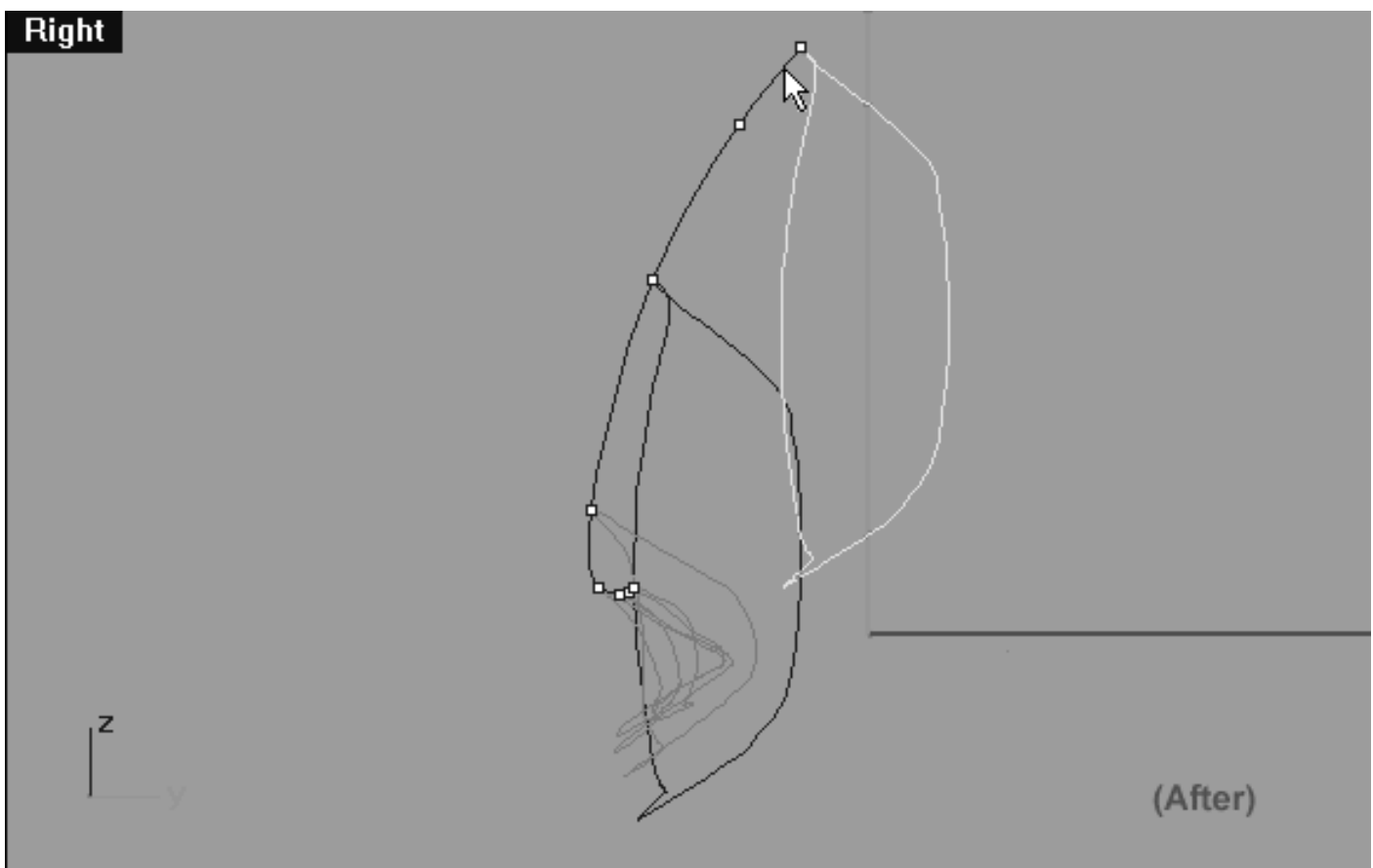
## Creating the 6th Eyelid Curve

Now let's create the 6th Eyelid curve. Once again we will do this from a copy of 5th Eyelid curve that we made in the previous lesson.



- If you've not done so already make sure the 1st, 2nd, 3rd & 4th Eyelid curve objects are visible but LOCKED. If not, lock them by selecting the objects -- they will highlight and then typing the command: Lock at the command line and then pressing Enter.
- The Cross section curve should also be visible, select it and display its edit points.
- Create a new layer entitled: Eyelid\_06, set the layer colour to black and make it active.
- Maximise the **Right Viewport** and select the 5th Eyelid Curve by left clicking on it -- it will highlight.
- From the toolbar choose the Copy Icon  or type: Copy at the command line.
- The system will respond with the following prompt at the command line: **Point to copy from (Vertical InPlace):**
- Type IN at the command line and press ENTER to complete the operation. A duplicate of the curve has now been created.
- Activate Osnaps End / Point.
- From the toolbar choose the Move Icon  and snap your cursor to the end point of the highlighted curve. Once done, move the object along the Z axis and snap to the **last** point of the cross section curve.

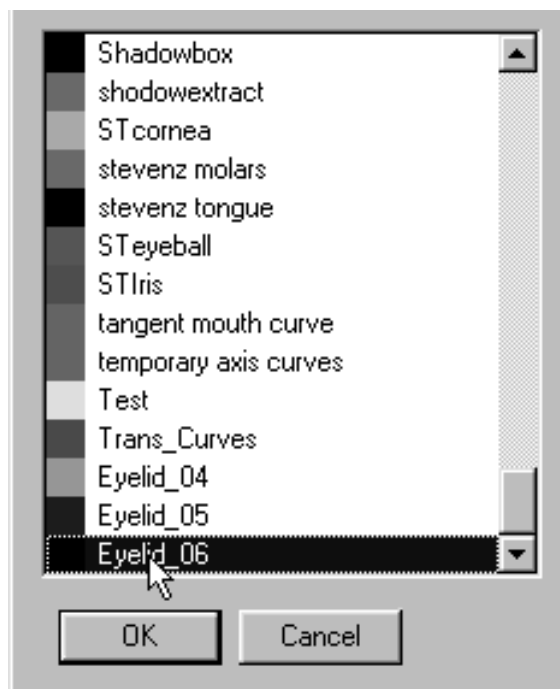


This **Right Viewport** screenshot shows the duplicate of the 5th eyelid curve prior to being moved along the Z axis.

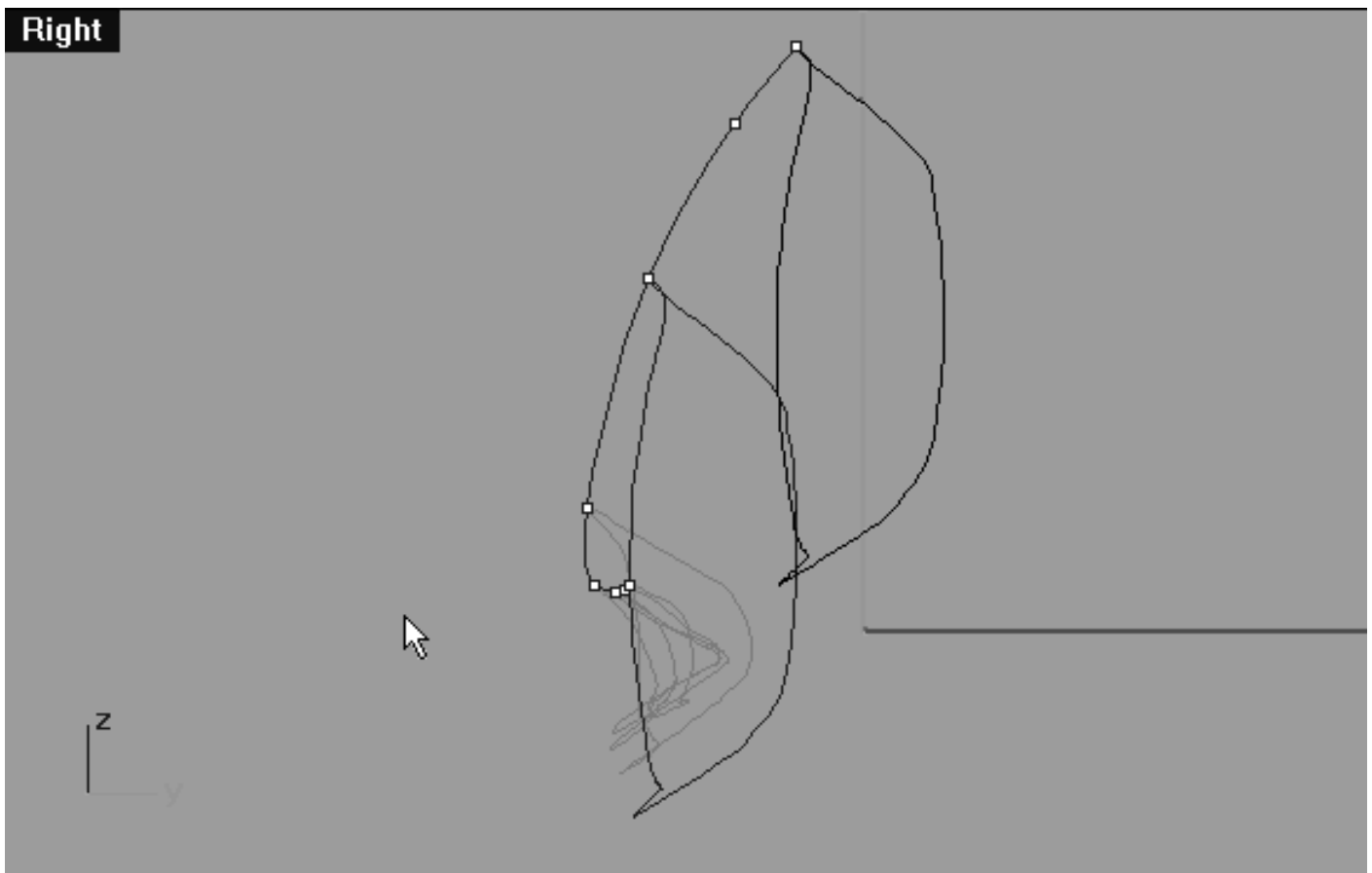


This **Right Viewport** screenshot shows the duplicate of the 5th eyelid curve after to being moved along the Z axis and snapped to the last point on the cross section curve.

- Now be certain to assign the newly duplicated and moved curve to the currently active layer, in this case (Eyelid\_06). With the moved curve still selected, choose from the toolbar the Edit Layers Icon  and then select the change layers icon  from the fly out, the Layer for Object dialogue will appear as in the screenshot below:



- Locate the layer entitled: Eyelid\_06 in the list, highlight it and then either double click on it or press OK to complete the operation. Once done, the copied curve should turn blue thus indicating it is now on the correct layer as in the screenshot below.



This **Right Viewport** screenshot shows the duplicated and moved curve has now been assigned to the correct layer (*Eyelid\_06*).

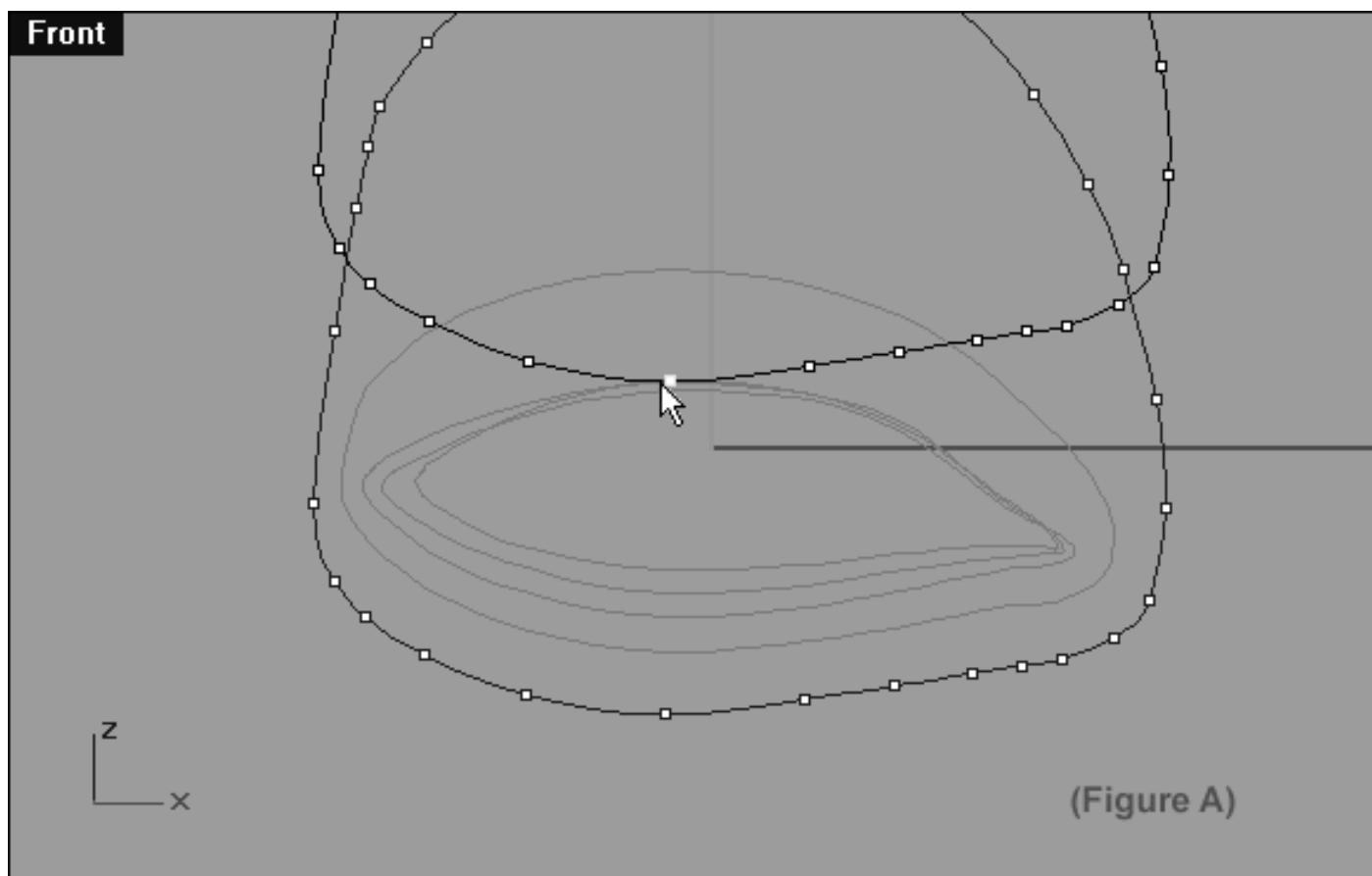
## Editing the 6th Eyelid Curve

### Lower Row, Right Side

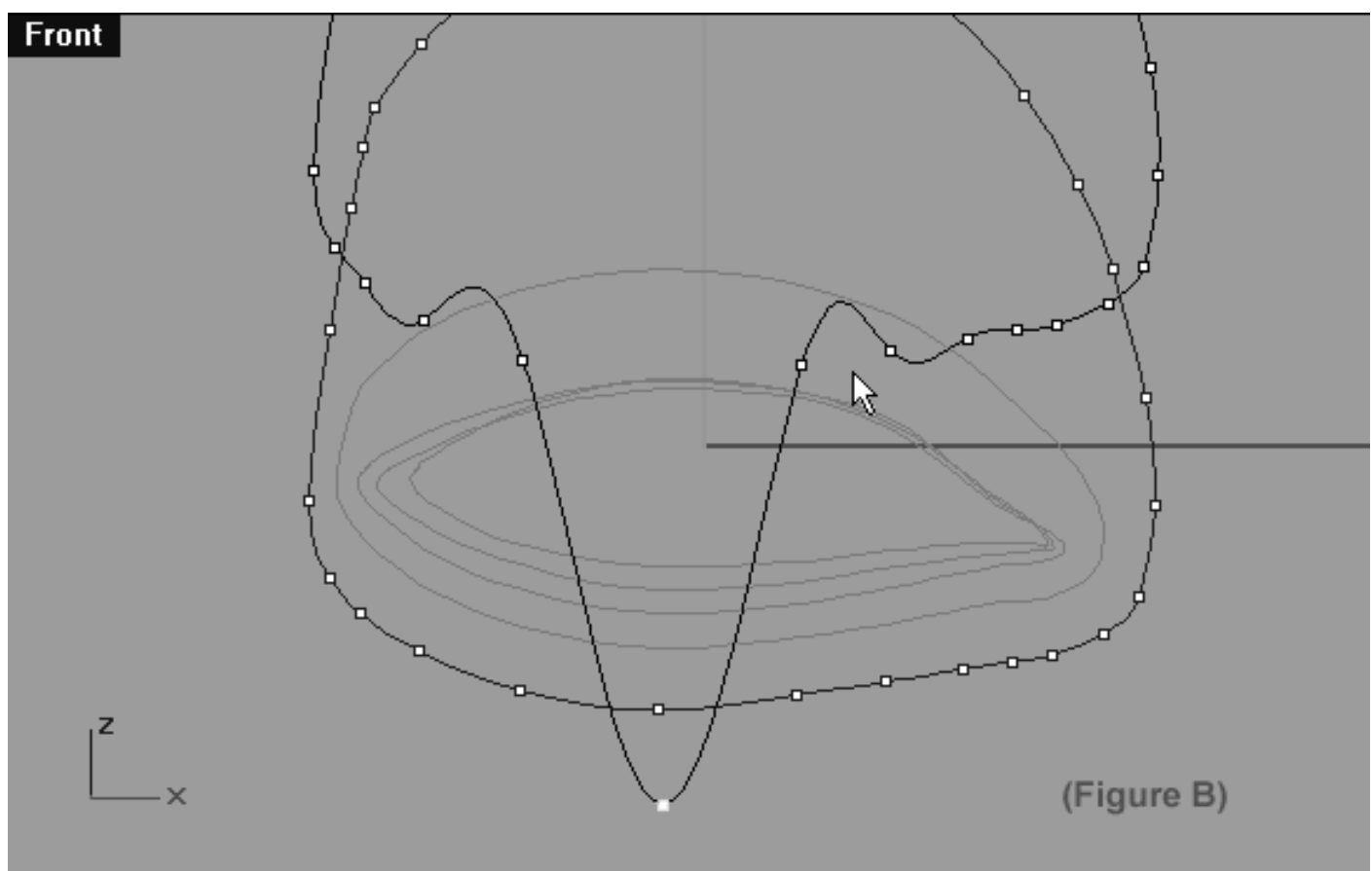
Now let's start moving some points...

- Minimise the **Right Viewport**.
- Temporarily turn off the edit points and hide the cross section curve.
- Disable any currently active Osnaps.
- In Any Viewport, select the 5th Eyelid Curve by left clicking on it -- it will highlight. Once done, display its edit points and then Lock its layer to prevent it being damaged.
- Select the 6th Eyelid curve and display its edit points.
- In the **Front Viewport** and select the point at the **6 o'clock** position on the lower row -- it will highlight (see Figure A. Below).
- Now whilst holding down the Shift key, move the point downward along the Z axis until it is well below its sister point on the 5th curve. (see Figure B. Below).

- Working in an anti-clockwise manner repeat this procedure with the following 7 lower row points. Your aim should again be to create a shape similar to the screenshot below (see Figure C. Below).
- Refer to the helper table for further guidance.



*This **Front Viewport** screenshot shows the 6th Eyelid Curve (Eyelid\_06) prior to any editing taking place on the lower row. Notice that the point at roughly the 6 o'clock position has been selected and is now ready to be moved downward along the Z axis.*

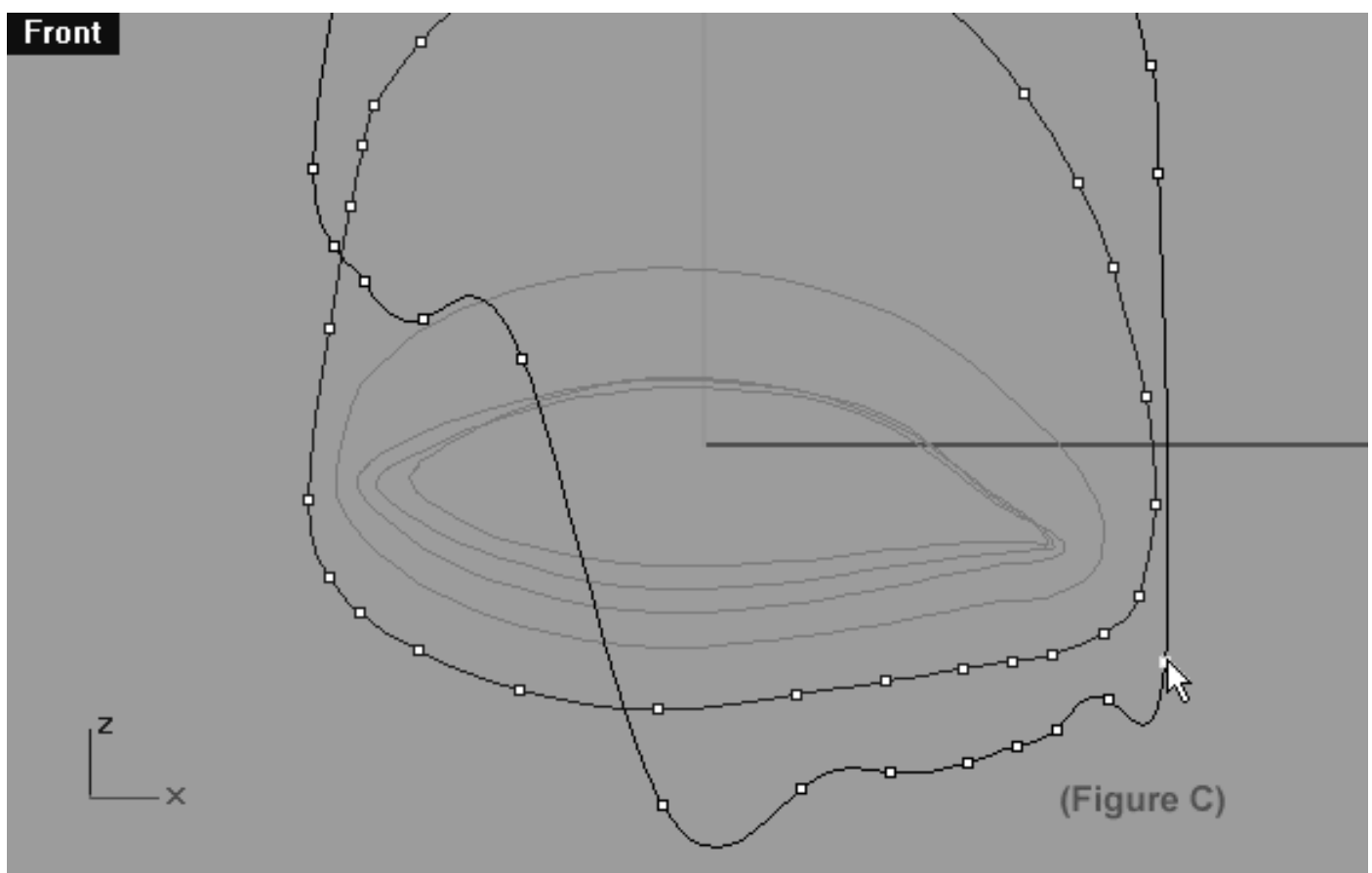


This **Front Viewport** screenshot shows the 6th Eyelid Curve (Eyelid\_06) after the 1st stage of initial editing has taken place on the lower row.

### Helper Table

Point	Approximate Units Moved
6 o'clock	Z: 16.195
Next point anti-clockwise	Z: 16.201
Next point anti-clockwise	Z: 16.178
Next point anti-clockwise	Z: 16.103
Next point anti-clockwise	Z: 15.936
Next point anti-clockwise	Z: 15.435
Next point anti-clockwise	Z: 14.560
Next point anti-clockwise	Z: 13.968

*Note: At this stage the points are NOT resting at their final locations, you've only moved them partially the way there.*



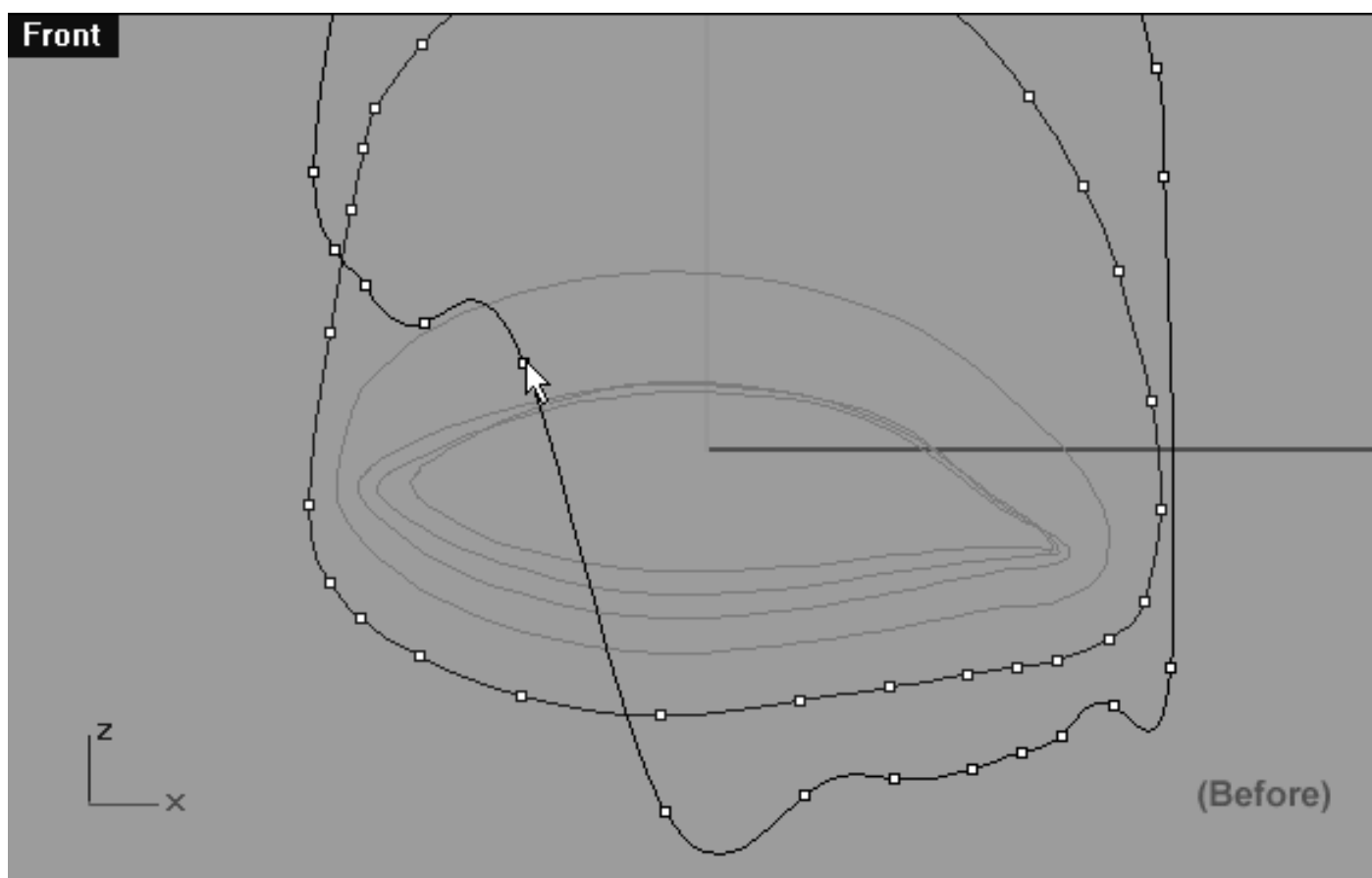
This **Front Viewport** screenshot shows the 6th Eyelid Curve (Eyelid\_06) after the last stage of initial editing has taken place on the lower row. Notice that a total of 8 points have now been moved.

## Lower Row, Left Side

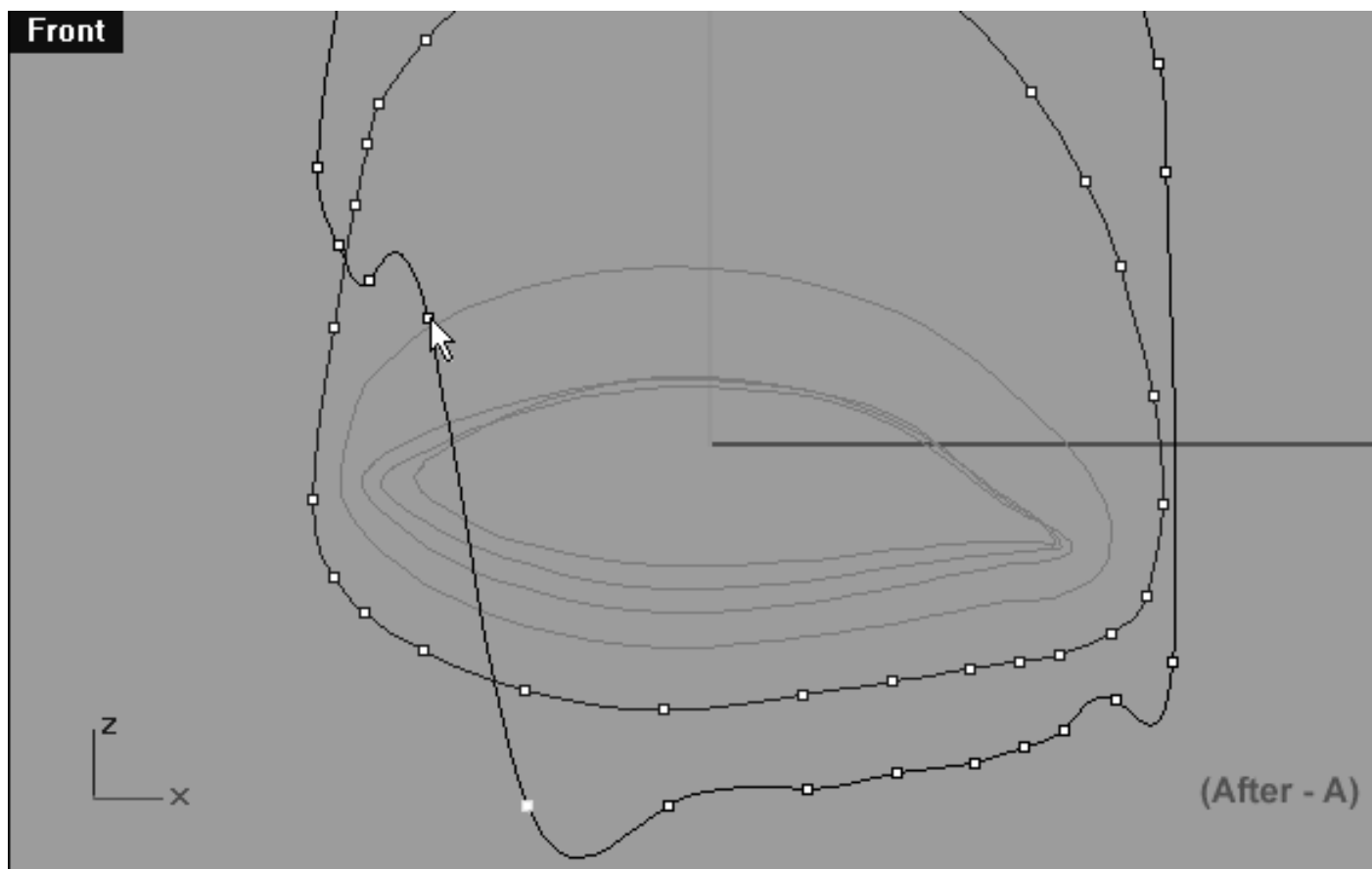
Now let's start moving some points on the opposite side...

- Still working in the **Front Viewport**, this time select the point at the **7 o'clock** position on the lower row, left side -- it will highlight (see screenshot below entitled: Before).
- Now whilst holding down the Shift key, move the point downward along the Z axis until well below its sister on the 5th curve (see screenshot below entitled: After - A).
- Working in a clockwise manner repeat this procedure with the following 4 lower row points. Your aim should again be to create a gentle arcing shape -- (see screenshot below entitled: After - B).
- Refer to the Helper Table for further guidance.





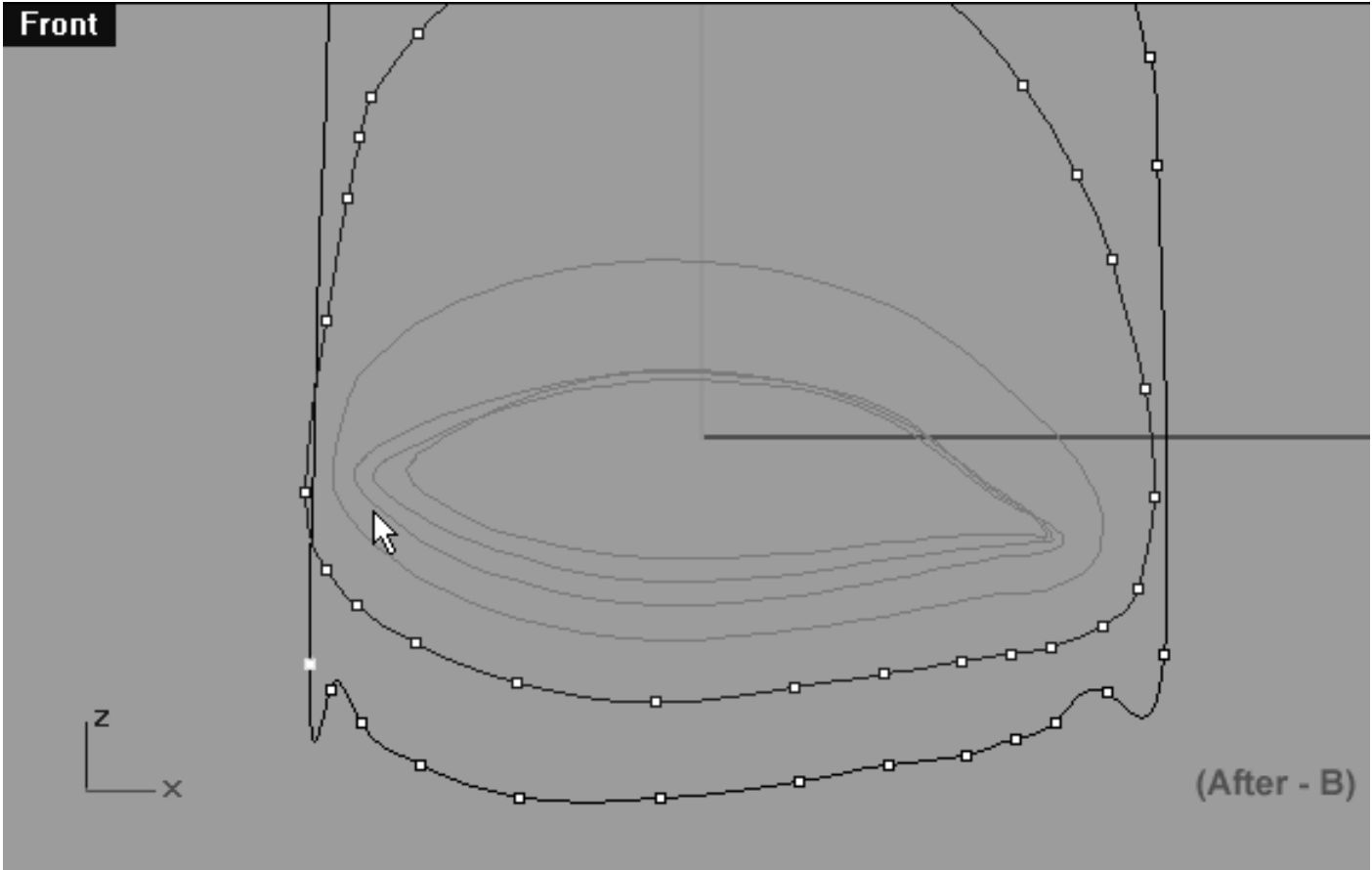
This **Front Viewport** screenshot shows the 6th Eyelid Curve (Eyelid\_06) lower row, left side. Notice that the point at roughly the 7 o'clock position has been selected and is ready to be moved downward along the Z axis below that of its sister point on the 5th curve.



This **Front Viewport** screenshot shows the 6th Eyelid Curve (Eyelid\_06) lower row, left side. Notice that the point at roughly the 7 o'clock position has been selected and moved downward.

Helper Table

Point	Approximate Units Moved
7 o'clock	Z: 16.739
Next point clockwise	Z: 17.082
Next point clockwise	Z: 16.923
Next point clockwise	Z: 15.733
Next point clockwise	Z: 17.665



This **Front Viewport** screenshot shows the 6th Eyelid Curve (Eyelid\_06) after editing has taken place on the lower row, left side. Notice that a total of 5 points were moved this time round.



**View an example movie**  
**Creating and editing the 6th Eyelid Curve** [Click Here](#)

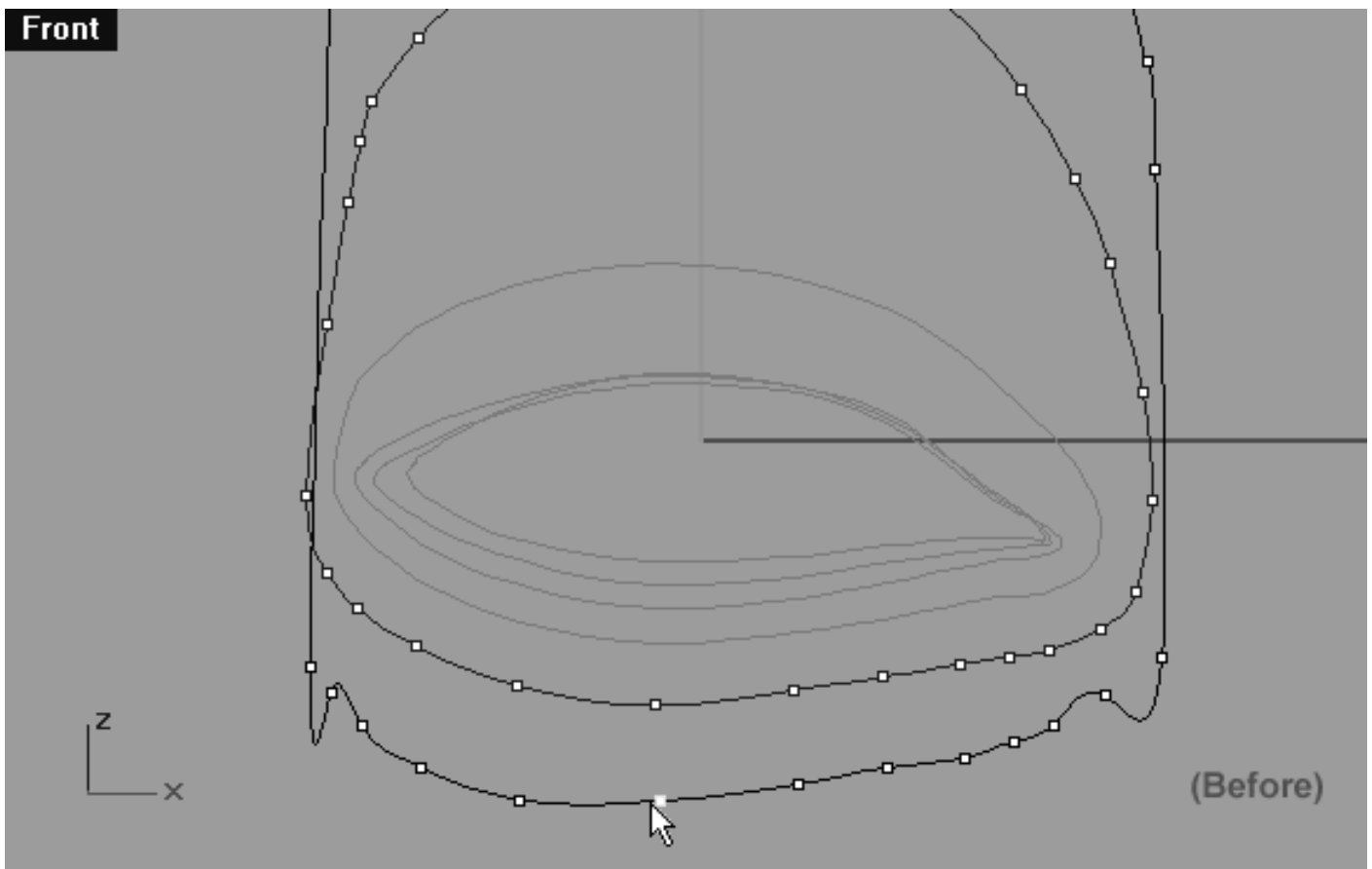
# Refine -- Right Side

Now let's refine the point placement on the lower row, right side of the curve.

- In the Front Viewport select the point at the 6 o'clock position and whilst holding down the Shift key move it ever so slightly downward along the Z.

Then, whilst still holding down the Shift key move it just a bit along the X axis also -- (see screenshot below entitled: Before).

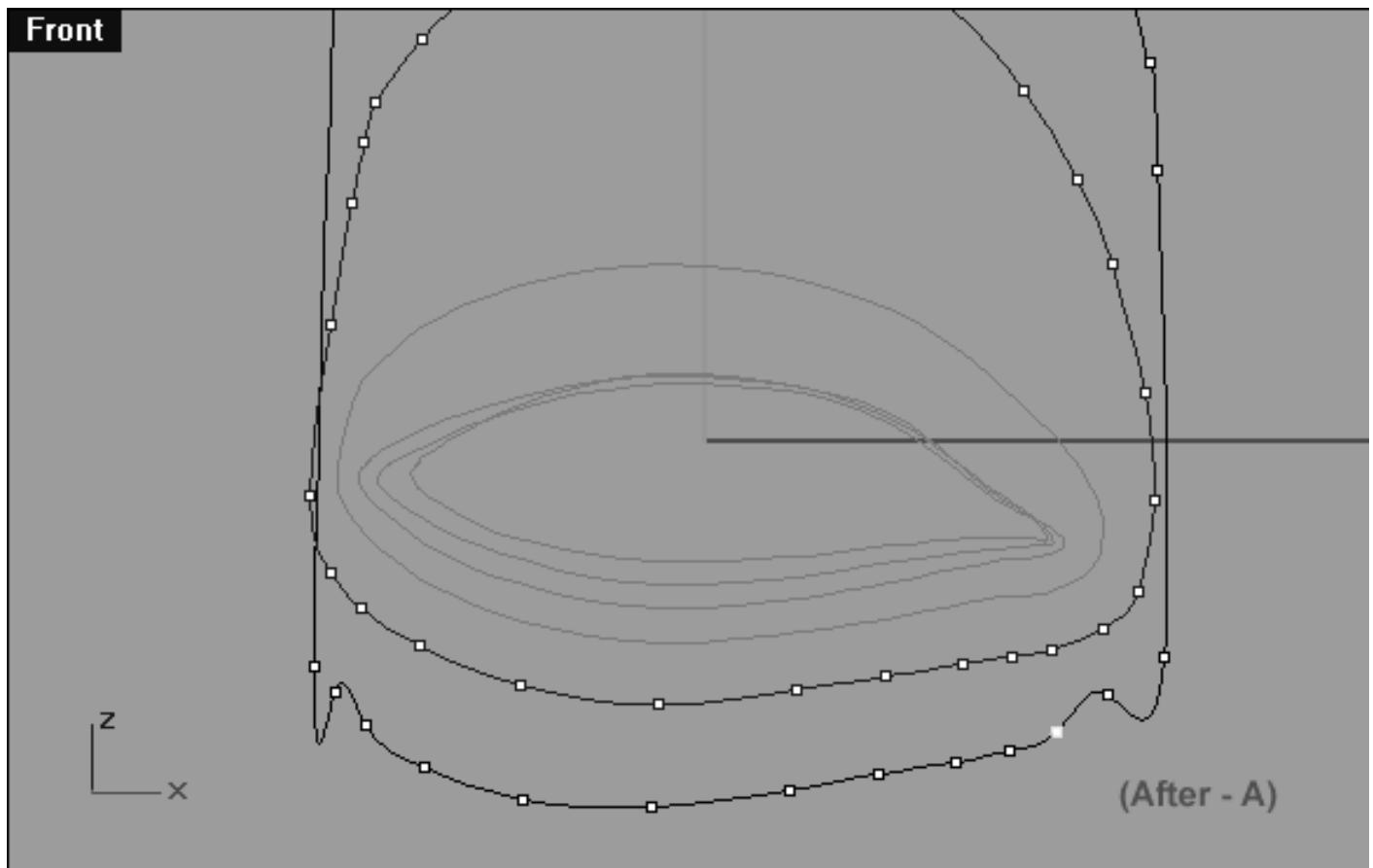
- Once done, continue working in a anti-clockwise manner and repeat the procedure with the next 5 points.
- When complete your monitor should resemble the screenshot below entitled: (After - A).
- Refer to the Helper Table for further guidance.



This **Front Viewport** screenshot shows the 6th Eyelid Curve (Eyelid\_06) lower row, right side. Notice that the point at roughly the 6 o'clock position (as seen from front view) has been selected and is ready to be moved slightly along the Z and X axis.

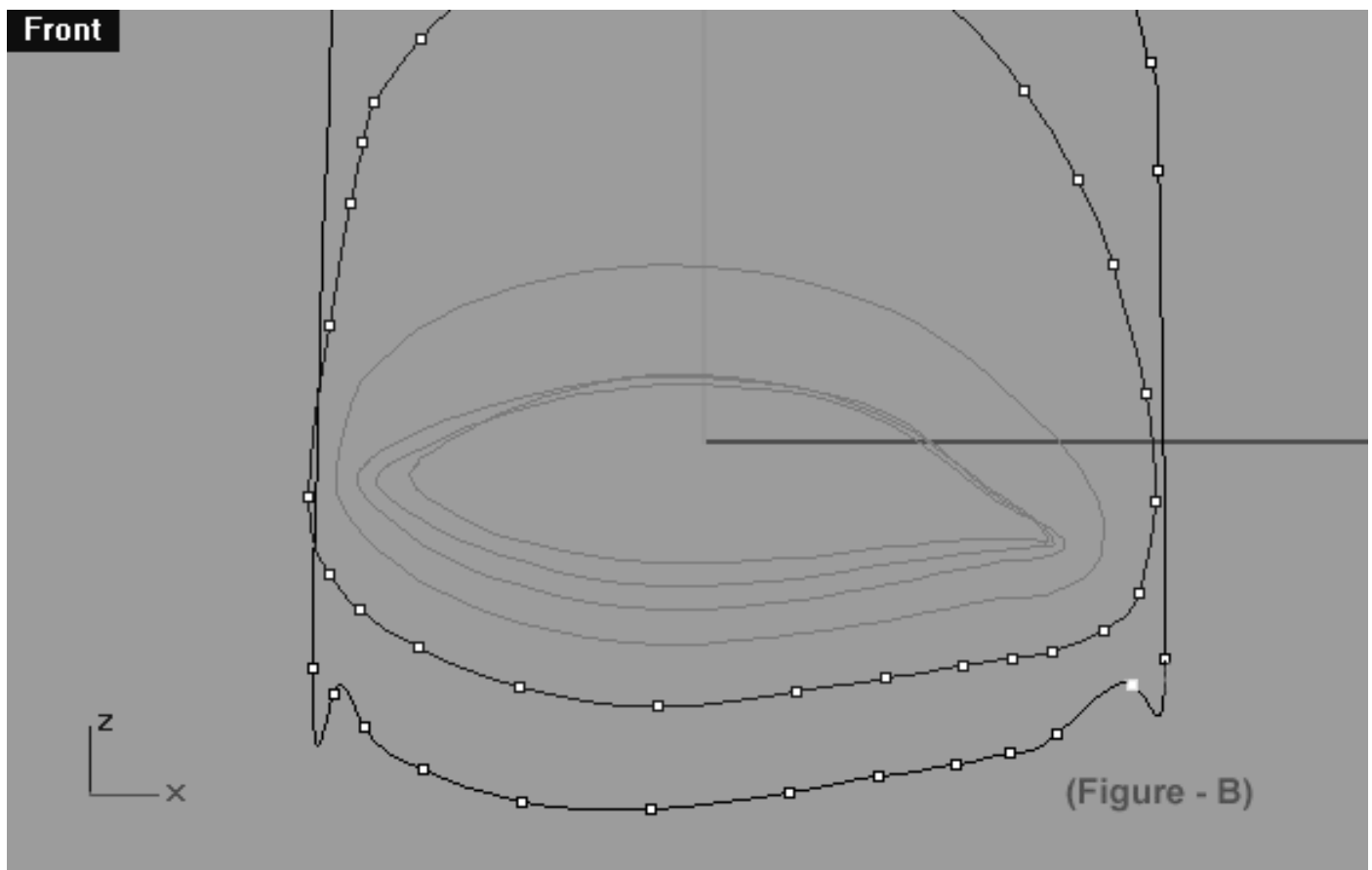
## Helper Table

Point	Approximate Units Moved
6 o'clock	Z: 0.949, X: 0.406 (left)
Next point anti-clockwise	Z: 0.993, X: 0.504 (left)
Next point anti-clockwise	Z: 1.004, X: 0.457 (left)
Next point anti-clockwise	Z: 0.982, X: 0.410 (left)
Next point anti-clockwise	Z: 0.978, X: 0.399 (left)
Next point anti-clockwise	Z: 1.185, X: 0.187 (left)



This **Front Viewport** screenshot shows the 6th Eyelid Curve (Eyelid\_06) lower row, right side. Notice that the point at roughly the 6 o'clock position and the following 5 points moved slightly along the Z and X axis.

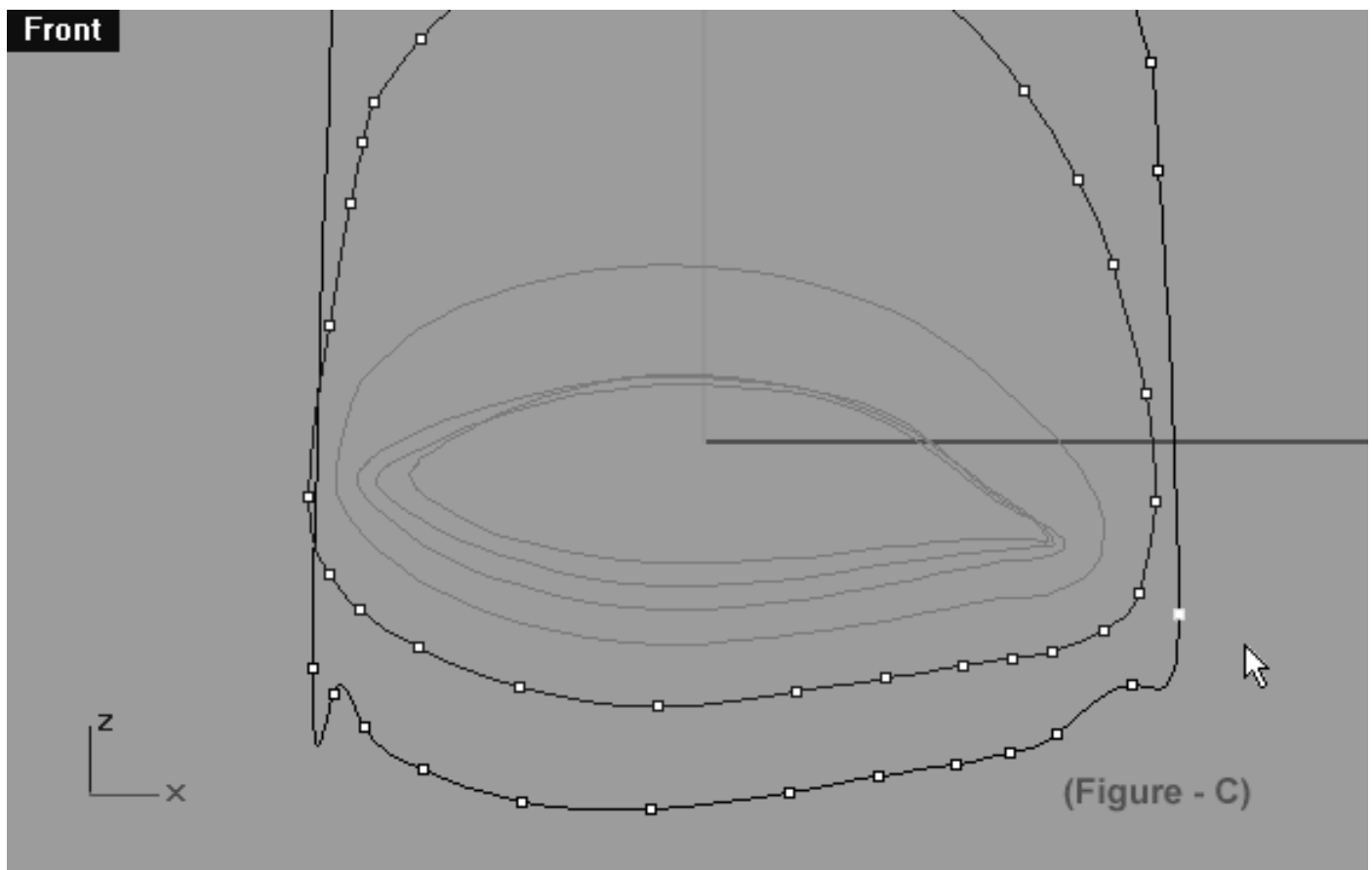
- We will keep on working in a anti-clockwise manner, however, the next 2 points will each require some special attention...
- This time select the next point (the 6th point from the 6pm position) and whilst holding the Shift key move it across on the X axis and then down on the Z -- see the screenshot below (Figure - B).
- Now select the next point (the 7th point from the 6pm position) and whilst holding the Shift key move it across and along the X axis mostly -- see the screenshot below (Figure - C).
- Refer to the Helper Table for further guidance.



This **Front Viewport** screenshot shows the 6th Eyelid Curve (Eyelid\_06) after editing has taken place on the 6th point from the 6pm position on lower row, right side.

### Helper Table

Point	Approximate Units Moved
6th from 6pm, lower right	X: 0.687 (right), Z: 0.806 (down)
7th from 6pm, lower right	X: 1.173 (right), Z: Nil

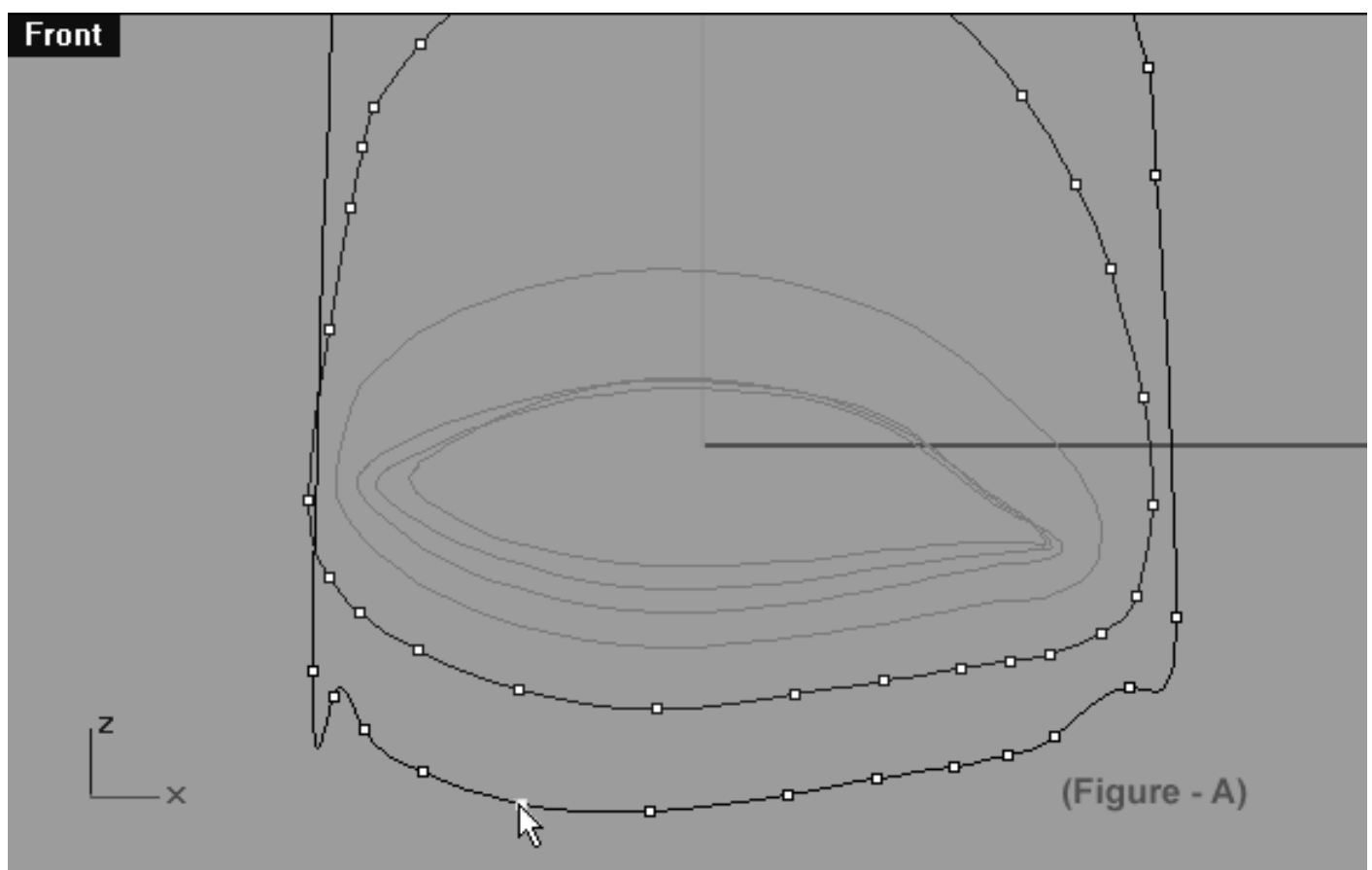


*This **All Viewport** screenshot shows the 6th Eyelid Curve (Eyelid\_06) after editing has taken place on the 7th point from the 6pm position on lower row, right side. Notice that a total of 8 points were moved this time round.*

## Refine -- Left Side

Now we do almost the same thing again only this time on the opposite side...

- In the Front Viewport select the point at the 7 o'clock position and whilst holding down the Shift key move it only very slightly along the X axis -- (see screenshot below entitled: Figure - A). When you've finished, once again, hold down the Shift key and move the point downward along the Z axis.
- Once done, continue working in a clockwise manner and repeat the procedure with the next point only.
- When complete your monitor should resemble the screenshot below entitled: (After).
- Refer to the Helper Table for further guidance.

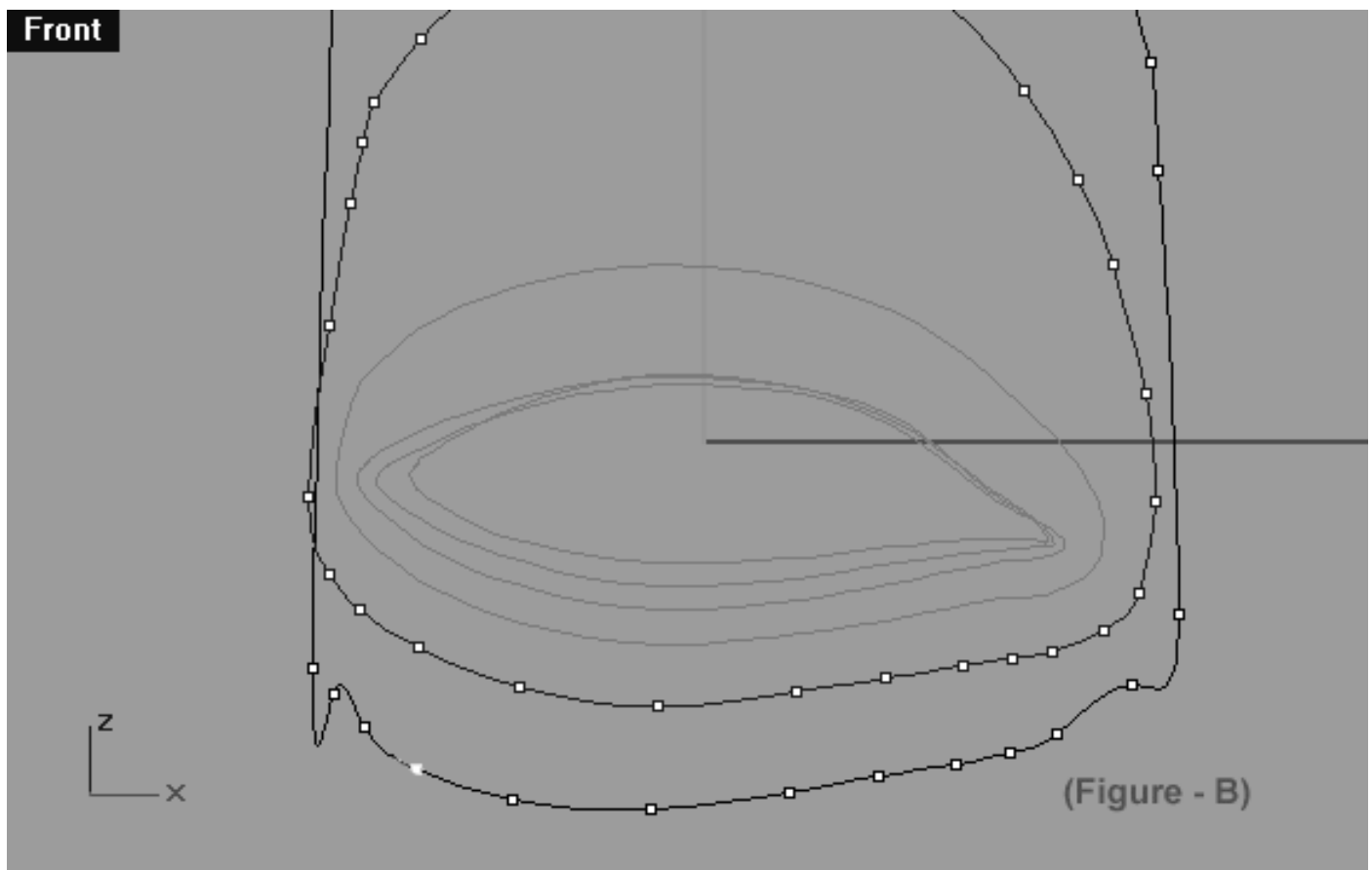


This **Front Viewport** screenshot shows the 6th Eyelid Curve (Eyelid\_06) lower row, left side. Notice that the point at roughly the 7 o'clock position has been selected and is ready to be moved along the X and Z axis.

### Helper Table

Point	Approximate Units Moved
7 o'clock	X: 0.479 (left), Z: 0.996 (down)
8 o'clock	X: 0.393 (left), Z: 1.034 (down)



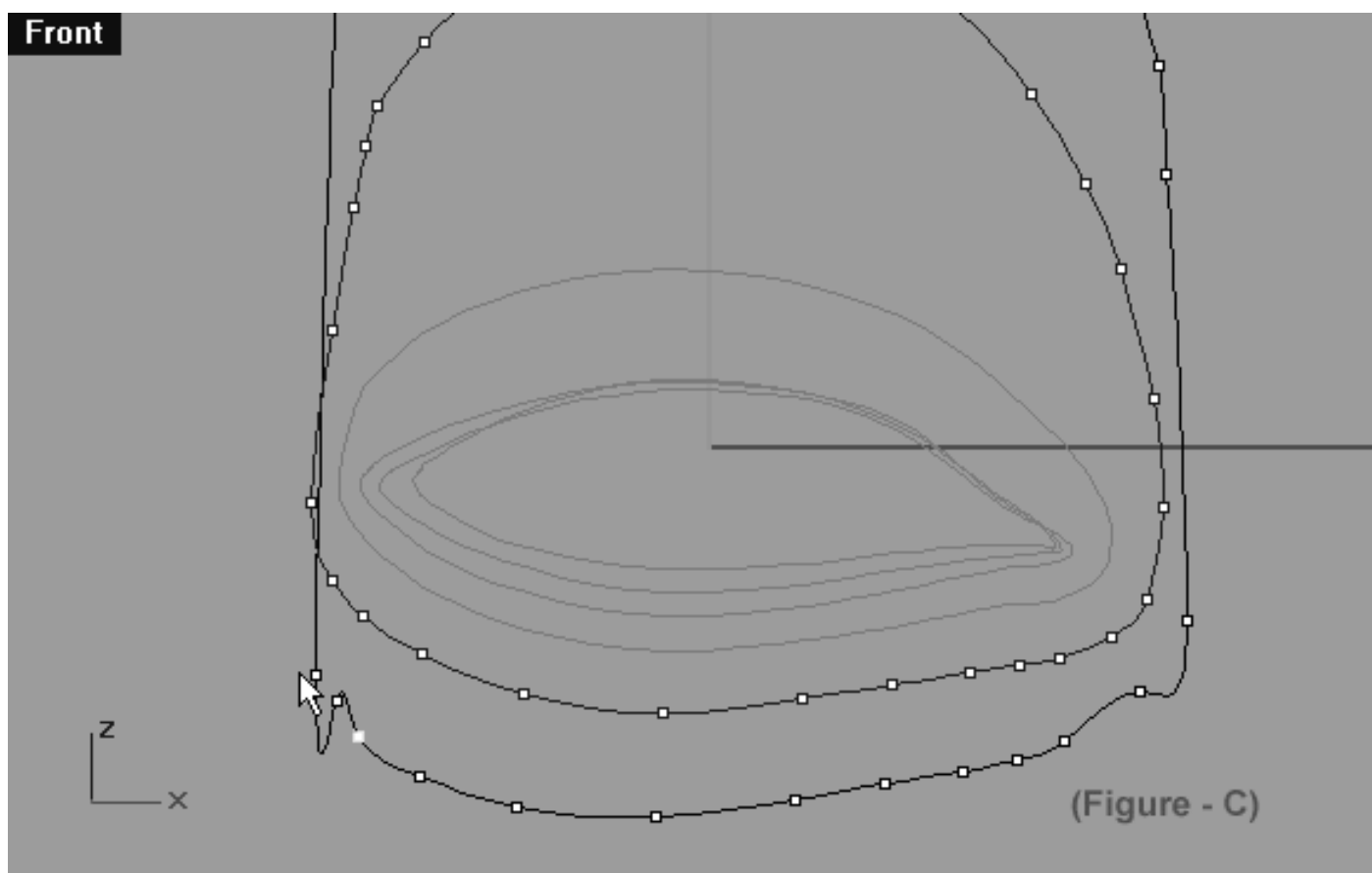


This **Front Viewport** screenshot shows the 6th Eyelid Curve (Eyelid\_06) lower row, left side. Notice that the points at roughly the 7 & 8 o'clock positions have now been moved along the X and Z axis only very slightly. Notice that a total of 2 points were moved on this occasion.

- Now let's continue with the next point (the 3rd from the 6pm position) by moving it also only very slightly along the X axis -- (see the screenshot below entitled Figure - C). Once done, then move the point down along the Z axis too.
- Refer to the Helper Table for further guidance.

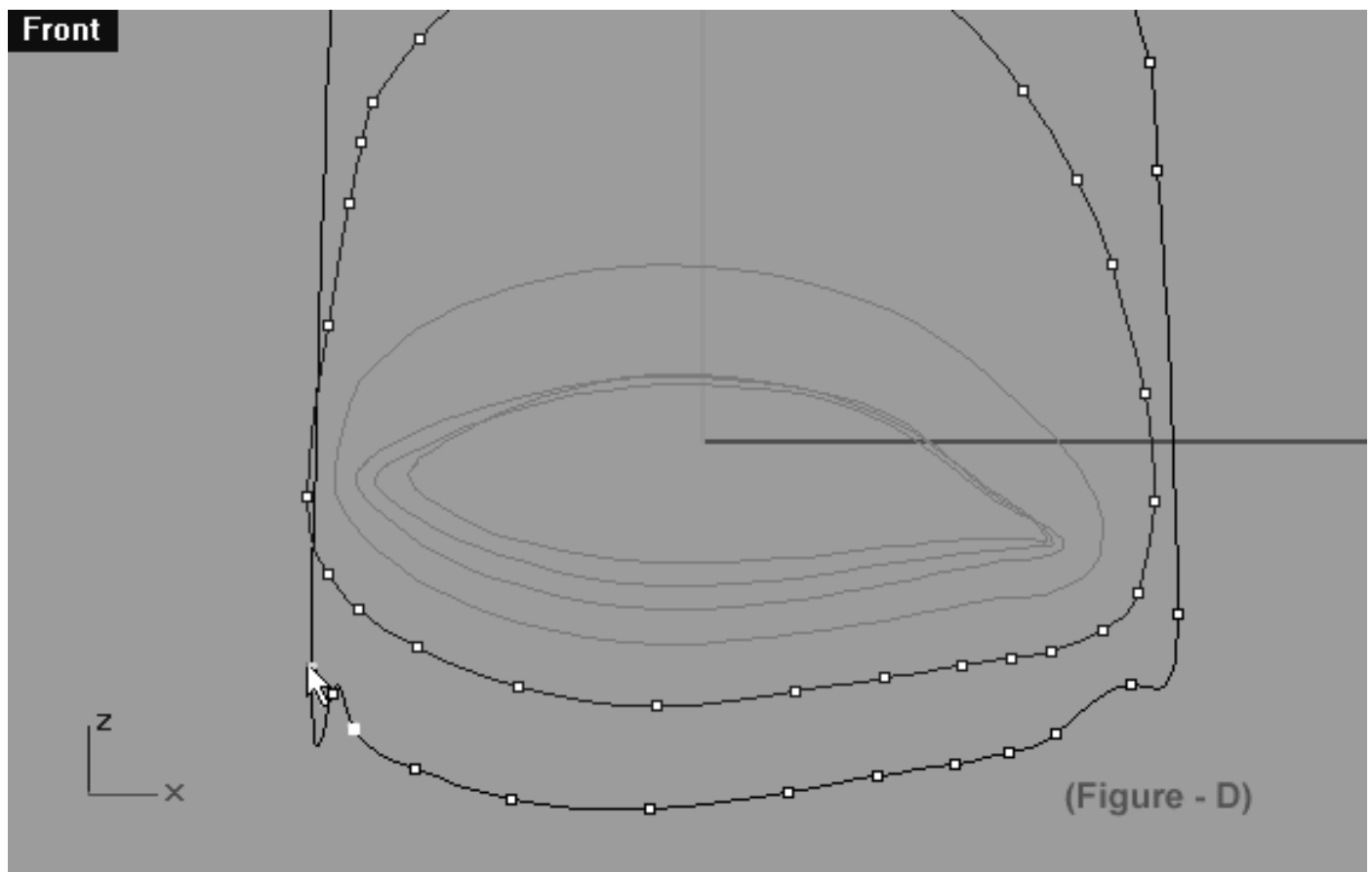
### Helper Table

Point	Approximate Units Moved
3rd from 6pm, lower left.	X: 0.542 (left), Z: 1.035 (down)



This **Front Viewport** screenshot shows the 6th Eyelid Curve (Eyelid\_06) lower row, left side. Notice that the 3rd point from the 6 o'clock position has now been moved along the X and Z axis only very slightly. Notice that a total of 1 point was moved on this occasion.

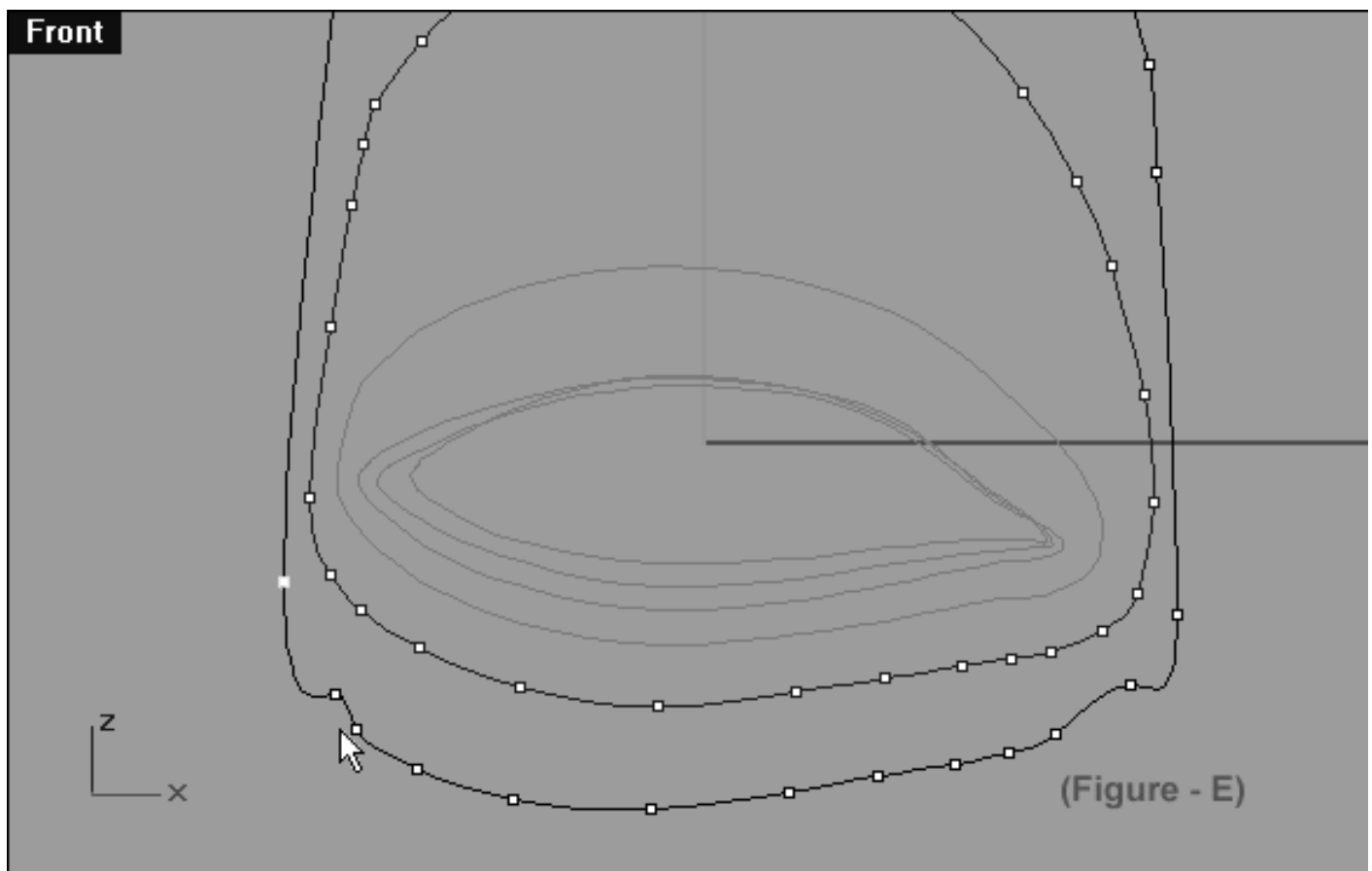
- Now using your eyes only follow along the curve in a clockwise manner until you've located the point just before the large gap and once you have done, select it -- (see the screenshot below entitled: Figure - D).
- Next whilst holding down the Shift key, move the point upward along the Z axis until it is roughly parallel with the 4th point from the 6 o'clock position on the 5th eyelid curve -- (see the screenshot below entitled: Figure - E).
- Refer to the Helper Table for further guidance.



This **Front Viewport** screenshot shows the 6th Eyelid Curve (Eyelid\_06) lower row, left side. Notice that the last point before the big gap has now been selected and is ready to be moved until it is roughly parallel with the 4th point from the 6 o'clock position on the 5th eyelid curve.

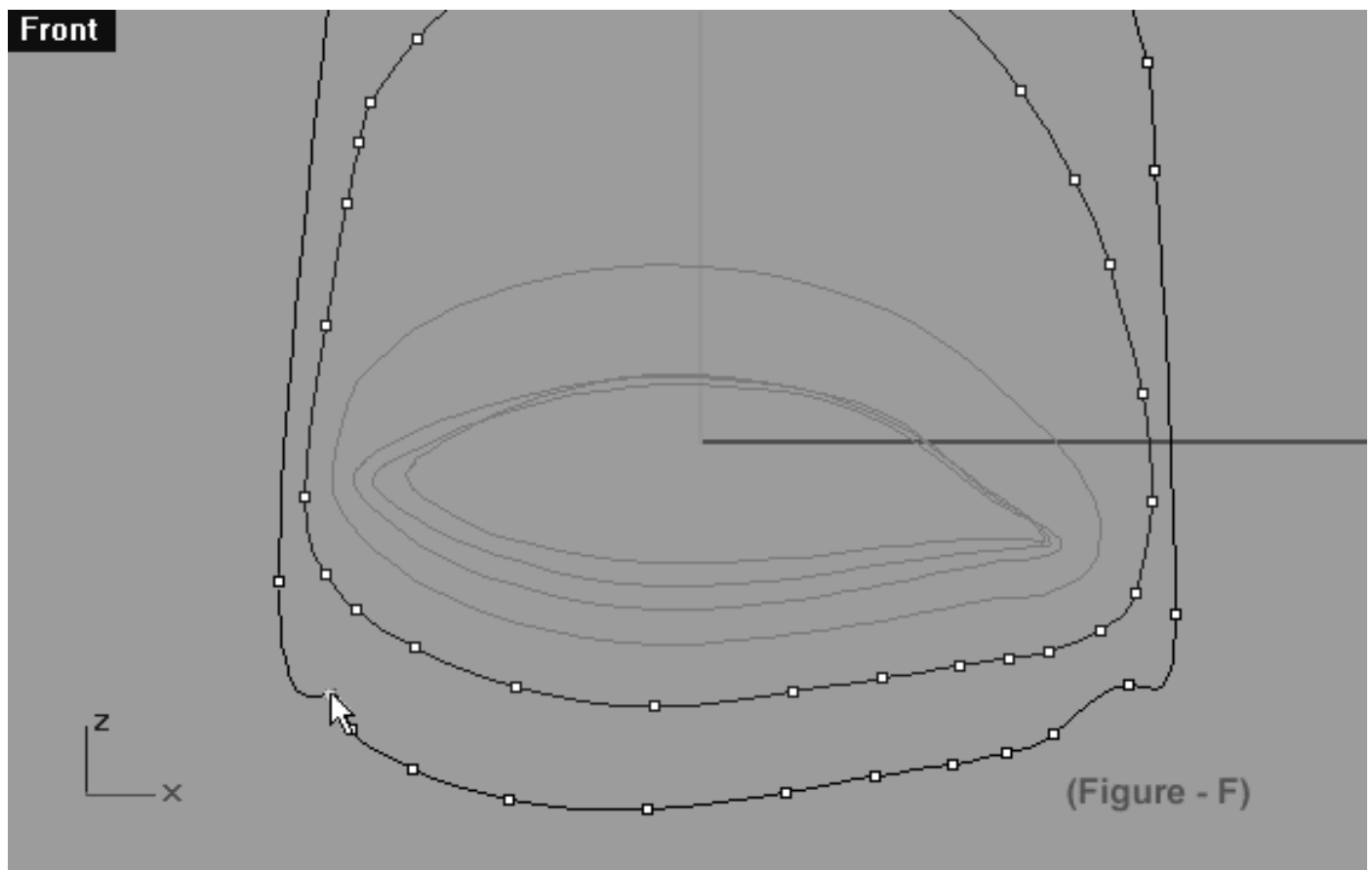
### Helper Table

Point	Approximate Units Moved
Point before large gap, lower left	Z: 1.302



This **Front Viewport** screenshot shows the 6th Eyelid Curve (Eyelid\_06) lower row, left side. Notice that the last point before the big gap has now been selected and moved and is roughly parallel with the 4th point from the 6 o'clock position on the 5th eyelid curve.

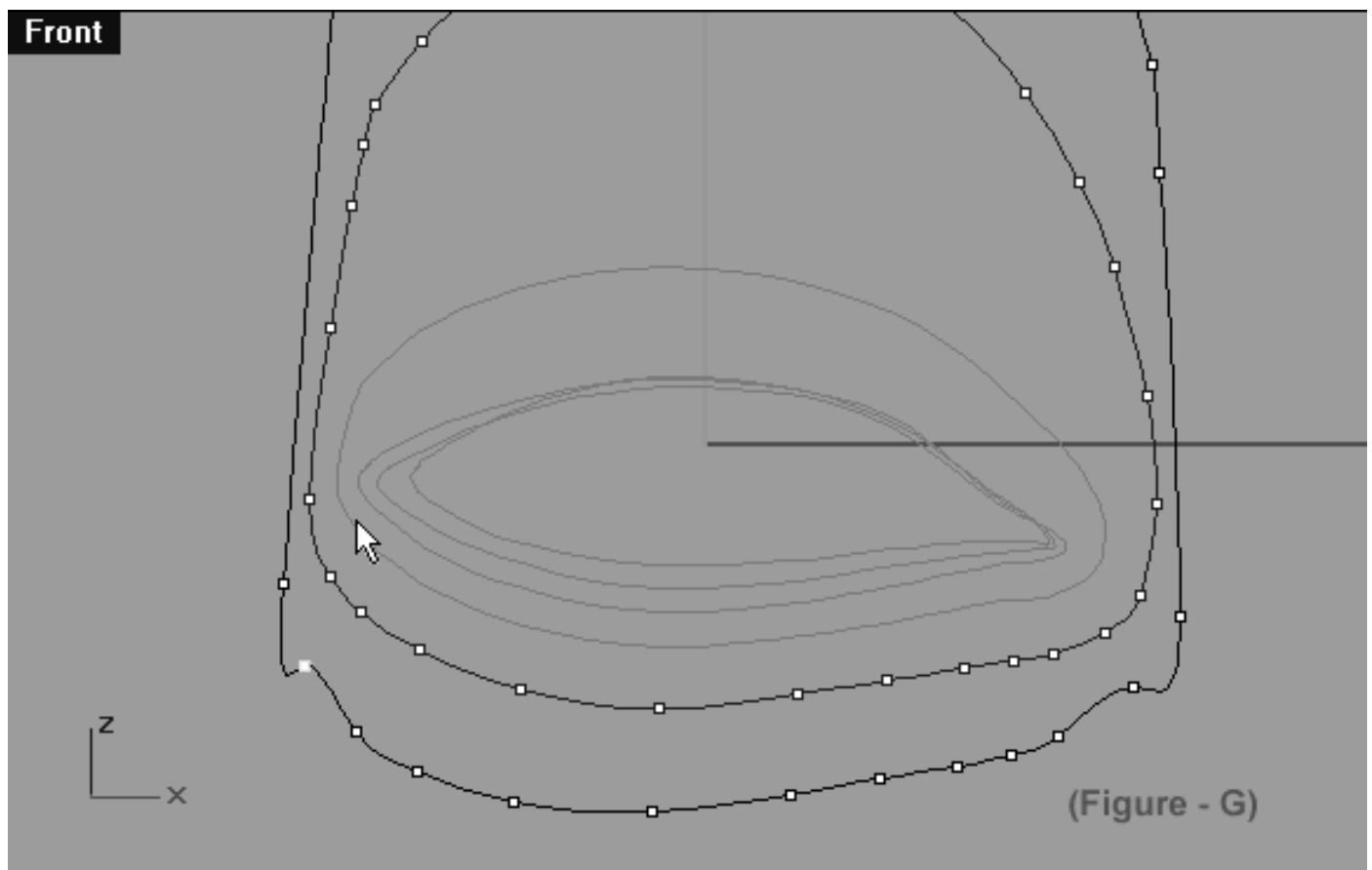
- Next, return to the previous point (the 4th from the 6pm position) and select it -- (see the screenshot below entitled: Figure - F).
- Once done, whilst holding down the Shift key first move it outward along X and then down along the Z axis until is situated as in the screenshot below entitled: (Figure - G).
- Refer to the Helper Table for further guidance.



This **Front Viewport** screenshot shows the 6th Eyelid Curve (Eyelid\_06) lower row, left side. Notice that the 4th point from the 6pm position has now been selected and is ready to be moved outward along X and downward along the Z axis.

### Helper Table

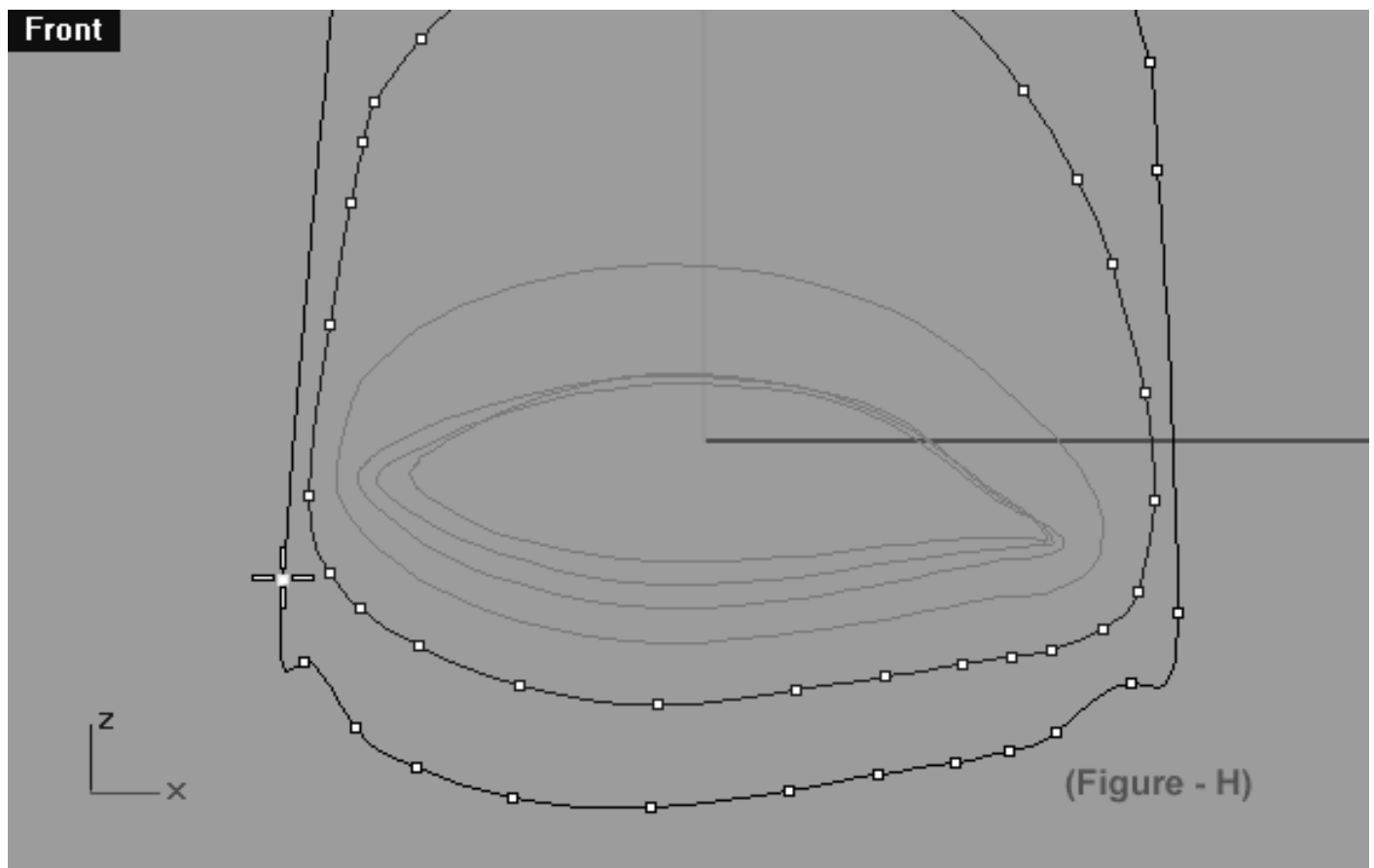
Point	Approximate Units Moved
4th from 6pm, lower left	X: 1.285 (left), Z: 0.992 (down)



This **Front Viewport** screenshot shows the 6th Eyelid Curve (Eyelid\_06) lower row, left side. Notice that the 4th point from the 6pm position has now been moved outward along X and upward along the Z axis.

We are very nearly finished with this section of the curve now, all that remains is to return once again to the last point before the big gap and refine its location -- let's do that now...

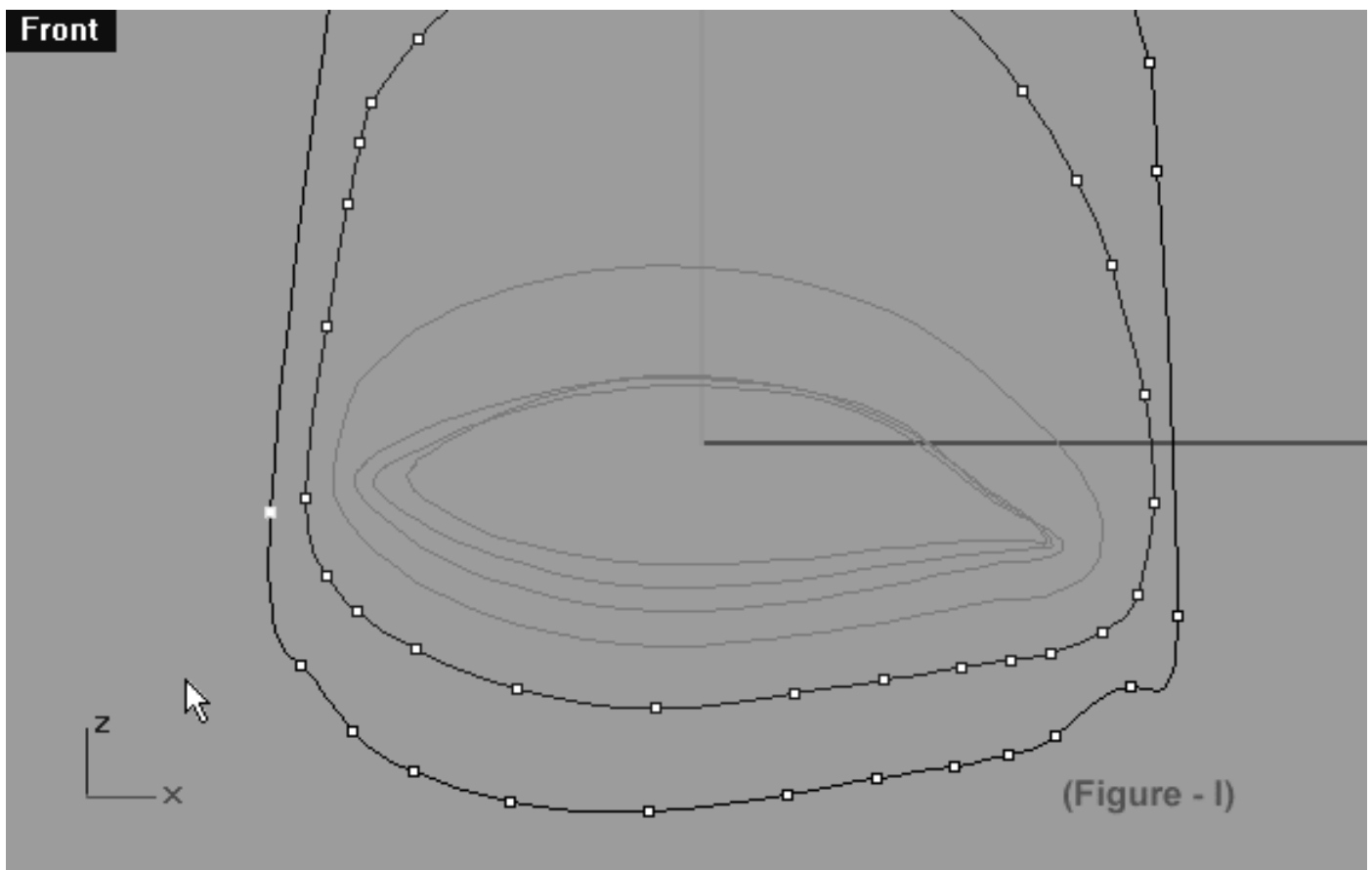
- Select the last point before the big gap (the 5th point from the 6pm position) -- see the screenshot below entitled (Figure - H).
- Once done, whilst holding down the Shift key first move it upward along the Z and then slightly outward along the X until the point is located roughly parallel to but just slightly below the 5th point from the 6 o'clock position on the 5th curve -- see the screenshot below entitled: (Figure - I).
- Refer to the Helper Table for further guidance.



This **Front Viewport** screenshot shows the 6th Eyelid Curve (Eyelid\_06) lower row, left side. Notice that the 5th point from the 6pm position has now been selected and is ready to be moved upward along the Z axis and slightly outward along the X until it is located roughly parallel to yet just slightly below the 5th point from the 6 o'clock position on the 5th curve.

### Helper Table

Point	Approximate Units Moved
Last point before large gap, lower left	Z: 2.648 (up), X: 1.663 (left)



This **Front Viewport** screenshot shows the 6th Eyelid Curve (Eyelid\_06) lower row, left side. Notice that the 5th point from the 6pm position has now been selected and now moved upward along the Z axis and slightly outward along the X and is located roughly parallel to yet just slightly below the 5th point from the 6 o'clock position on the 5th curve.



**View an example movie**

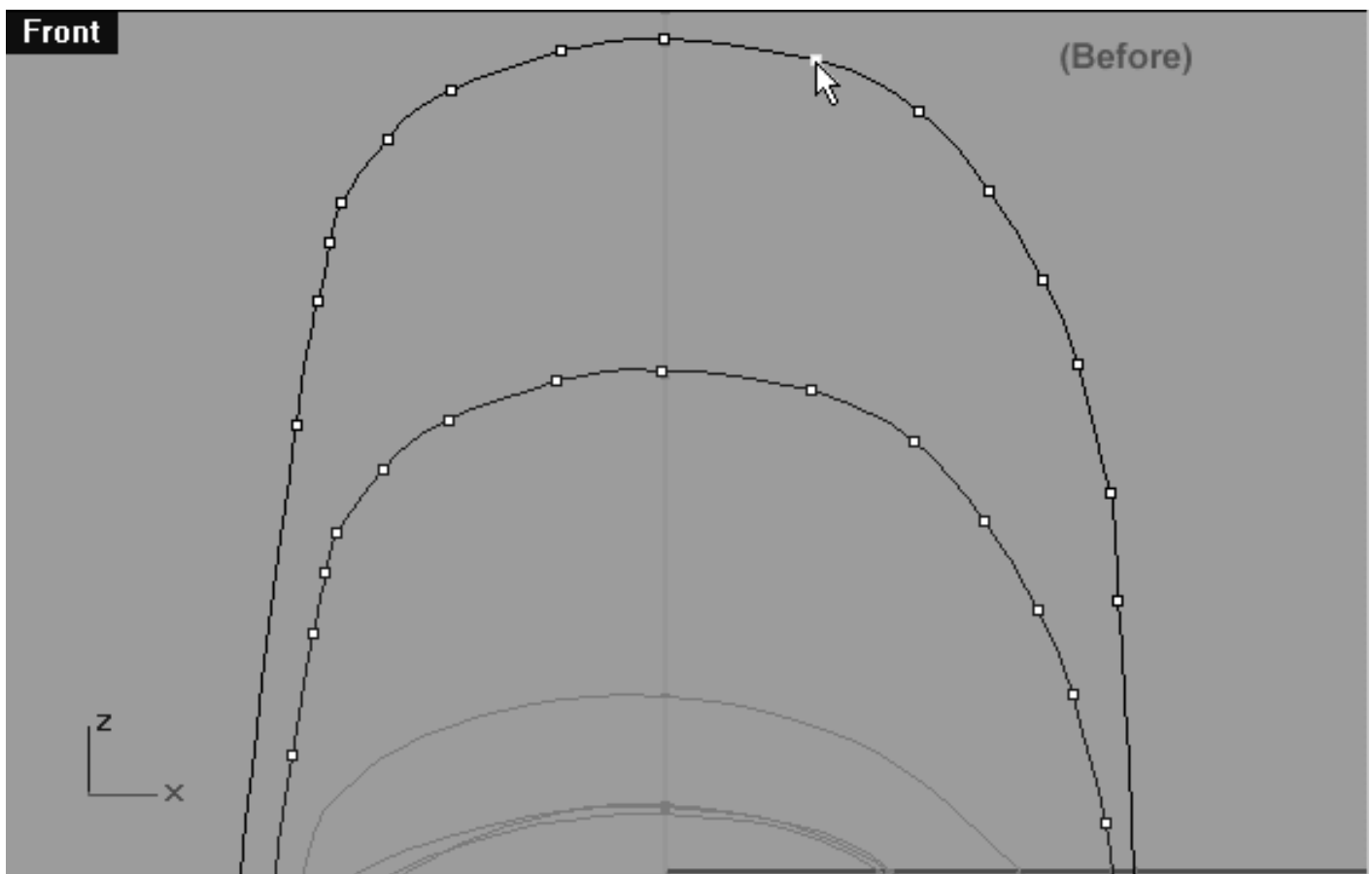
**Editing the 6th Eyelid Curve, Pt. 2** [Click Here](#)

## Upper Row, Right Side

It's time to refine the point placement and spacing on the upper row, right side.

- In the **Front Viewport**, select the point at the 1 o'clock position (see screenshot below entitled: Before).
- Next, whilst holding down the Shift key first slide the point a bit along the X axis. When complete, then move it slightly downward along the Z (see screenshot below entitled: After).
- Once done, continue working in a clockwise manner and repeat the procedure with the next 6 points only. When you've finished your monitor should resemble the screenshot below (After).
- Refer to the Helper Table for further guidance.

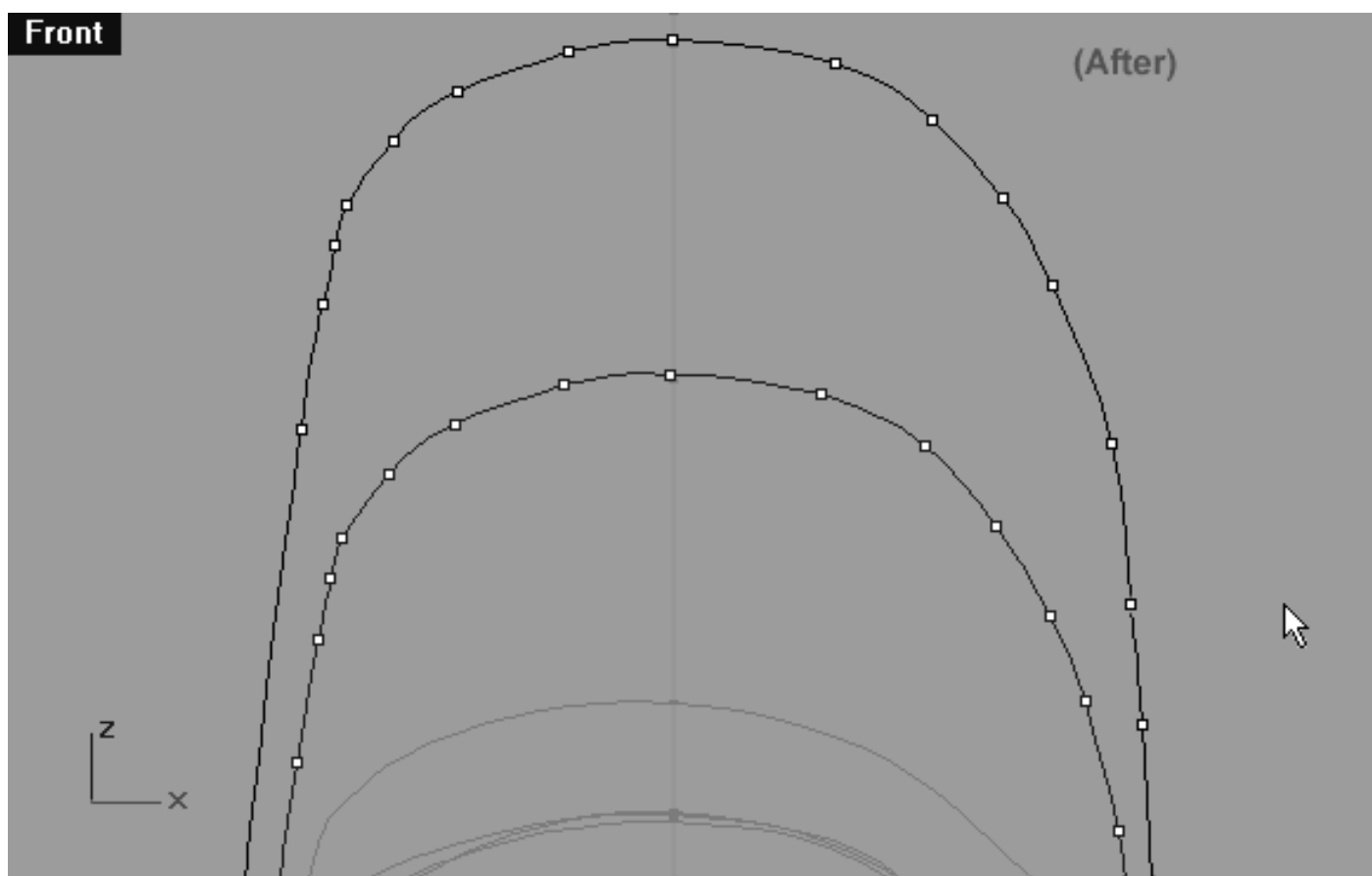




This **Front Viewport** screenshot shows the point at the 1 o'clock position has now been selected and is ready to be moved along the X axis and the Z axis.

### Helper Table

Point	Approximate Units Moved
1 o'clock	X: 0.164 (right), Z: 0.184 (down)
Next point clockwise	X: NIL (NIL), Z: 0.417 (down)
Next point clockwise	X: 0.133 (right), Z: 0.256 (down)
Next point clockwise	X: 0.454 (right), Z: 0.525 (down)
Next point clockwise	X: 0.863 (right), Z: 3.082 (down)
Next point clockwise (caution -- tricky)	X: 0.856 (right), Z: 4.115 (down)
Next point clockwise (caution -- tricky)	X: 1.050 (right), Z: 3.887 (down)

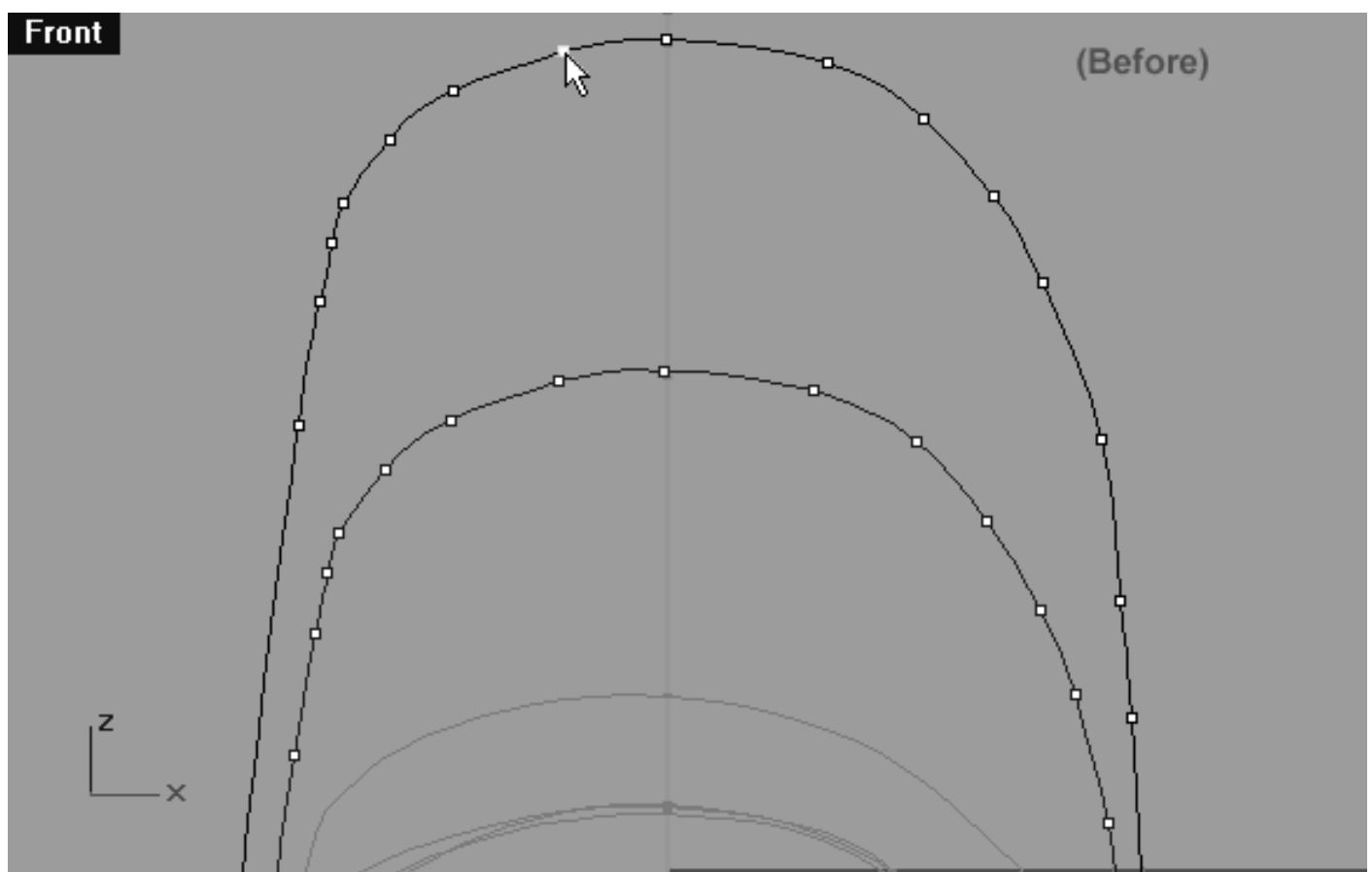


This **Front Viewport** screenshot shows that starting with the point at the 1 o'clock position a total of 7 points have now been moved along the X axis and the Z axis.

## Upper Row, Left Side

It's time to refine the point placement and spacing on the upper row, left side.

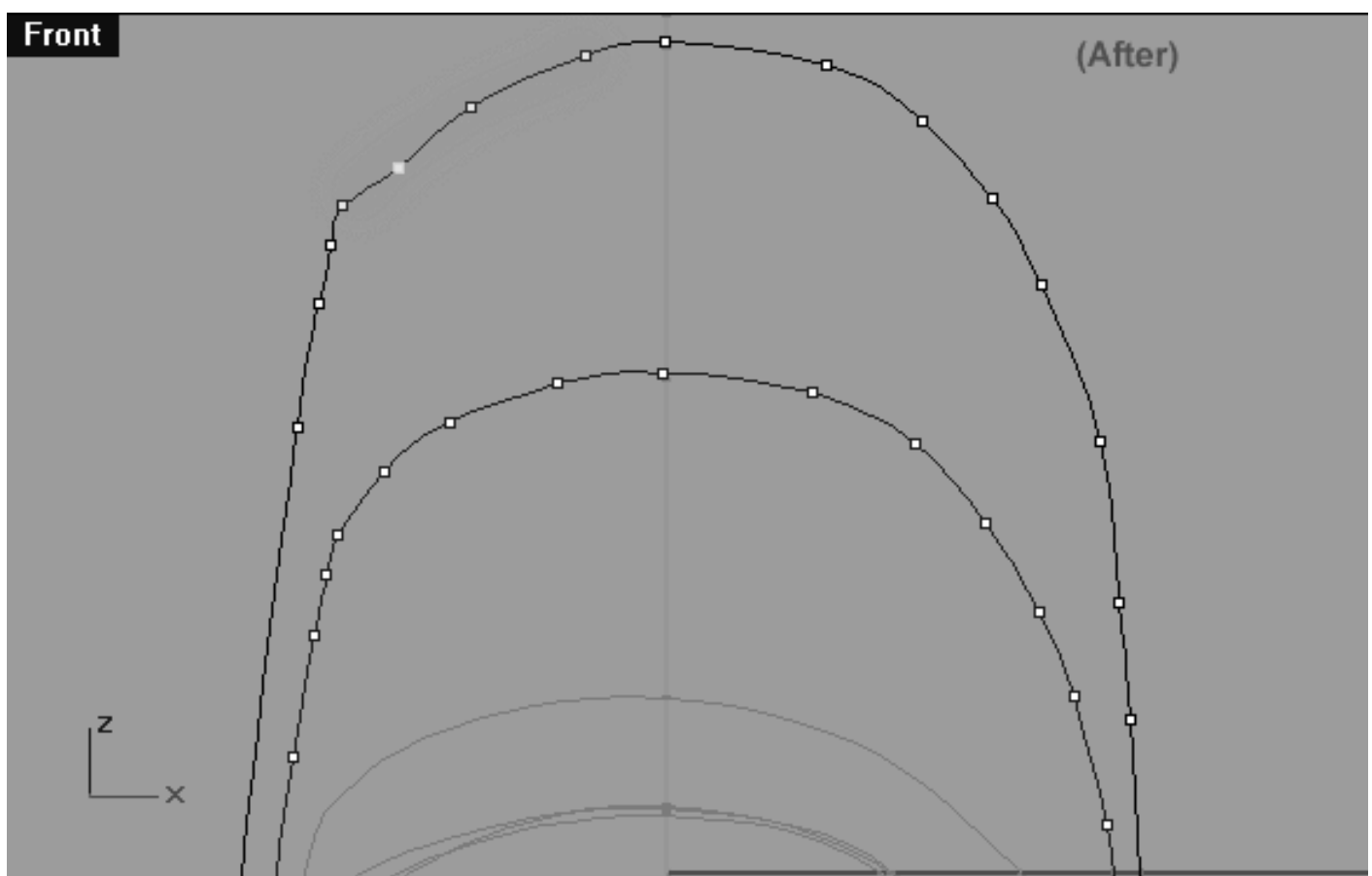
- In the Front Viewport, select the point at the 11 o'clock position -- see the screenshot below entitled: (Before). Next, whilst holding down the Shift key first move it just a bit along the X axis. Then once completed, move the point downward along the Z axis.
- Once done, continue working in an anti-clockwise manner and repeat the procedure with the next 2 points only. When you've finished your monitor should resemble the screenshot below entitled: (After).
- Refer to the Helper Table for further guidance.



This **Front Viewport** screenshot shows the point at the 11 o'clock position has now been selected and is ready to be moved along the X and the Z axis.

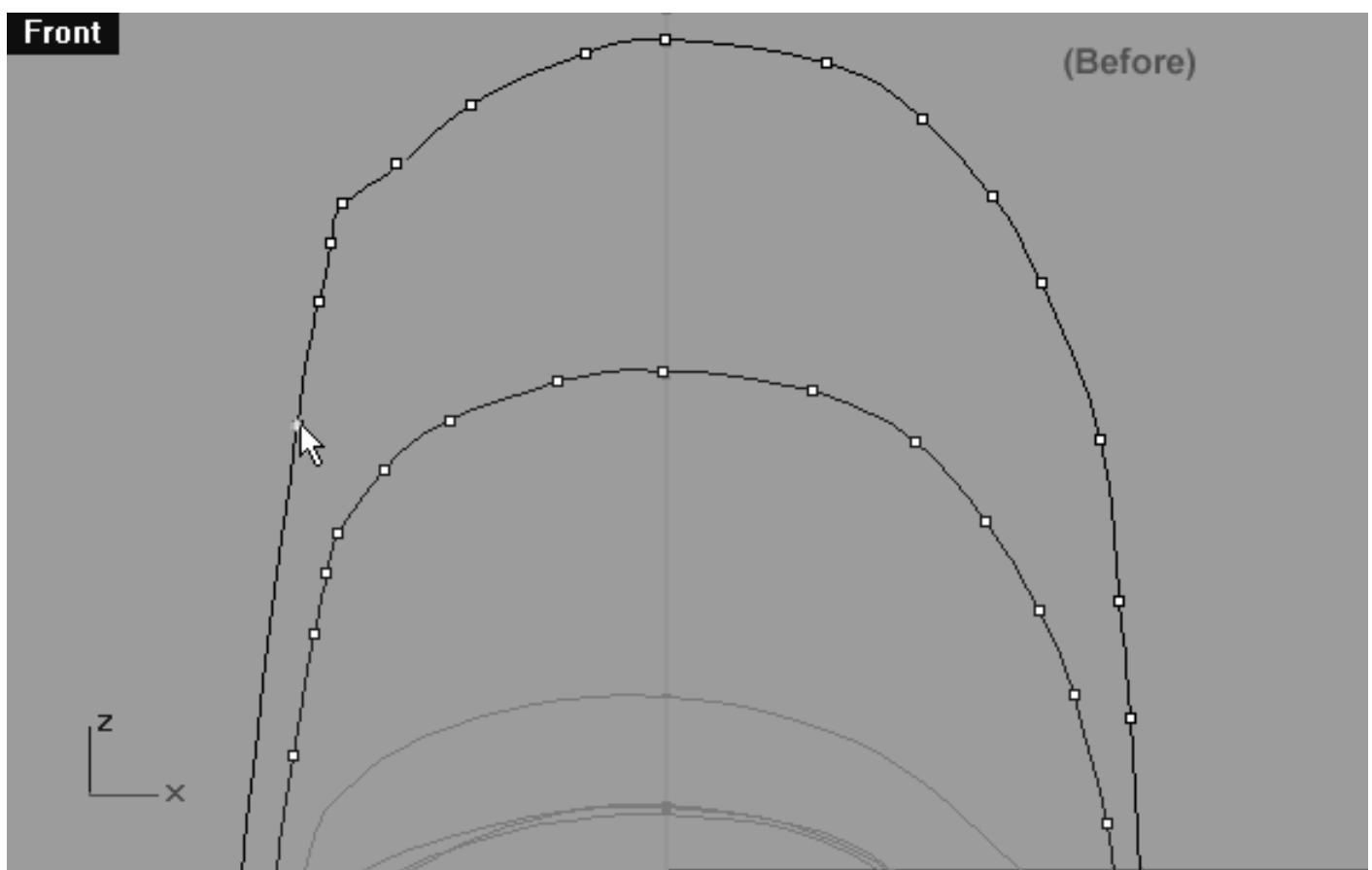
### Helper Table

Point	Approximate Units Moved
11 o'clock	X: 0.903 (right), Z: 0.177 (down)
Next point anti-clockwise	X: 0.718 (right), Z: 0.508 (down)
Next point anti-clockwise	X: 0.330 (right), Z: 1.030 (down)



This **Front Viewport** screenshot shows that beginning with the point at the 11 o'clock position and working anti-clockwise a total of 3 points have now been moved along the X and Z axis. Observe how the steepness of the angle has now become more acute (as highlighted in green).

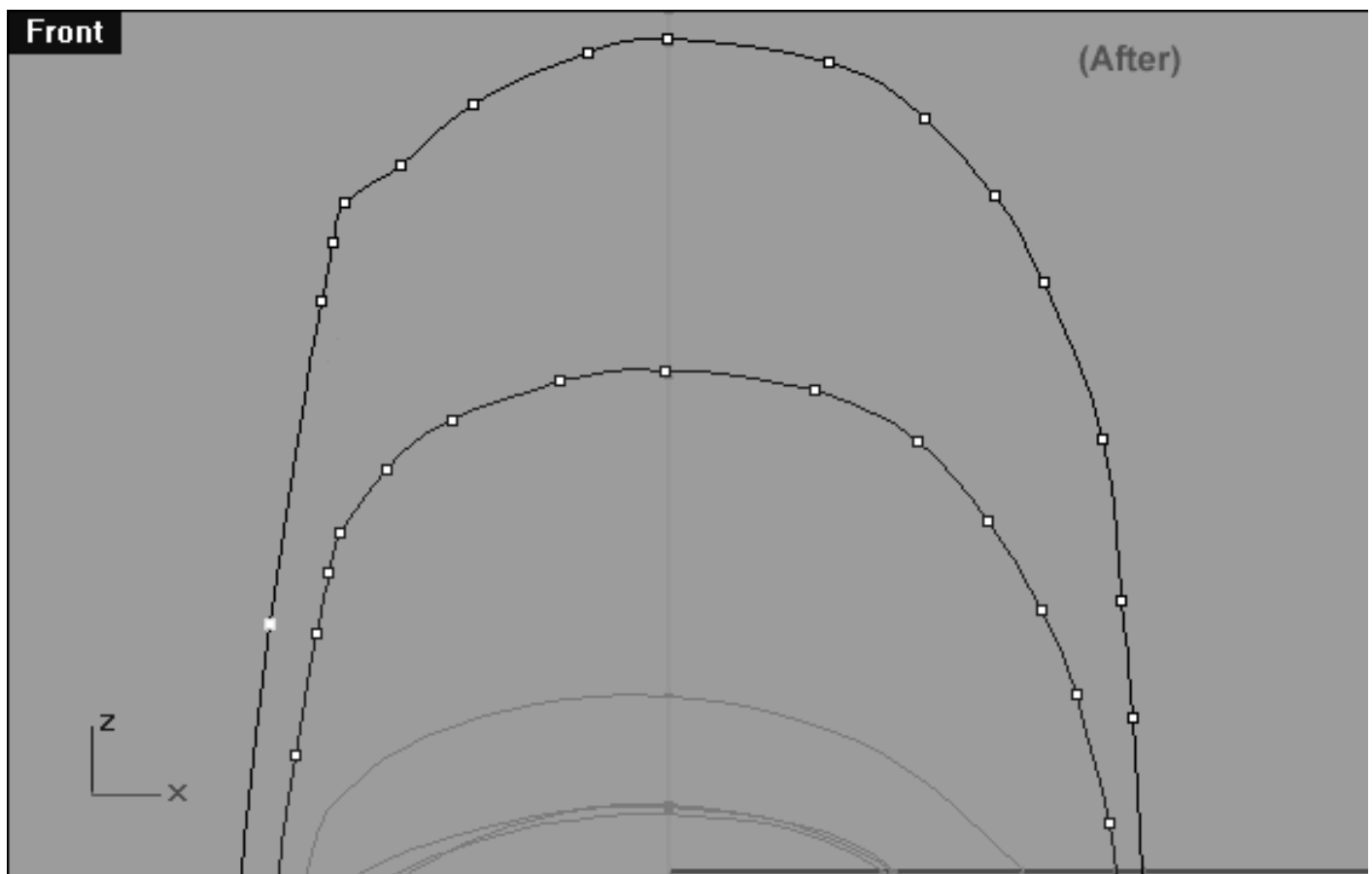
- Next using your eyes only, follow along the curve until you've located the last point before the big gap -- when you've done so, select it (see the screenshot below entitled: Before).
- Once done, whilst holding down the Shift key, move the point downward along the Z axis until it's roughly parallel with the 6th point from the 12 o'clock position on the 5th eyelid curve -- see the screenshot below entitled: (After).
- Refer to the Helper Table for further guidance.



This **Front Viewport** screenshot shows the last point before the big gap (the 7th from the 12 pm position on the 6th eyelid curve) has now been selected and is ready to be moved along the Z axis.

### Helper Table

Point	Approximate Units Moved
Last point before large gap, upper left	Z: 8.581 (down), X: 0.728 (left)

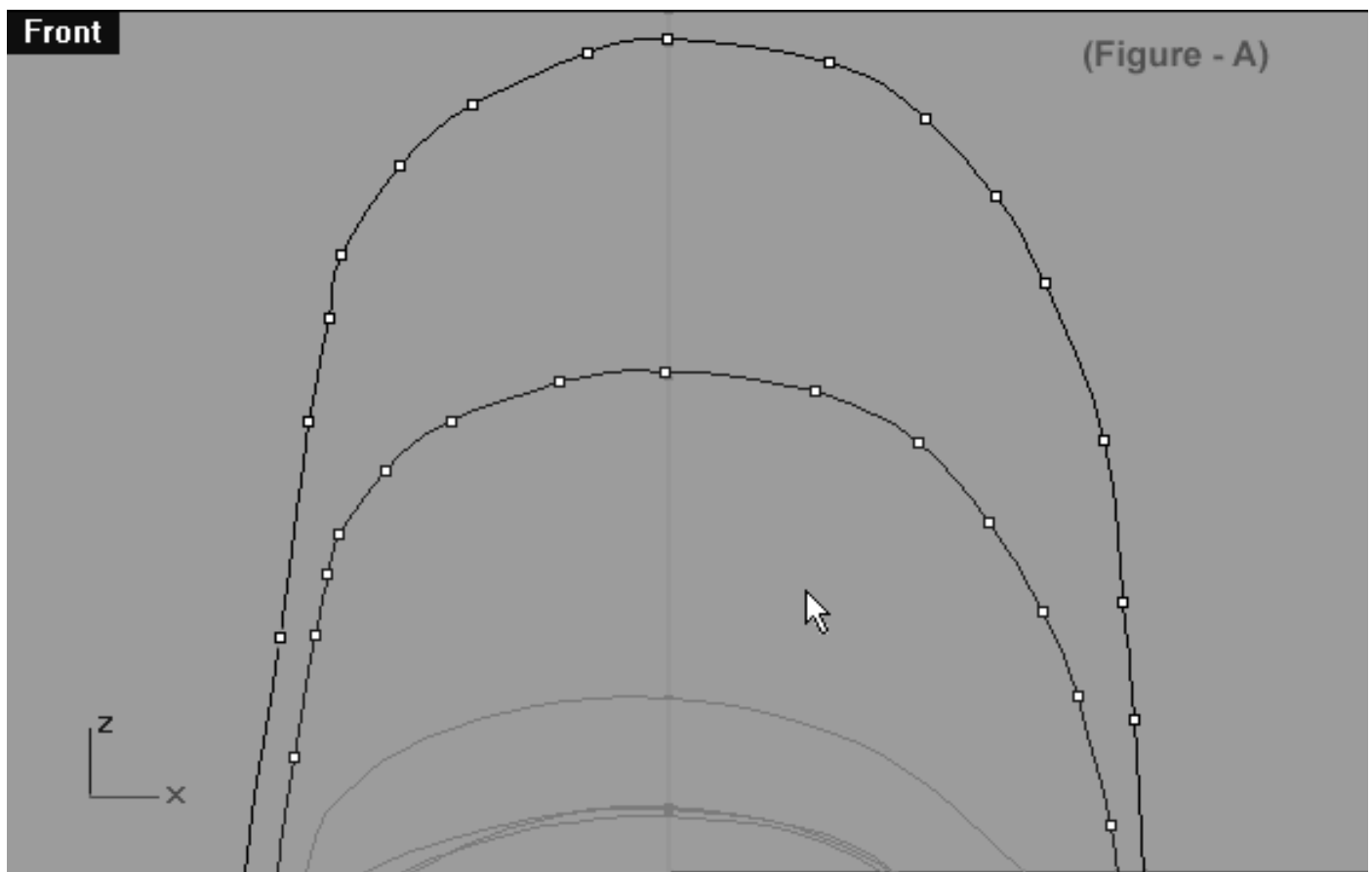


This **Front Viewport** screenshot shows the last point before the big gap (the 7th from the 12 pm position) has now been moved along the Z axis and is now roughly parallel with the 6th point from the 12 o'clock position on the 5th eyelid curve.

- Now work your way backwards (clockwise) along the curve on an incremental basis sliding each of the 3 remaining points downward along the Z axis.
- Once completed your monitor should resemble the screenshot below entitled: (Figure - A).
- Refer to the Helper Table for further guidance.


### Helper Table

Point	Approximate Units Moved
Next point clockwise	Z: 4.837
Next point clockwise	Z: 3.059
Next point clockwise	Z: 1.966



This **Front Viewport** screenshot shows the correct placement of the points after they've been refined.

## Right Side

- This would be a good time to make sure that all the edit points on the curve are clearly visible within the **Front Viewport**. Choose the Zoom Extents / Zoom Extents All Views icon  from the toolbar.
- Starting with the point at the 12 o'clock position, with your eyes follow along the curve in a clockwise direction until you've located the 6th point from it and then select it -- see the screenshot below entitled: (Figure - A).
- Once done, whilst holding down the Shift key slide the point downward along the Z axis until it is roughly parallel to the 5th point on the 5th eyelid curve -- see the screenshot below entitled: (Figure - B).
- Now select the next point and slide it downward in the same manner until it is located midway between the 6th and 7th point of the 5th eyelid curve -- see the screenshot below entitled: (Figure - C).
- Refer to the Helper Table for further guidance.



This **Front Viewport** screenshot shows the 6th point from the 12 pm position (on the 6th eyelid curve) has now been selected and is ready to be moved along the Z axis.

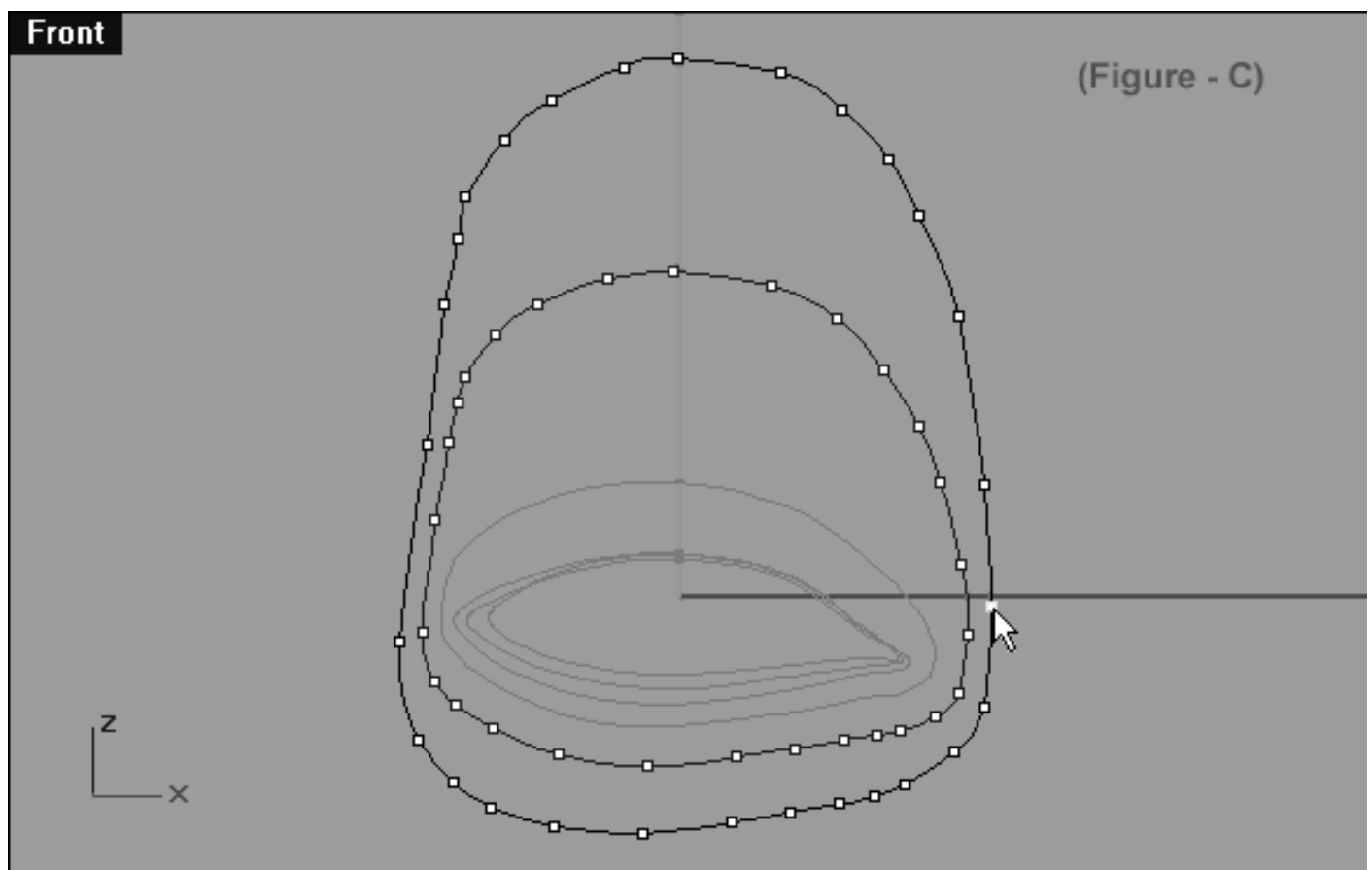
### Helper Table

Point	Approximate Units Moved
6th from 12 o'clock, upper right	Z: 4.012
7th from 12 o'clock, upper right	Z: 7.657





This **Front Viewport** screenshot shows the 6th point from the 12 pm position (on the 6th eyelid curve) has now been moved along the Z axis and is now located roughly parallel to the 5th point on the 5th eyelid curve.



This **Front Viewport** screenshot shows that working in a clockwise direction the next point has now been selected and moved along the Z axis and is now situated roughly midway between the 6th and 7th point of the 5th eyelid curve.

We are now just about ready to wrap things up in the Front Viewport, however, before we do we need to make one very minor adjustment.

- In the Front Viewport, select the point at the 12 o'clock position on the 6th eyelid curve. Once done, whilst holding down the shift key move the point along the X axis so that it rests just slightly off centre -- see the screenshot below entitled: (Figure - A).
- Refer to the Helper table for further guidance.

Helper Table

Point	Approximate Units Moved
12 o'clock	X: 1.341 (right)



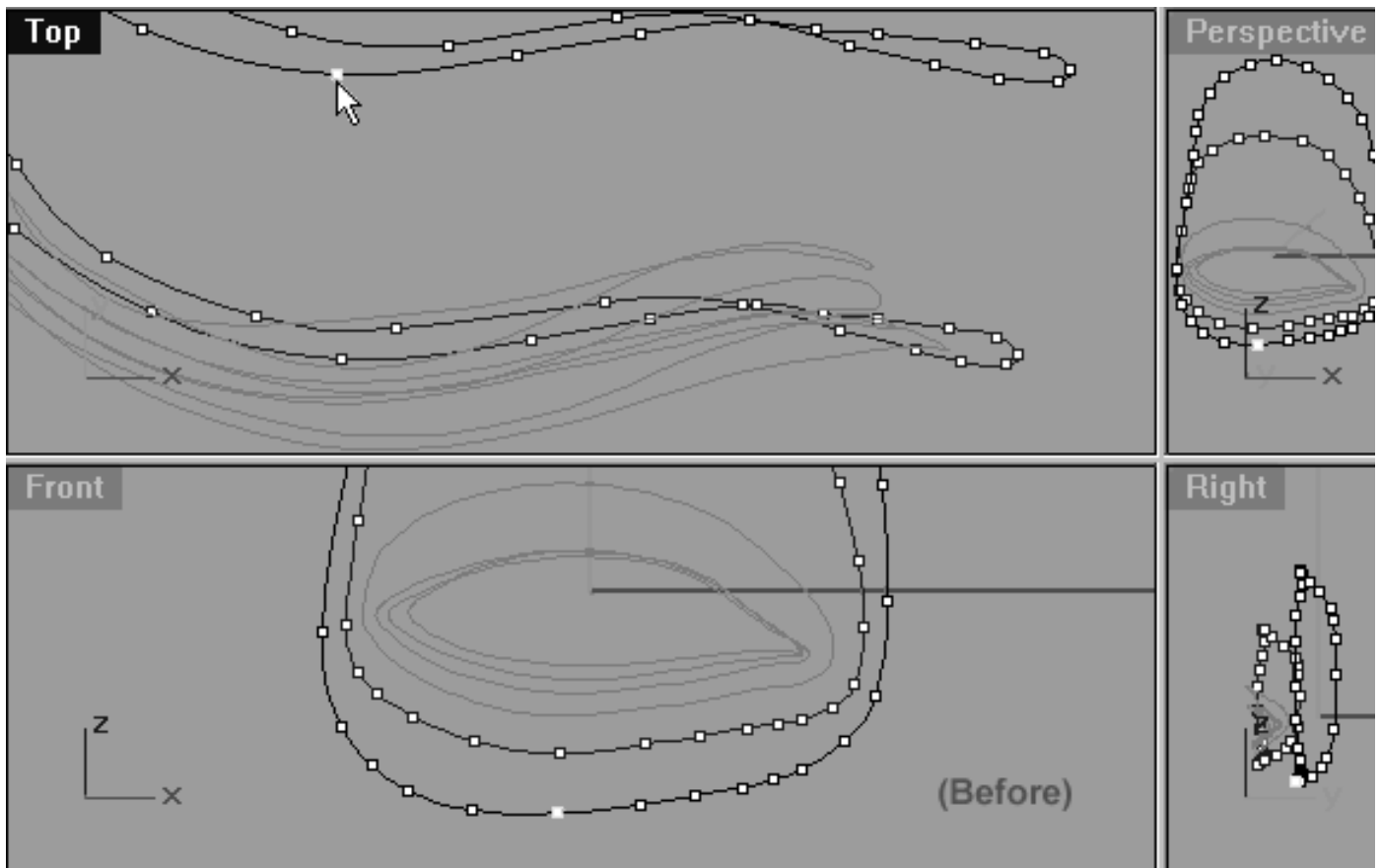
*This **Front Viewport** screenshot shows that the point located at the 12 o'clock position has now been moved along the X axis and is now situated just slightly off centre. Wondering why I've done this? It's to help prevent the surface from twisting when lofted.*



**View an example movie**  
**Editing the 6th Eyelid Curve, Pt. 3** [Click Here](#)

## Lower Row -- Right Side

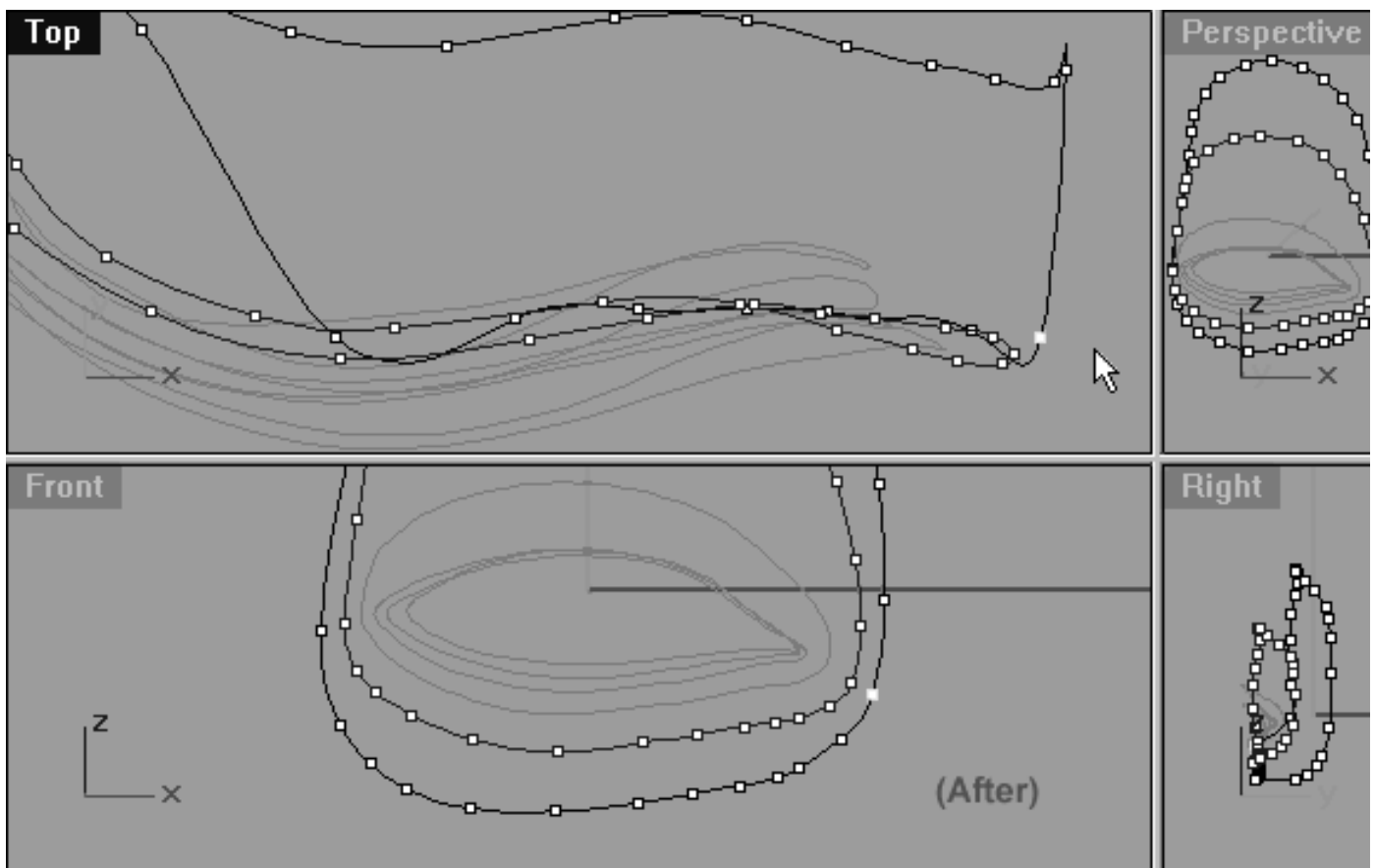
- Rearrange your viewports so that the viewports are laid out as in the screenshot below entitled: (Before).
- In the **Front Viewport**, select the point at the 6 o'clock position -- see the screenshot below entitled: (Before).
- Once done, move the cursor into the **Top Viewport** and whilst holding down the Shift Key move the point downward along the Y axis until you've gone just a hair beyond the 5th curve -- see the screenshot below entitled: (After).
- Continue working in a anti-clockwise manner and repeat the procedure with the next 7 points, moving each downward along the Y axis -- see the screenshot below entitled: (After).
- Refer to the Helper Table for further guidance.



This **Front Viewport** screenshot shows the point at the 6pm position (on the 6th eyelid curve) has now been selected and is ready to be moved along the Y axis in the **Top Viewport**.

## Helper Table

Point	Approximate Units Moved
6 o'clock	Y: 7.714 (down)
Next point anti-clockwise	Y: 7.804 (down)
Next point anti-clockwise	Y: 8.064 (down)
Next point anti-clockwise	Y: 8.530 (down)
Next point anti-clockwise	Y: 8.367 (down)
Next point anti-clockwise	Y: 8.425 (down)
Next point anti-clockwise	Y: 8.383 (down)
Next point anti-clockwise	Y: 8.410 (down)



This **Front Viewport** screenshot shows the point located at the 6pm position and the 7 points following in a anti-clockwise direction (on the 6th eyelid curve) have now been moved along the Y axis in the **Top Viewport**.

## Lower Row -- Left Side

- Maximise the Top Viewport then Pan and Zoom as required so that the edit points on the lower row, left side are clearly visible.
- Select the 1st point directly to the left of 6 o'clock position -- see the screenshot below entitled: (Before).
- Next, whilst holding down the Shift key move the point downward along the Y axis until it is slightly ahead of the 5th curve -- see the screenshot below entitled: (after).

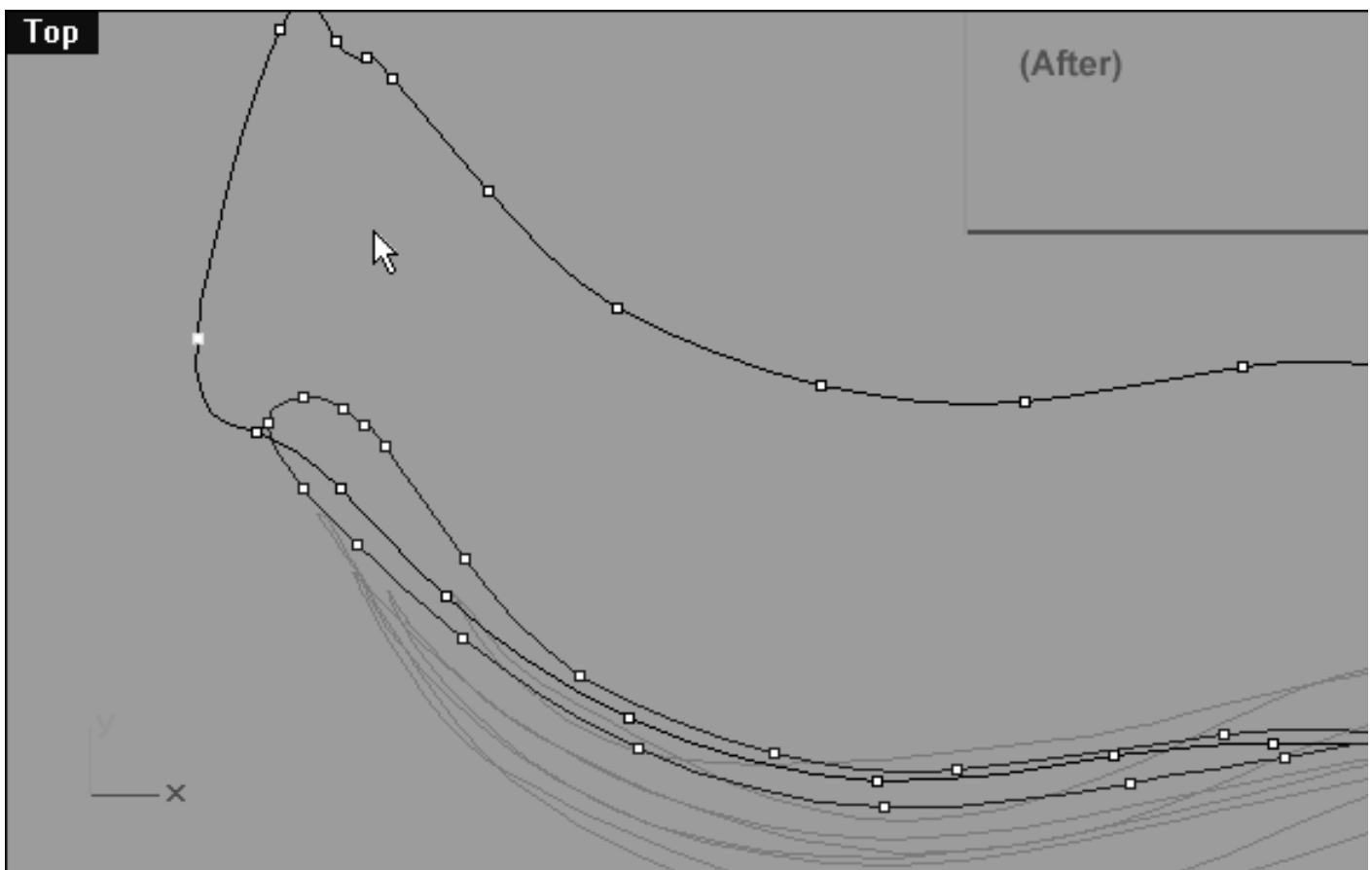
- Continue working in a clockwise manner (as seen from the Front View) and repeat the procedure with the next 4 edit points.
- Refer to the Helper Table for further guidance.



This **Top Viewport** screenshot shows the point at the 7 pm position (as seen from the front view) has now been selected and is ready to be moved along the Y axis.

### Helper Table

Point	Approximate Units Moved
7 o'clock	Y: 7.539 (down)
Next point clockwise	Y: 7.370 (down)
Next point clockwise	Y: 7.082 (down)
Next point clockwise	Y: 6.938 (down)
Next point clockwise	Y: 6.409 (down)



*This **Top Viewport** screenshot shows the point located at the 7 pm position (as seen from the front view) and the 4 points following in a clockwise direction (on the 6th eyelid curve) have now been moved along the Y axis in the **Top Viewport**.*

## Upper Row, Right Side

- Arrange your viewports so that you can clearly see the points on the upper row, right side of the curve in **All Viewports**.
- In the Front Viewport select the point at the 1 o'clock position -- see the screenshot below entitled: (Before).
- Next, move the cursor into the Top Viewport and whilst holding down the Shift key move the point slightly downward along the Y axis -- see the screenshot below entitled: (Before).
- Once done, continue working in a clockwise direction (as seen from the front view) and repeat the procedure with the next 3 points, moving each one a bit further along the Y axis than the last. When you've finished your monitor should resemble the screenshot below entitled: (After).
- Refer to the Helper Table for further guidance.



This **All Viewport** screenshot shows the point at the 1 pm position (as seen from the front view) has now been selected and is ready to be moved along the Y axis in the **Top Viewport**.

### Helper Table

Point	Approximate Units Moved
1 o'clock	Y: 0.763 (down)
Next point clockwise	Y: 1.846 (down)
Next point clockwise	Y: 3.046 (down)
Next point clockwise	Y: 5.460 (down)

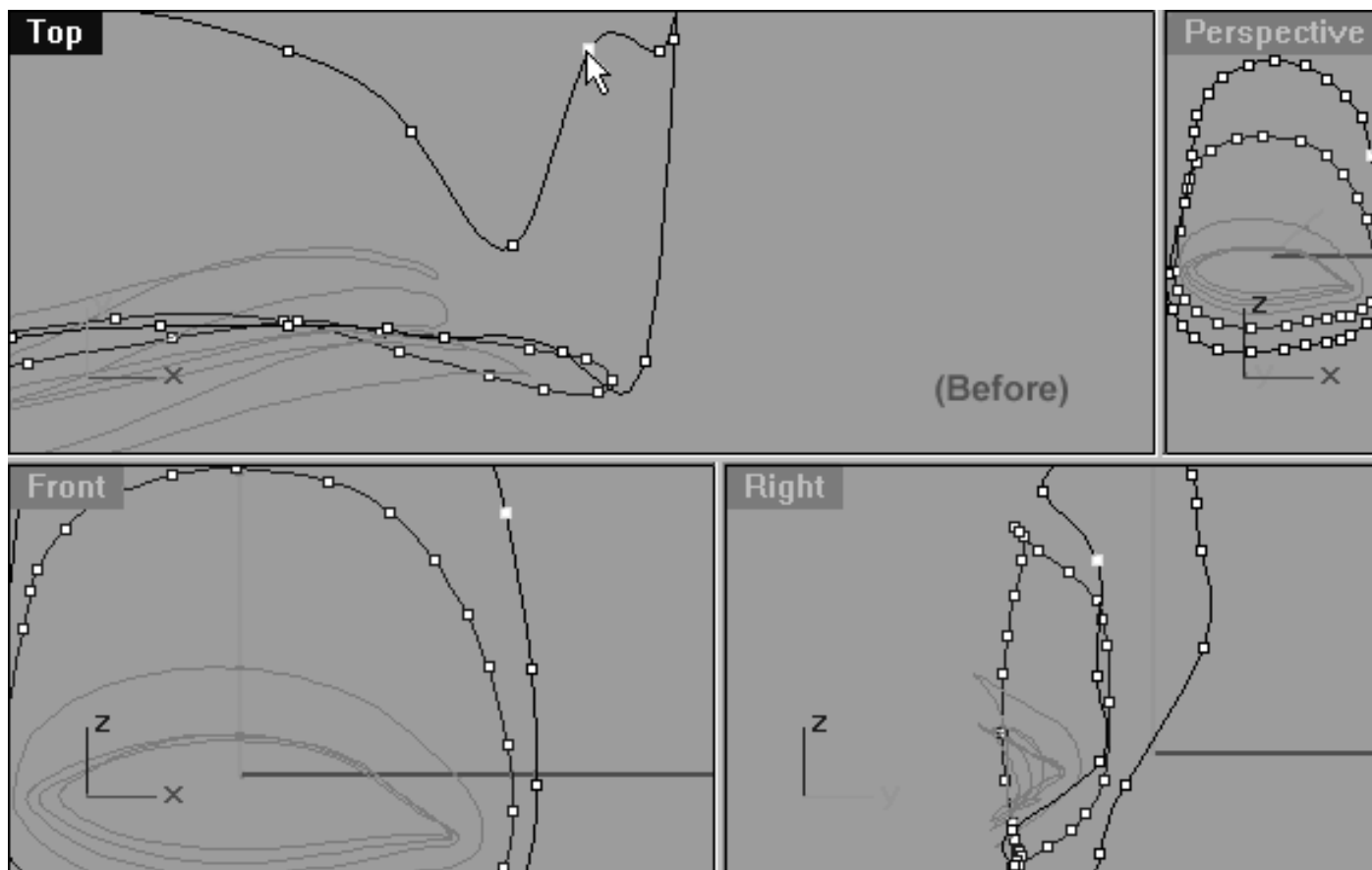


This **All Viewport** screenshot shows the point located at the 1 pm position (as seen from the front view) and the 3 points following in a clockwise direction (on the 6th eyelid curve) have now been moved along the Y axis in the **Top Viewport**.

Now all that remains to be done in this area is to sort out the last few corner points -- let's do that now...

- In the Top Viewport select the next point heading in a clockwise direction (as seen from the front view) -- see the screenshot below entitled: (Before).
- Still in the Top Viewport, whilst holding down the Shift key move the point downward along the Y axis until it nearly touches the 5th curve -- see the screenshot below entitled: (After).
- Once done, (and still working clockwise) select the next point, repeat the same procedure as before only this time move the point even further along the Y axis. \*Hint -- this point should be moved the furthest along the Y axis of all the points in this particular group -- see the screenshot below entitled: (After).
- Refer to the Helper Table for further guidance.

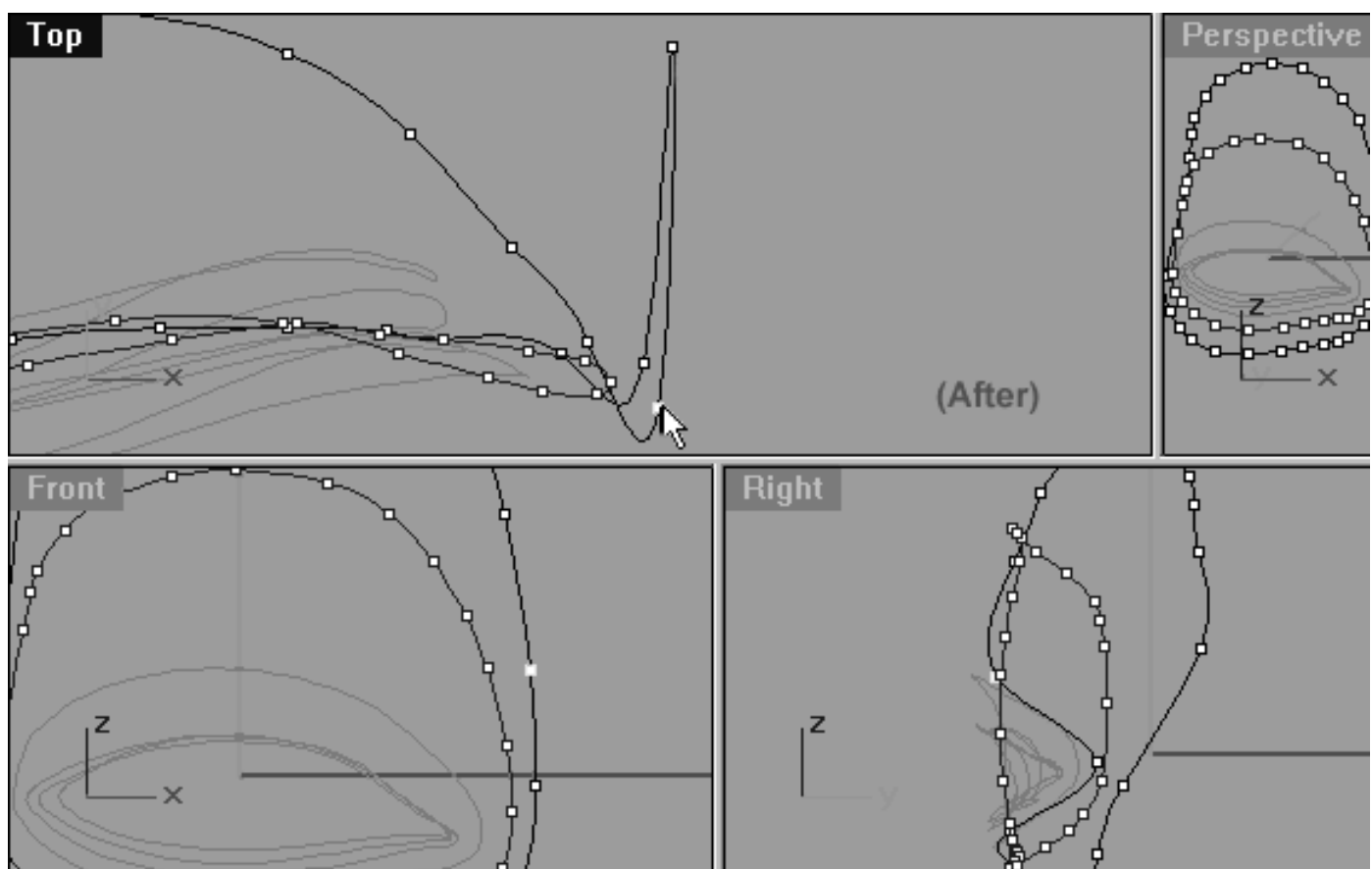




This **All Viewport** screenshot shows the next point after the one you moved in the previous step has now been selected and is ready to be dragged along the Y axis in the **Top Viewport**.

### Helper Table

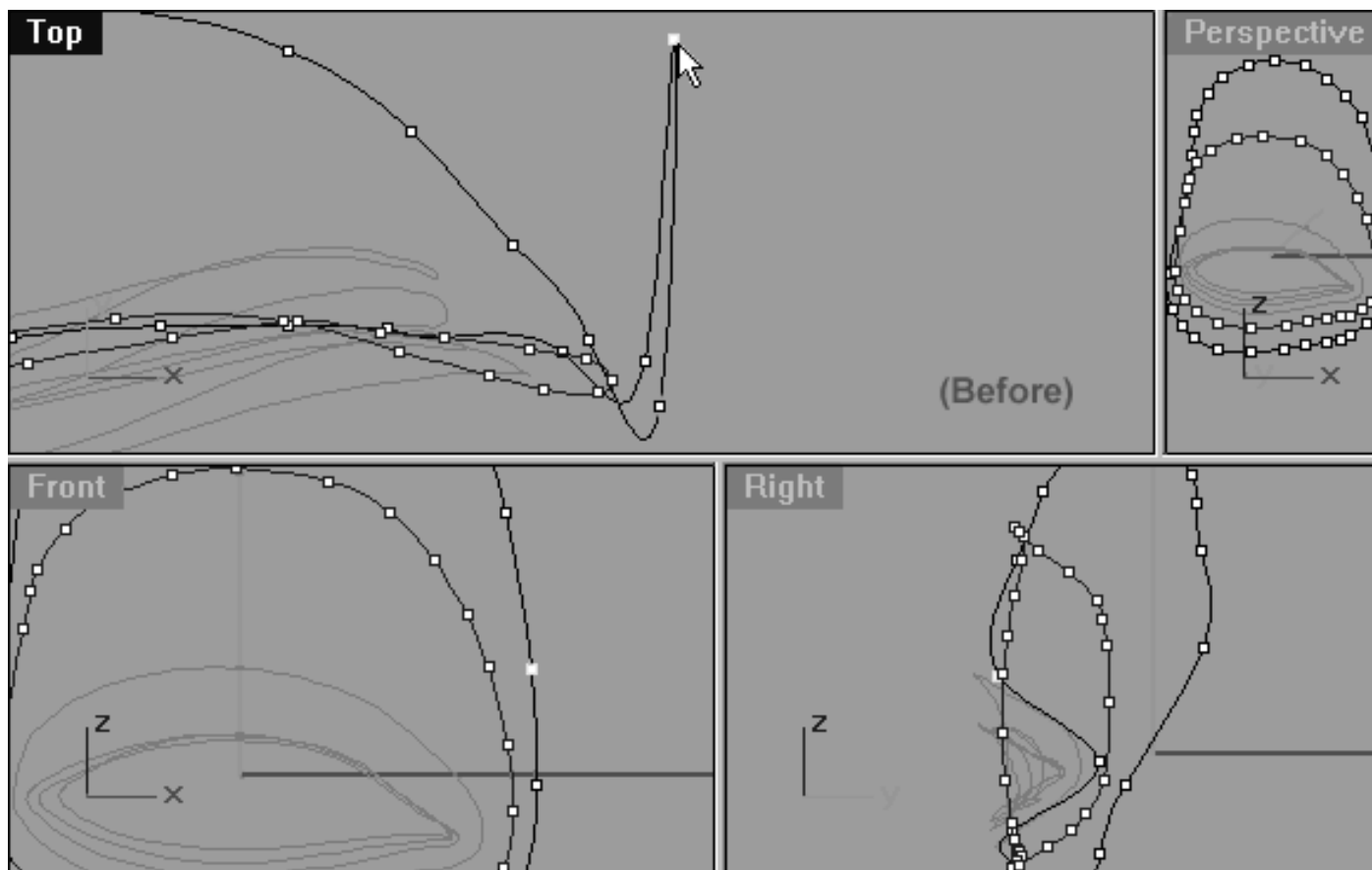
Point	Approximate Units Moved
As shown in screenshot	Y: 7.364 (down)
Next point clockwise	Y: 7.317 (down)
Next point clockwise	Y: 8.584 (down)



*This **All Viewport** screenshot shows the next logical point and the one also following it a clockwise direction (on the 6th eyelid curve) have now been moved along the Y axis in the **Top Viewport**.*

Last but not least we need to move the corner point into position -- this is simple...

- In the **Top Viewport** select the corner point (it's obvious which one this is) -- see the screenshot below entitled: (Before).
- Once done, whilst holding down the Shift key move the point downward along the Y axis until it located roughly between the last two points you moved previously -- see the screenshot below entitled: (After).
- Refer to the Helper Table for further guidance.



This **All Viewport** screenshot shows the corner point has now been selected and is ready to be moved along the *Y* axis in the **Top Viewport**.

### Helper Table

Point	Approximate Units Moved
Corner point (as shown in screenshot below)	Y: 8.561 (down)



This **All Viewport** screenshot shows the corner point has now been moved along the Y axis in the **Top Viewport**.



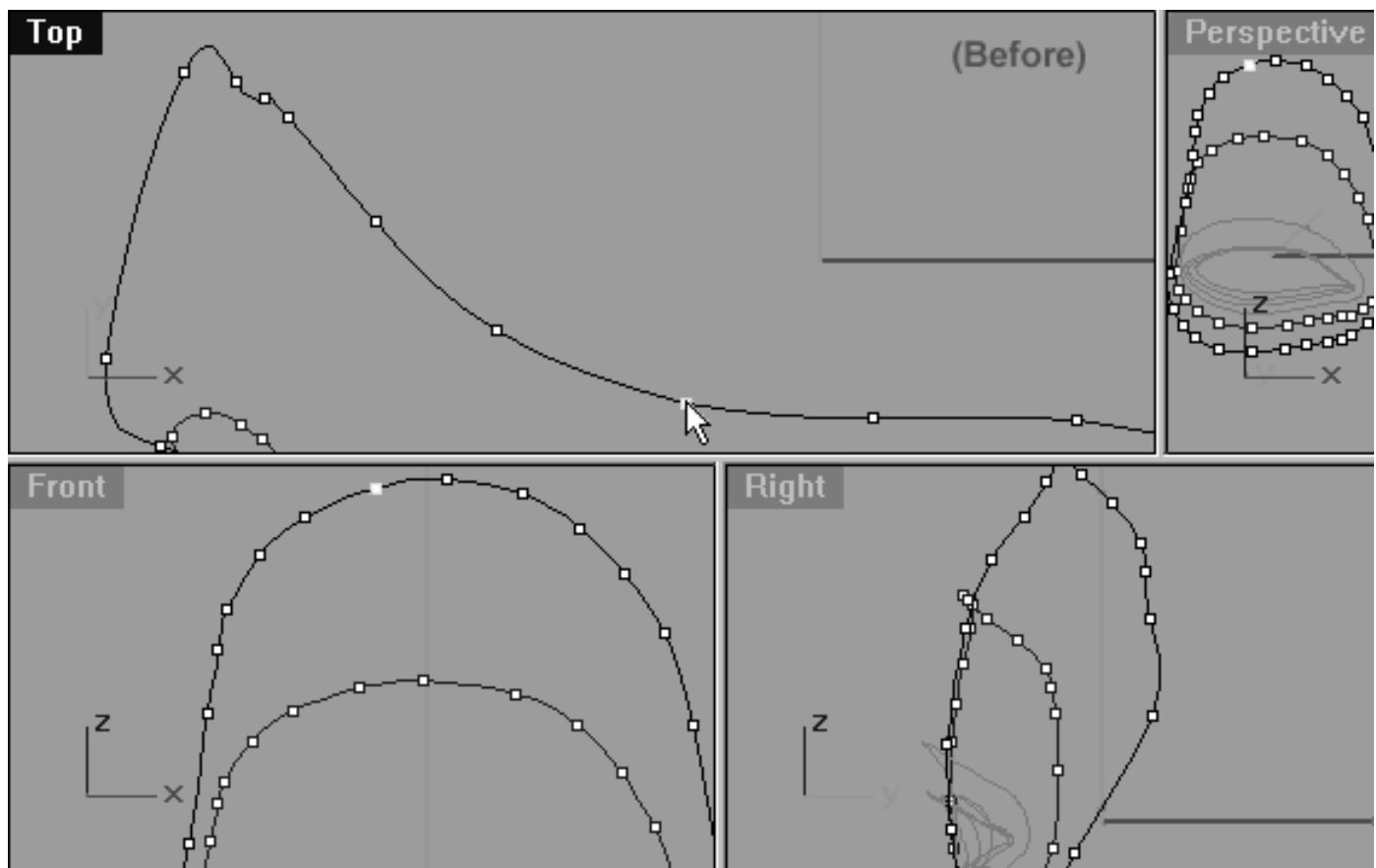
**View an example movie**

**Edit the 6th Eyelid Curve, Pt. 4** [Click Here](#)

## Upper Row -- Left Side

We are just about ready to wrap the job up now, all that remains is to refine the upper row, left side -- so let's get stuck in...

- In the Front Viewport, select the point located at the 11 o'clock position -- see the screenshot below entitled: (Before).
- Next, move the cursor into the Top Viewport and while holding down the Shift key move the point downward just a bit along the Y axis.
- Once done, continue working in a anti-clockwise direction moving the next 6 points along the Y axis. When you've completed the process your monitor should resemble the screenshot below entitled: (After).
- Refer to the Helper Table for further guidance.



This **All Viewport** screenshot shows the point at the 1 o'clock position has now been selected and is ready to be dragged along the Y axis in the **Top Viewport**.

### Helper Table

Point	Approximate Units Moved
11 o'clock	Y: 0.235 (down)
Next point anti-clockwise	Y: 0.851 (down)
Next point anti-clockwise	Y: 1.578 (down)
Next point anti-clockwise	Y: 2.734 (down)
Next point anti-clockwise	Y: 3.123 (down)
Next point anti-clockwise	Y: 3.635 (down)
Next point anti-clockwise	Y: 4.564 (down)



This **All Viewport** screenshot shows the point at the 1 o'clock position as well as the next 6 points heading in a anti-clockwise direction have now been moved along the Y axis in the **Top Viewport** and are now resting in the correct locations. Observe the gentle shape of the curve in the top view (highlighted in green). Compare the right viewport images in the before and after screenshots above and notice how the angle of the curve has now become far more steep and linear (highlighted in green).

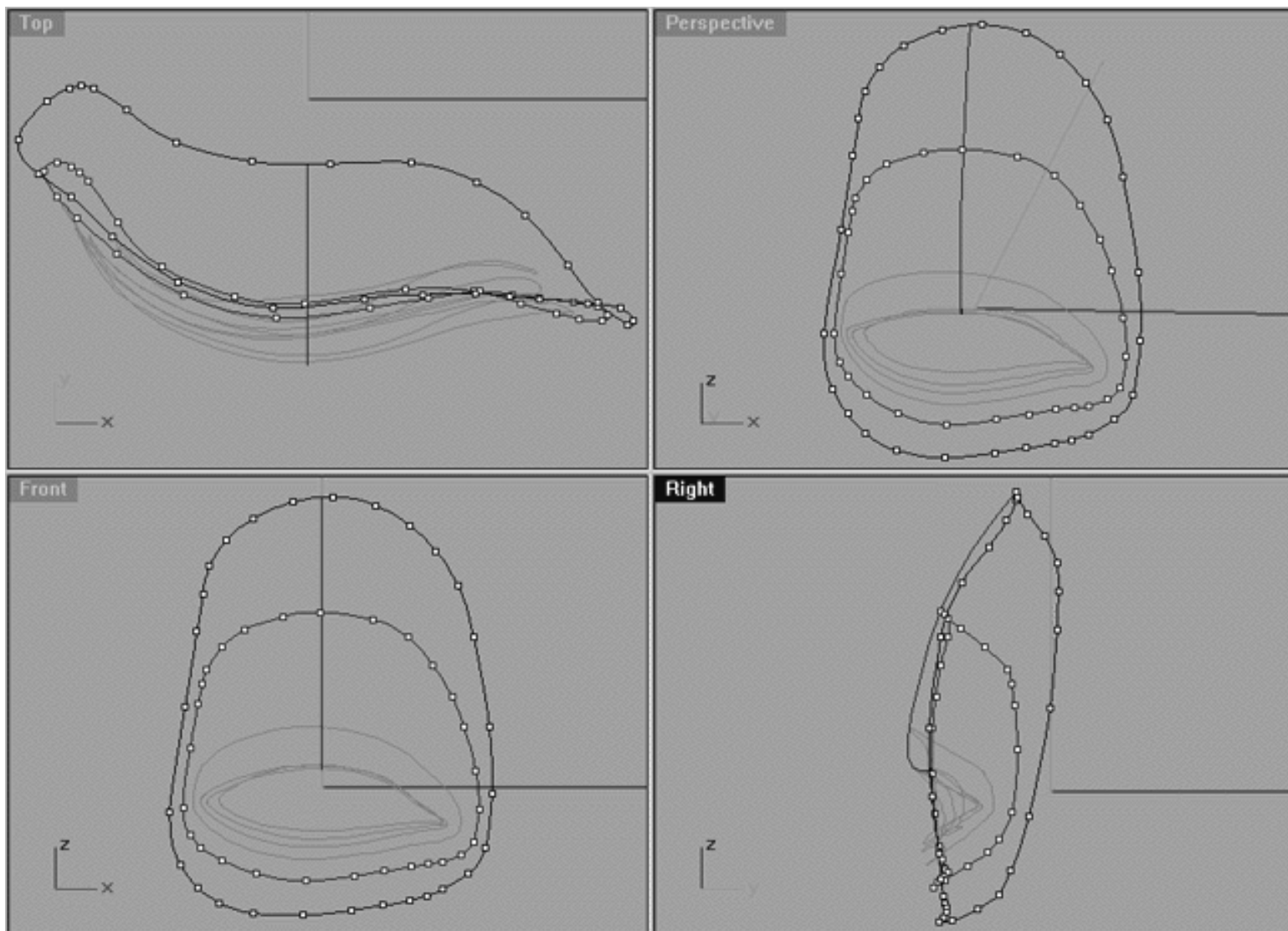


**View an example movie**

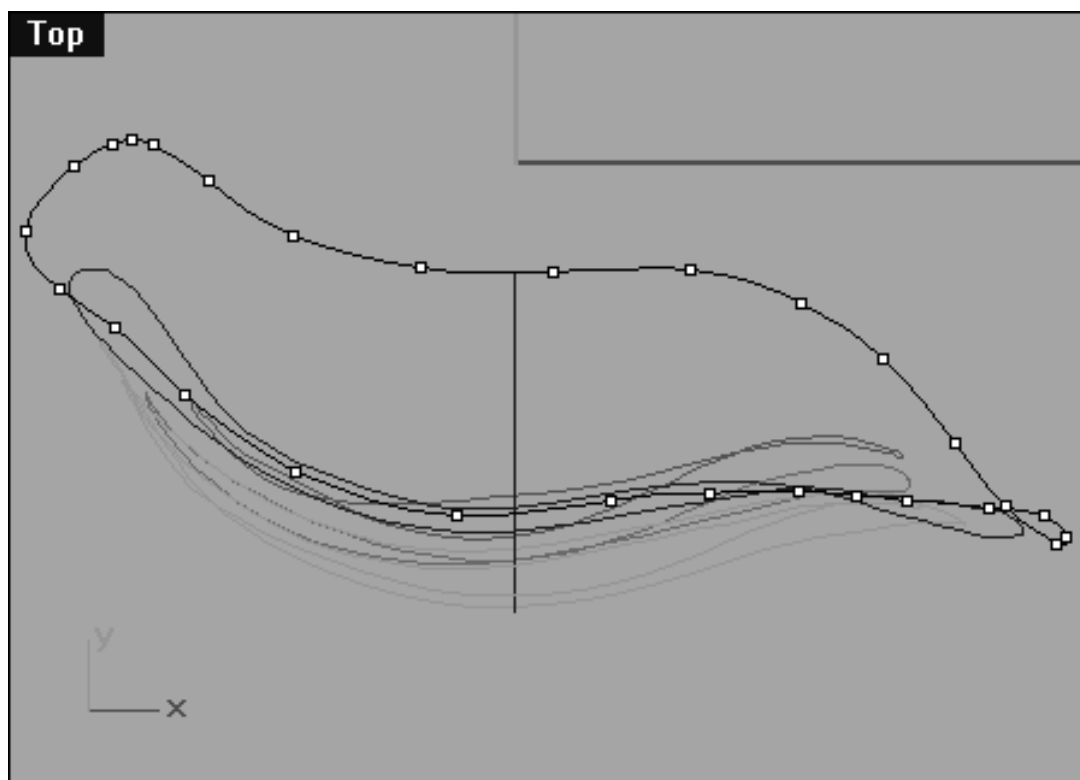
**Editing the 6th Eyelid Curve, Pt. 5** [Click Here](#)

Congratulations, the 6th Eyelid Curve has now been completed! As ever, you should some take a little extra time to carefully inspect the curve in order to clean up, refine and adjust points as required.

Your monitor should now resemble the screenshot below...



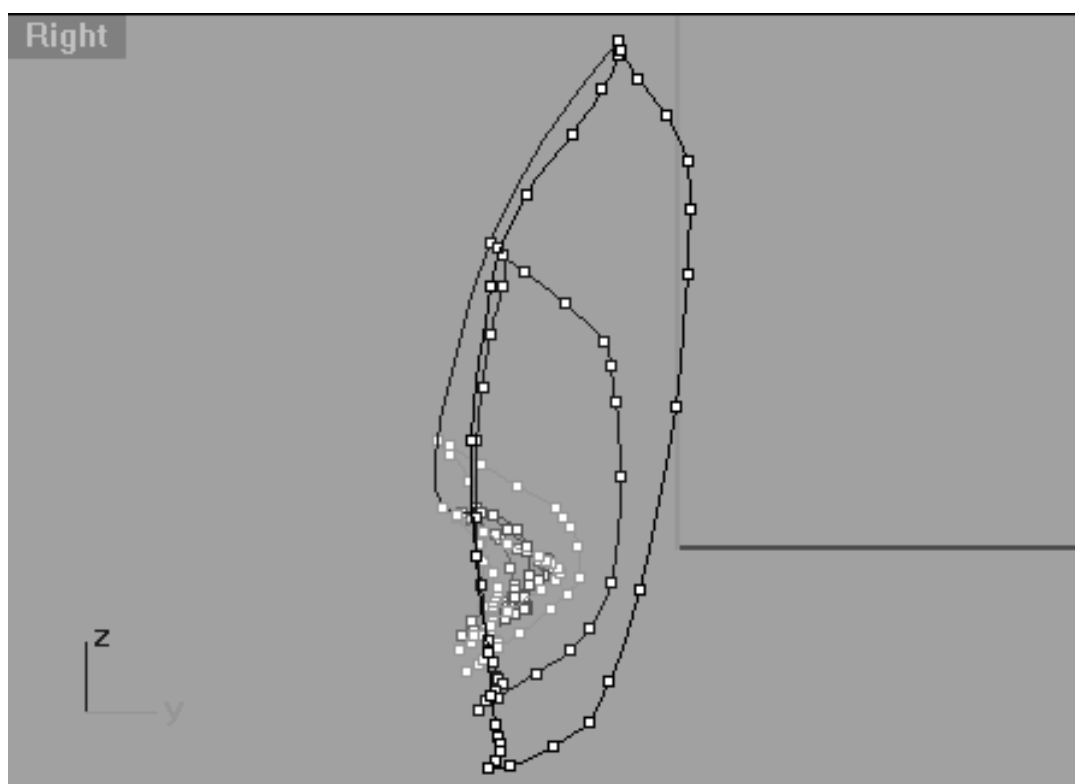
This **All Viewport** screenshot shows the now fully completed and refined 6th Eyelid Curve. Observe the relationships.



This **Top Viewport** screenshot shows the now fully completed and refined 6th Eyelid Curve.



This **Front Viewport** screenshot shows the now fully completed and refined 6th Eyelid Curve. The points on Eyelid Curves 1, 2, 3, 4 & 5 have also been unlocked and displayed so that you can study their placement and relationships to each other.



This **Right Viewport** screenshot shows the now fully completed and refined 6th Eyelid Curve. The points on Eyelid Curves 1, 2, 3, 4 & 5 have also been unlocked and displayed so that you can study their placement and relationships to each other.





**View an example movie**

**The completed 6th Eyelid Curve, Pt. 6** [Click Here](#)

---

## Snap It Up

This was a rather complex lesson, you've had to make a lot of moves and it's possible that you could be feeling a bit confused. The main thing is, don't panic because you can always check your work against what we've done and see how close you've come or where you've gone off track along the way. To do this, open the Edit Layers dialogue box and turn **ON** the layer entitled: **Eyelid\_guide\_06**, then press **OK** to **Exit**. Then in **Any Viewport** select the **Eyelid\_guide\_06** curve and display its edit points. Once done, reopen the Edit Layers dialogue box and set the **Eyelid\_guide\_06** layer to **LOCK**, press **OK** to **Exit**. You can now compare the results and refine the specific areas where you've gone wrong or become confused. You can then turn on the **Osnaps, Point** and snap each of the points on the curve you've created to those of the guide curve (highly recommended).

---

# Shutting Down the Scene

- Rearrange the viewports to a normal 4 view pattern.
- Confirm that no Osnaps are currently active, disable any that are.
- Display any currently hidden objects, type the command: Show at the command line and press Enter.
- Turn off any edit points that may be currently displayed.
- Unlock any currently locked objects -- type **UNLOCK** at the command line and press **Enter**.
- Open the Edit Layers Dialogue box and locate the layer entitled **SCENE START UP**. Make it the currently active layer by clicking in the "check" field -- a check mark should appear in the column, when it has press **APPLY**. Once done, the layer entitled **SCENE START UP** should now have become the active layer and should be **ON**.
- The Layer entitled: Photopoints should be turned **ON**.
- Turn off the layers entitled: **Eyelid Curves, Eyelid\_02, Eyelid\_03, Eyelid\_04, Eyelid\_05, Eyelid\_guide\_06, Eyelid\_06** and **Eyelid\_Xsection** and press **APPLY**.
- With the exception of those mentioned, all other layers should be **OFF** -- press **OK** to Exit.
- Perform a Zoom Extents All.
- **S A V E Y O U R W O R K..!**

---

Go to the NEXT LESSON

RETURN to the Top of page -- [Click Here](#)

Written by Joseph R. Saltzman.

Co-produced in association with Steven Ståhlberg

©1998-1999 Cinemagic Productions Limited. All Rights Reserved.

Duplication of this document including images and text by any means is expressly forbidden without prior written consent of Cinemagic Productions Limited.

Web Site: <http://www.cmagic.co.uk> Telephone: +44 (0)1753 733 190 Fax: +44 (0)1753 736 619 email: [cmagic@cmagic.co.uk](mailto:cmagic@cmagic.co.uk)

qat290699



To **PLAY** the example movie, double click below:

To **RETURN** to the tutorial -- [click here](#).

# MOVIE EDITING THE 6TH EYELID CURVE PART TWO

To **PLAY** the example movie, double click below:

To **RETURN** to the tutorial -- [click here](#).

# MOVIE EDITING THE 6TH EYELID CURVE PART THREE

To **PLAY** the example movie, double click below:

To **RETURN** to the tutorial -- [click here](#).

# MOVIE EDITING THE 6TH EYELID CURVE PART FOUR

To **PLAY** the example movie, double click below:

To **RETURN** to the tutorial -- [click here](#).



To **PLAY** the example movie, double click below:

To **RETURN** to the tutorial -- [click here](#).

# MOVIE EDITING THE 6TH EYELID CURVE PART SIX

To **PLAY** the example movie, double click below:

To **RETURN** to the tutorial -- [click here](#).



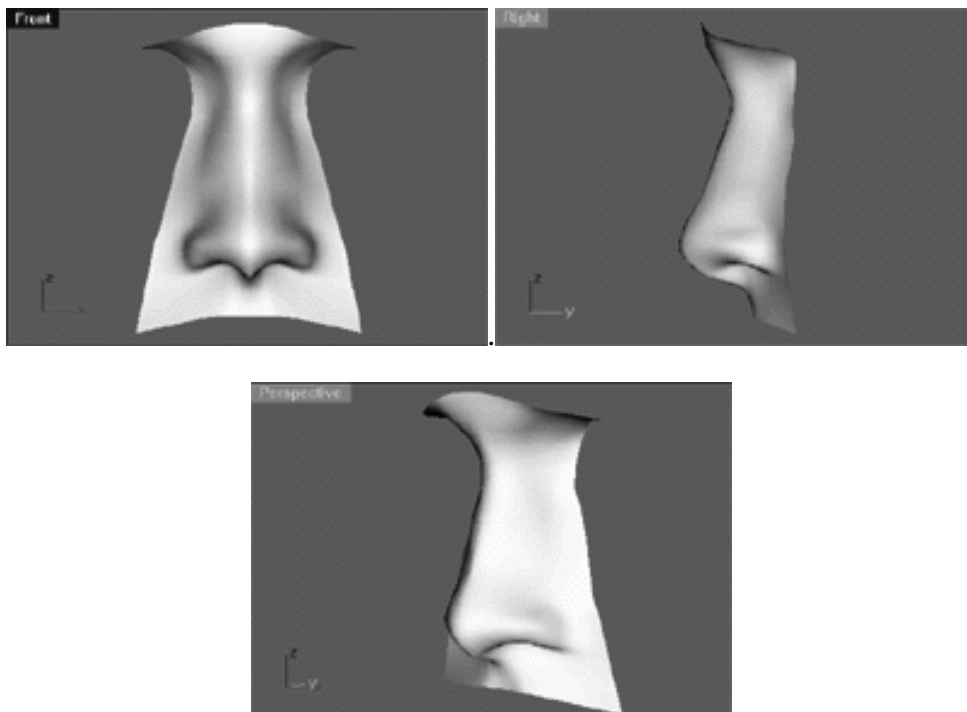
**RETURN** to previous page -- [Click Here](#)

**GOTO** the [NEXT LESSON](#)



## CREATING THE NOSE PART ONE

*(profile and 2nd curves)*



---

### Skip To:

[Nose, Part 2](#)

[Nose, Part 3](#)

[Nose, Part 4](#)

[Nose, Part 5](#)

### Contents:

- [General Concerns & Observations](#)
- [Scene Setup](#)
- [Devising a Strategy](#)
- [Creating and Roughing in the Nose Curves](#)

- [Creating the 2nd Nose Curve, Right View](#)
  - [Creating the 2nd Nose Curve, Front View](#)
  - [Shutting Down the Scene](#)
- 

## General Concerns & Observations

If there is one area of the human face that seems to fill most 3D artists with a sense of overwhelming dread it must be certainly be the nose. Constructing the nose geometry can be a little bit tricky and does require a fair amount of trial and error before it's liable to look right. Geometrically speaking the construction of the nose is rather straightforward. Essentially it is comprised of four planes which form something of a wedge shape that increasingly tapers towards the top where it meets with the brow bone. Although the top part is quite important and does require some work in order to get right, it's the bottom part that really worries most people. To be fair there is good reason to be concerned about the construction of the bottom area of the nose as it is here that the nose shape becomes far more complex due to the shape of the nasal cartilage. Constructing the nasal cartilage and making it look right is made even more problematic by the additional concern of incorporating the nostrils -- it's a quite a lot to think about.

Of course when thinking about representing the nose with 3D geometry there are many ways to approach the problem with no single right or wrong way. Regardless of the approach we take one fact remains constant and that is the overall shape of the nose is complex and as such shall require fairly large number of curves. Obviously by using a lot of curves we will be increasing the weight of our geometry by a substantial factor, which for purposes of animation is less than optimal. We are now faced with a bit of a decision to make, which is:

1. Do we build the nose into the head surface itself, thus creating a single seamless piece of geometry?
2. Do we build the nose as separate geometry and "blend" it into the head surface so that it "looks" seamless and like one solid piece?

I vote for the 2nd method -- and this is why...

If we use the 1st method and build the nose right into the face we will have to add a lot of new curves into the surface. The problem here is that although this will provide us with additional points to work with in the areas that we need them, it will also add many additional points throughout the entire area of the head surface where we do not need or want them. This is a perfect illustration of one of the weak points of NURBS technology, that is that you can't add detail locally only globally so to speak. Since the nose is a complex structure and by default will be geometrically heavy we don't need to compound the problem by adding weight to our surface where it is not required. Now that I've said this prepare yourself for my next controversial statement.

Many novice 3D artists mistakenly believe that you have to create "seamless" one piece geometric surfaces when modelling.

**This is notion is complete and utter rubbish and should be forgotten about immediately!**

The only thing that is important is that when rendered the image should look correct and it simply does not matter how you achieve this, all that matters is that you do!

For this reason I recommend that you go with the 2nd method discussed above and "blend" the separate nose geometry into the surface of the head. This way you can create a separate heavy nose object and "blend" it to the lighter head surface. Your head model may no longer actually be one solid piece of geometry but who cares! All that matters is that it will look like one, your model will be much lighter overall as a result and future animation will therefore be much easier.

Right then, now that we've decided to build the nose from separate geometry all that remains now is to decide upon a strategy for the basis of its construction -- really two options are available:


1. We could build the nose from a series of horizontal "slices" created from inverted "U" shaped curves -- or
2. We could build the nose from a series of vertical "slices" created from "L" shaped curves.


Either method works equally well really, it just boils down to a matter of personal preference. Steven likes to build his nose geometry using the first method where as I like to use the 2nd. For the purposes of this lesson we will go with the 2nd method, however if you'd like more information on the first method you can find Steven's technique fully explained in the Alias PA Face Modelling Tutorial also available from Cinemagic Productions Limited.

---

## Scene Setup

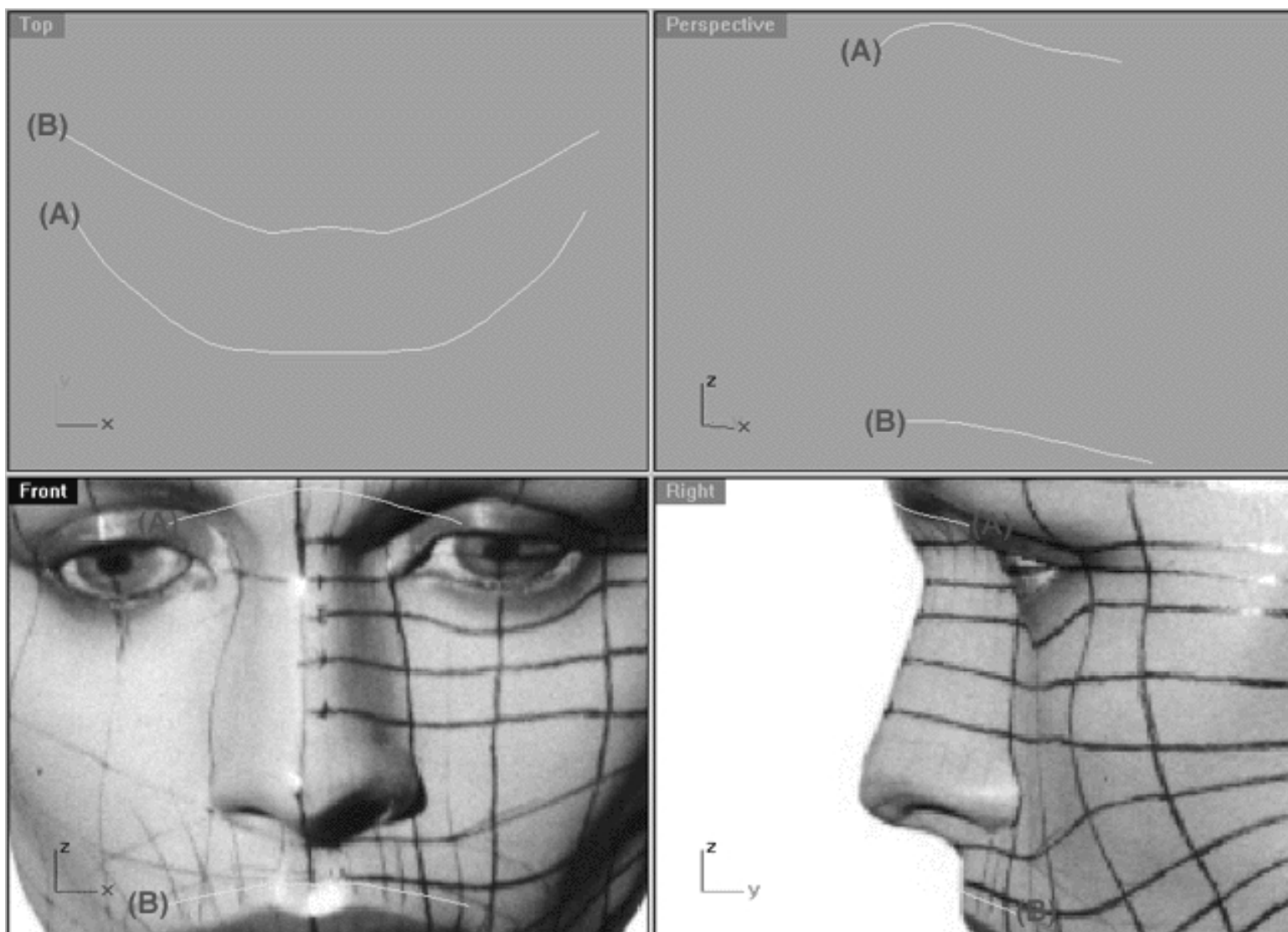


- If you've not done so already start a Rhinoceros session by **double clicking** on the desktop icon  the application will begin.
- Choose File, Open from the menu bar and double click on **START\_A.3DM** in the file list, it will load and open.
- Confirm at the Lower Status Bar the currently active layer is entitled SCENE START UP. If it is active proceed to the next step, if it's not then make it active by left clicking on the layer box, highlighting the correct layer and clicking on it.
- Again, at the Layers Box on the Lower Status Bar this time right click on the box, the Edit Layers Dialogue box will open. Confirm the following switches have been enabled or disabled:
  - The Layer entitled SCENE START UP should be ON.
  - The Layer entitled Noze\_H\_Guides should be ON.
  - All other layers should be set to OFF.
  - When you've finished making your changes ( if any ) click on OK.
  - Confirm that the grid display in the viewports has been disabled, if not turn it off now.
  - Confirm that no Osnaps are currently enabled, if any are disable them.

- Confirm that no edit points are currently displayed, if any are hide them.
- Zoom out all the viewports by selecting the Zoom Extents/Zoom Extents All Views icon  or by typing **ZoomExtentsAll** at the command line and pressing ENTER.

## Devising a Strategy

The first thing we need to do is to devise a strategy for roughing in our nose curves, since this can best be done by observation take a look at the screenshot below:

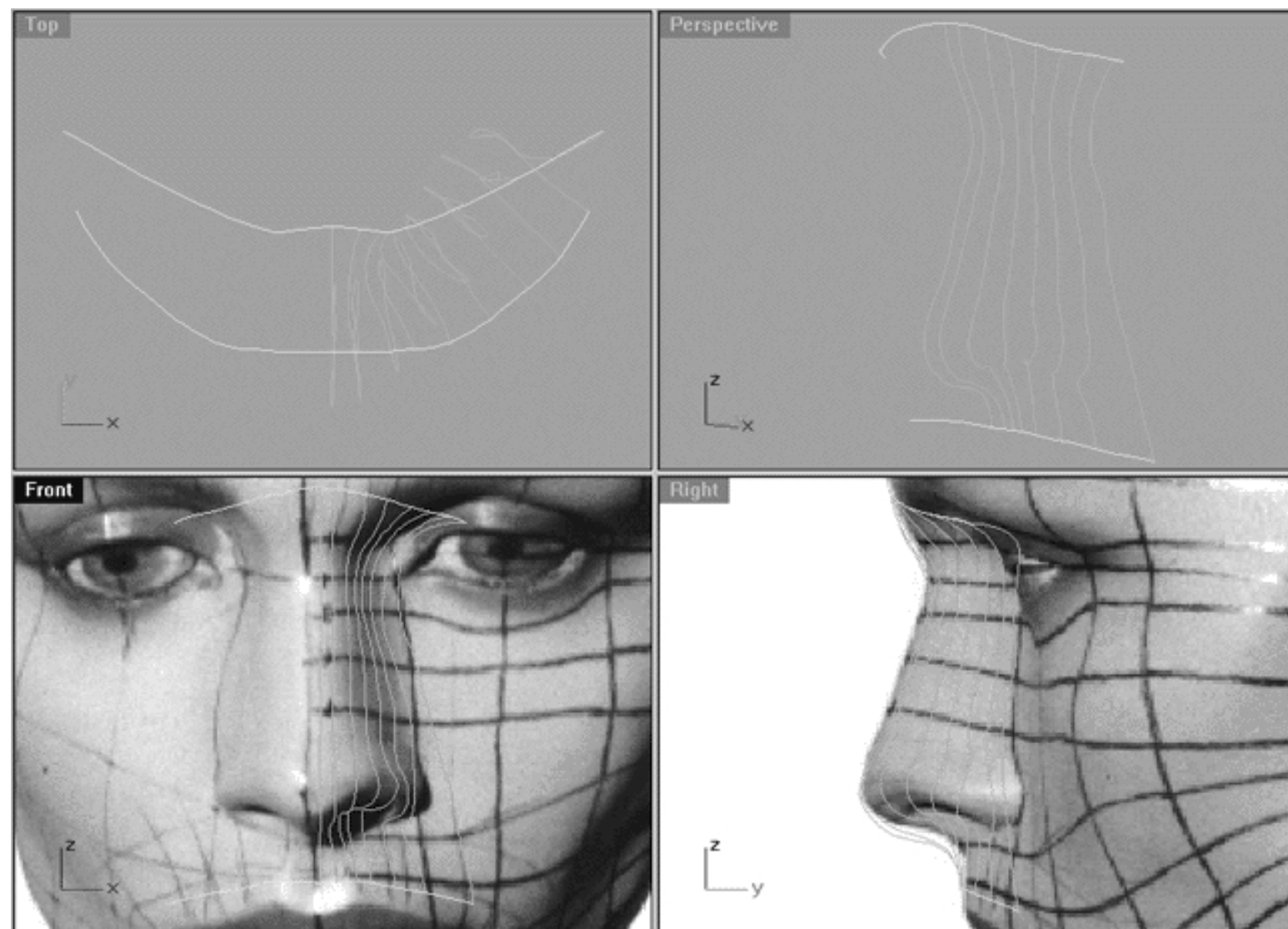


Obviously one of the first things that we must concern ourselves with are the two main areas of the head where the nose will be attached, which is at the brow bone (A) and at about the mid point of the upper lip (B). Although your first inclination might be to place the lower attachment point at the very base of the nose (near the top of the filtrum -- i.e. the dent in the lip), it's better placed midway on the top lip as it gives you more material to work with which could prove helpful a bit later on. As you can clearly see in the Top Viewport both of these areas will produce a "U" shaped curve due to the curvature of the head which is logical.

Observe how the (A) curve above runs from within the left eye socket upwards along the brow bone and then back down and into the right eye socket. The (B) curve is a little less impressive, basically just running midway across the upper lip like a moustache would do in real life.

So how did I arrive at the shapes for these curves then? Well, I just improvised for the time being by drawing them in using the interpolated curve command and making sure that they looked to be placed correctly in the Front, Right and Top viewports. At the moment all we are trying to do at this stage is to set up an overall strategy for creating the nose and getting it roughed in -- so these curves are really only guides. Once we've accomplished that we can fine tune where the nose actually attaches to the head by projecting those curve onto the head surface and then tweaking them.

Now that we've come up with game plan for the 2 main horizontal attachment points we need to think about how we are going to "slice up" the nose vertically. To see one possible way of doing this have a look at the screenshot below:



In the screenshot above notice that I've now drawn 8 new curves that are run vertically between the horizontal guide curves (A & B) that I drew a few moments ago. It's really only necessary to think about 1/2 the curves at this stage since we can easily create the other side by mirroring them once editing has been completed. Notice how in the Right and Front viewports the curves follow the logical contours of the nose and face.


I've created these guide curves to in order to help you visualize, locate and position the new curves that you'll create during the remainder of this lesson. Normally when working I tend to draw these "guide" curves directly on my computer monitor with OHP marker pens. These lines act as "templates" to help me figure out exactly where I should think about locating my actual curves and to aid in creating an even an logical spacing of those curves along the contour of the object. Obviously it's not possible for me to draw such guide lines on your monitor, so I've done the next best thing and created actual guide curves to help you understand what is going on with the geometry. If you've not already gone out and bought yourself a set of white board or OHP marker pens so that you can draw on your monitor now is a really good time to do it.

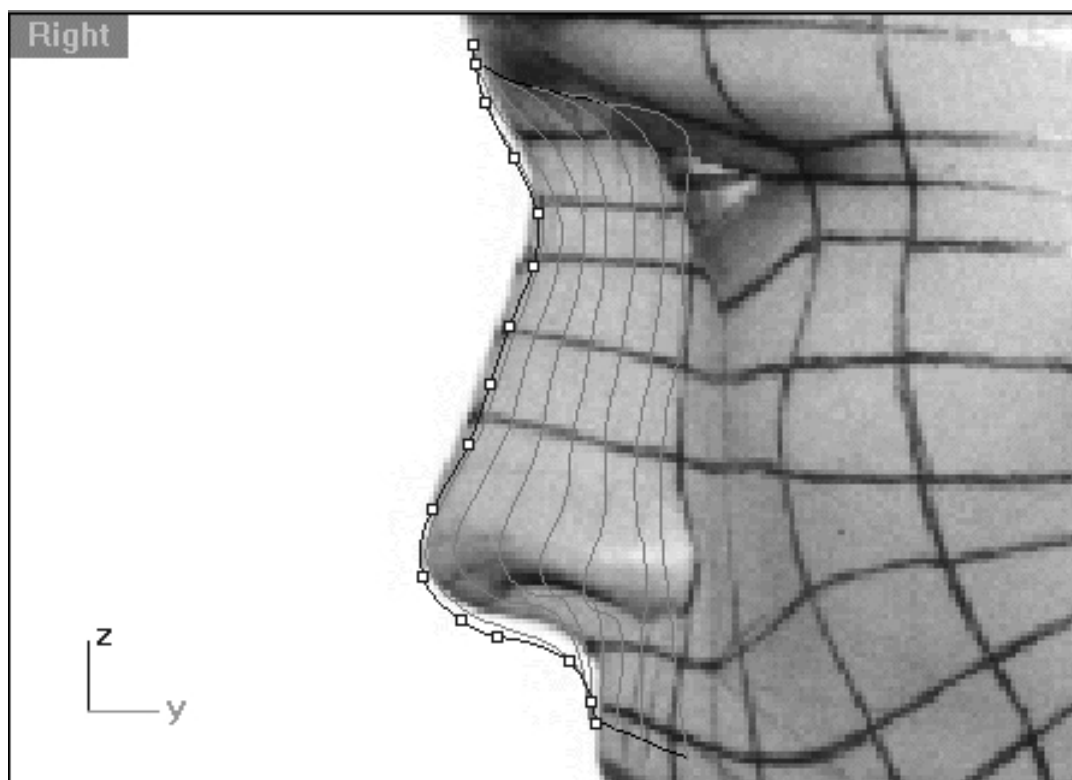
**Tip:** The most important factor in devising a strategy and drawing these guide lines is that you try and keep them as evenly spaced as possible in the Front, Top and Right viewports!

---

## Creating and Roughing in the Nose Curves

We will now set about creating a series of "L" shaped curves using the strategy we devised a few moments ago -- let's crack on...

- Create a new layer, entitle it Noze and set its layer colour to **blue**.
- Make the Noze layer active.
- Maximise the **Right Viewport**.
- From the toolbar choose the create Control Point Curve icon  or type: **Curve** at the command line and press Enter.
- In the Right Viewport, starting at the brow bone and working your way downward toward the upper lip along the Z axis draw a control point curve along the profile of the nose using the background image as a basic reference using **only 16** points!
- When you've finished, select the new curve and display its edit points. Then move each point as required in order to refine its overall shape.
- Once done, your monitor should resemble the screenshot below:



The above **Right Viewport** screenshot shows a new control point curve has now been drawn roughly following the profile contour of the nose & face, pay particular attention to the placement of the points and note that only **16** points have been used.

How did I decide to use 16 points? It's only a guess really, a totally arbitrary figure, it could have been more or less. The only reason for using 16 was in order to create the profile shape as easily as possible and to give us enough points to work with, especially when creating the nostril area later on. The truth is you could get easily get away with removing a couple of points along the bridge of the nose, but **don't**. Just use 16 points for now -- no more, no less!

You may have also noticed that the new nose curve does not follow the reference photo very accurately -- this IS intentional on my part. I'm only using the reference image as a "guide" to help me get the shape and proportions correct, I'm not trying to make a carbon copy of the model. I want the head that we are creating with Rhinoceros to be a unique and original object and besides we are only roughing in at this stage anyway.


---

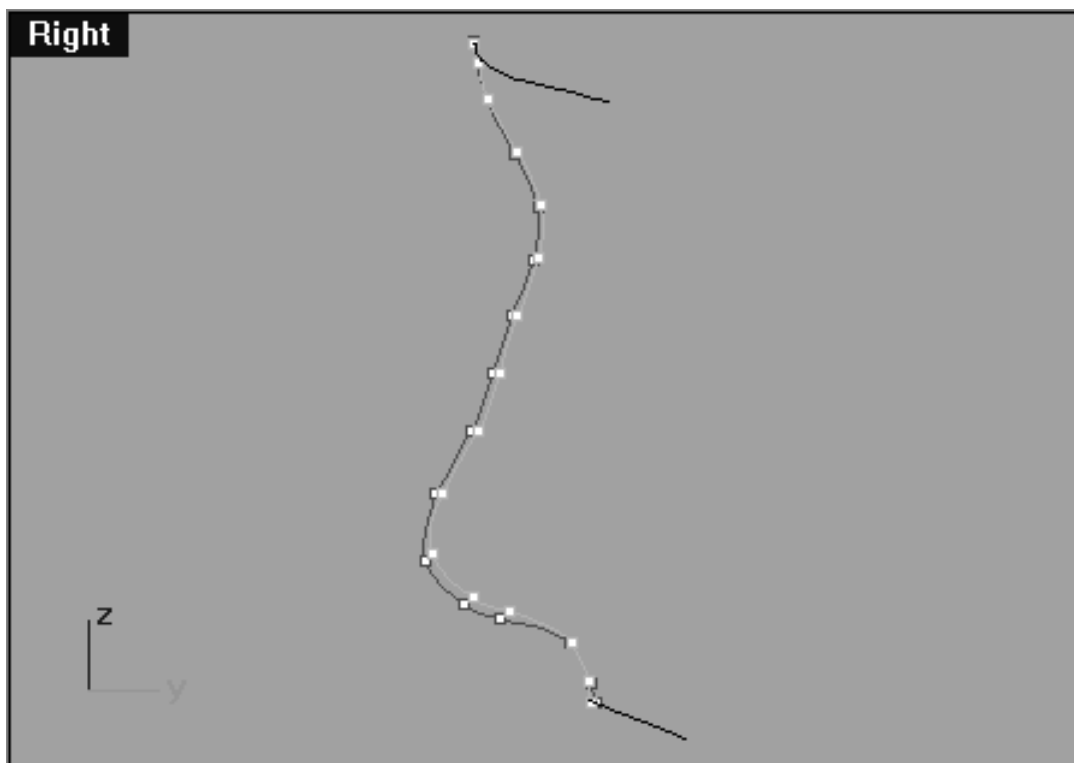
## Creating the 2nd Nose Curve Right View

Okay then, now we've got the main nose profile curve sorted out we can now move on to creating next nose curve (the 2nd). Generally speaking, this curve is pretty easy to make and once again we will begin by drawing another control point curve in the right view containing only 16 points. \*Note -- of course we could just make a copy of the profile, move it into the new position and then refine it by moving the points as required as we did when creating the head curves. However, in this instance we will not proceed in that manner because I'm not convinced that using that method would be any quicker or advantageous in the particular case of constructing a nose, mainly due to its fairly complex shape.

- Maximise the Right Viewport if you've not done so already.



- Create a new layer entitled: Noze\_Profile and set the colour to **red**.
- Turn off any currently displayed edit points.
- Select the profile curve -- it will highlight, then choose the Change Layer icon  from the toolbar and assign the profile curve to the layer entitled: Noze\_Profile -- once done, the curve should turn red.
- Select the profile curve -- it will highlight, then display its edit points.
- Next, Open the Edit Layers dialogue, find the layer entitled: Noze\_Profile and LOCK the layer.
- Now turn on the Layer entitled: Nose Curve 2 GUIDE, press OK to complete the operation.
- Select the Nose Curve 2 GUIDE -- it will highlight, then display its edit points.
- Once again, Open the Edit Layers dialogue, find the layer entitled: Nose Curve 2 GUIDE and LOCK the layer, press OK to complete the operation.
- Your monitor should now resemble the screenshot below:




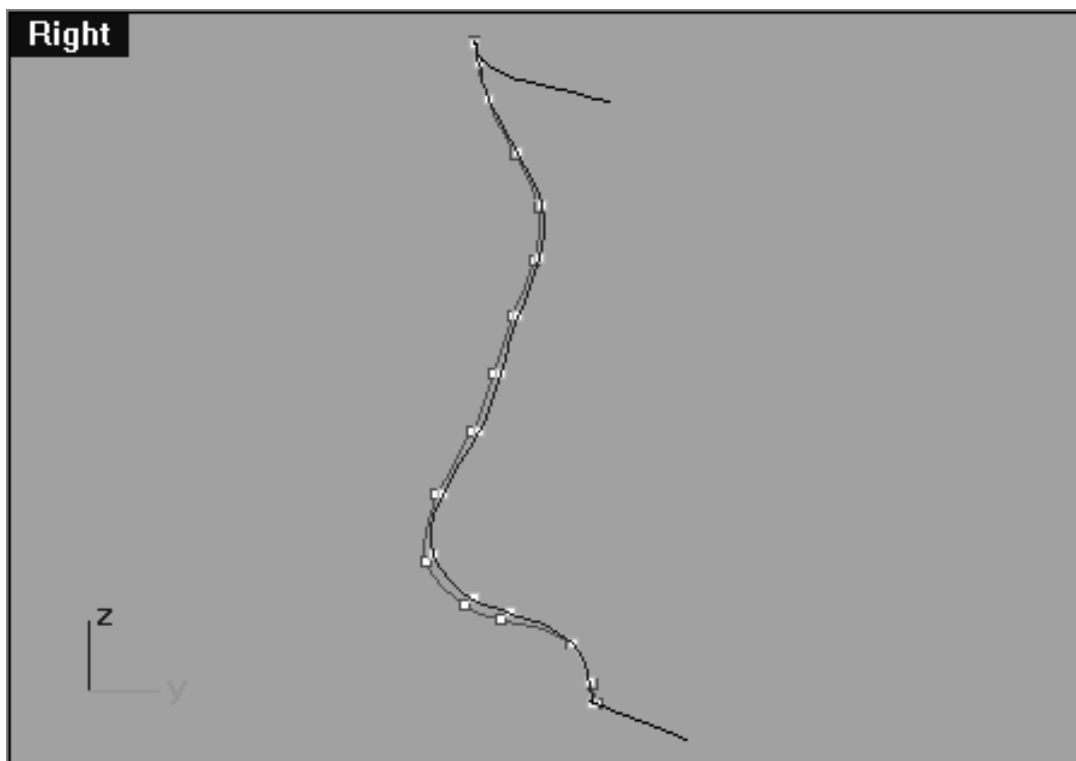
*This **Right Viewport** screenshot shows the Noze\_Profile curve (in red) and the Noze Curve 2 GUIDE (in cyan) -- observe the location and placement of the points.*

We can now begin to draw the 2nd nose curve, however, before we do just some general observations you should be aware of. For the most part, the 2nd nose curve should maintain a small but relatively even distance away from the profile curve, running just to the inside along the Y axis. Keep in mind that the distance should increase slightly in the area surrounding the tip of the nose and septum -- but again, overall the distance is fairly even.



Generally speaking, most of the edit points on the 2nd curve should be placed fairly parallel with the those of their sister points on the profile, however, there are a few "danger" areas to keep in mind. The 1st point (at the brow bone) will need to be placed slightly lower and ahead of the profile curve. the next hazard lies with points 15 and 16 which should be placed slightly higher and ahead of the profile curve.

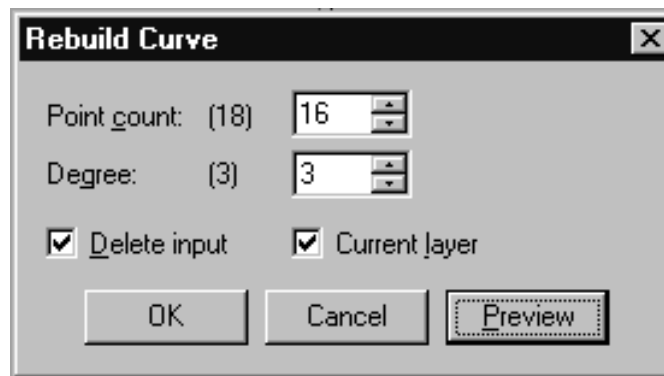
- Maximise the **Right Viewport** if you've not done so already.
- From the toolbar choose the create Curve, Interpolate Points icon  or type: **InterpCrv** at the command line and press Enter.
- This time we will start drawing an interpolated curve beginning at the brow bone and work our way downward toward the upper lip along the Z axis, once again using **only 16** points! Start to draw the new curve by placing your 1st point directly on top of that of the 1st point on the Noze Curve 2 GUIDE. Continue this procedure with all of the 15 remaining points -- when you've placed the last point press Enter to complete the operation. Once done, your monitor should resemble the screenshot below:



*This **Right Viewport** screenshot shows the Noze\_Profile curve (in red) and the Noze Curve 2 GUIDE (in cyan) and the interpolated curve we just drew directly on top of it.*

Because we drew an interpolated curve as opposed to a control point curve we now have a slight problem. That is, although we only placed a total of 16 points the interpolated curve is going to have gained a few "phantom" points as if by magic. Since we want all the curves to have exactly 16 points we are going to have "rebuild" the curve.

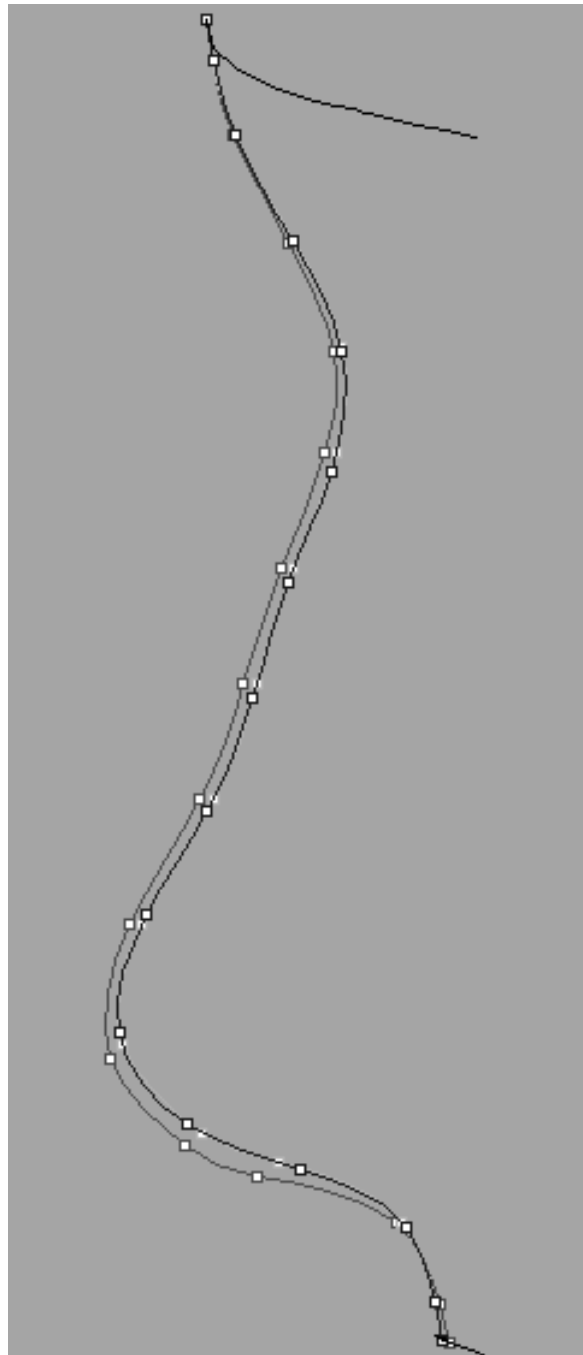
- Select the interpolated curve -- it will highlight.
- At the command line type: Rebuild and press ENTER -- The Rebuild Curve dialogue box will appear.
- Set all the values as in the screenshot below:



*This screenshot shows the Rebuild Curve dialogue box.*

- Press OK to complete the operation.

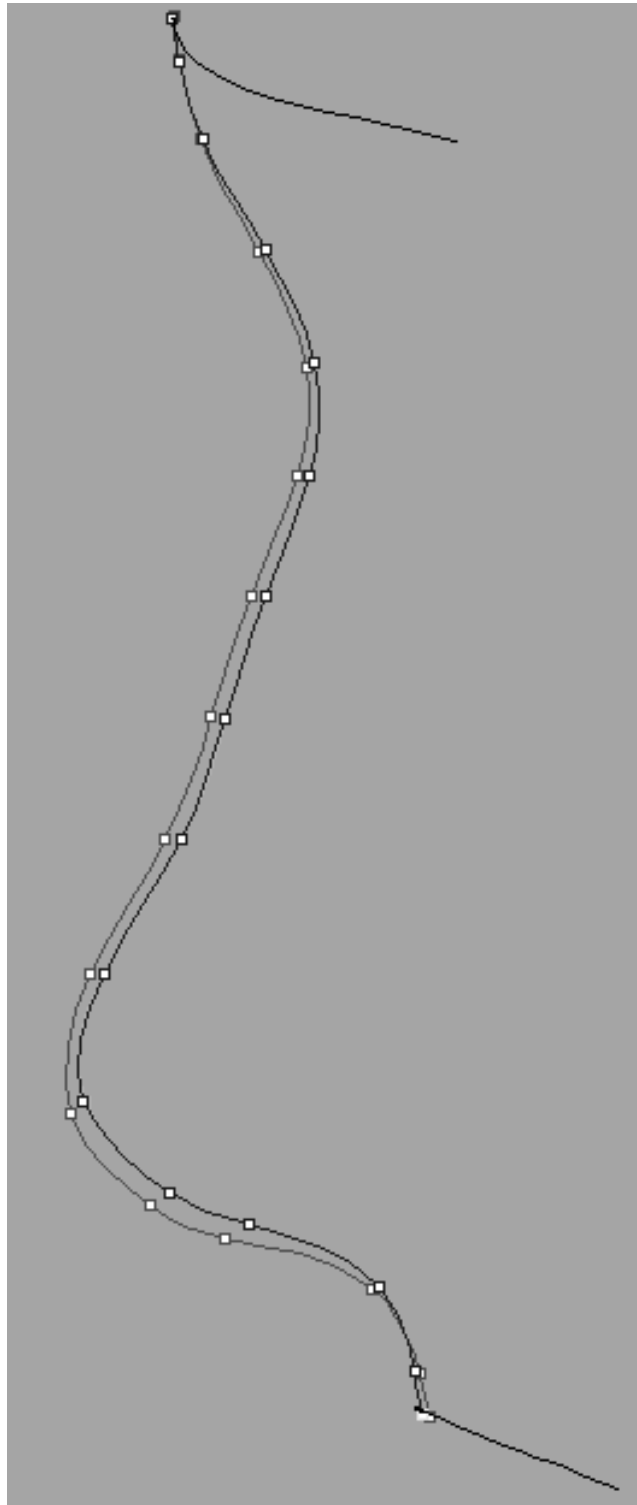
The curve will now have been rebuilt. Keep in mind that during the automatic rebuilding process performed by Rhinoceros the shape of the curve will have now changed slightly -- see the screenshot below:



This **Right Viewport** screenshot is a detailed view of all the currently displayed curves after the rebuilding process. Observe that the points on the rebuilt curve (dark blue) are no longer positioned directly on top of those of the guide curve (cyan).

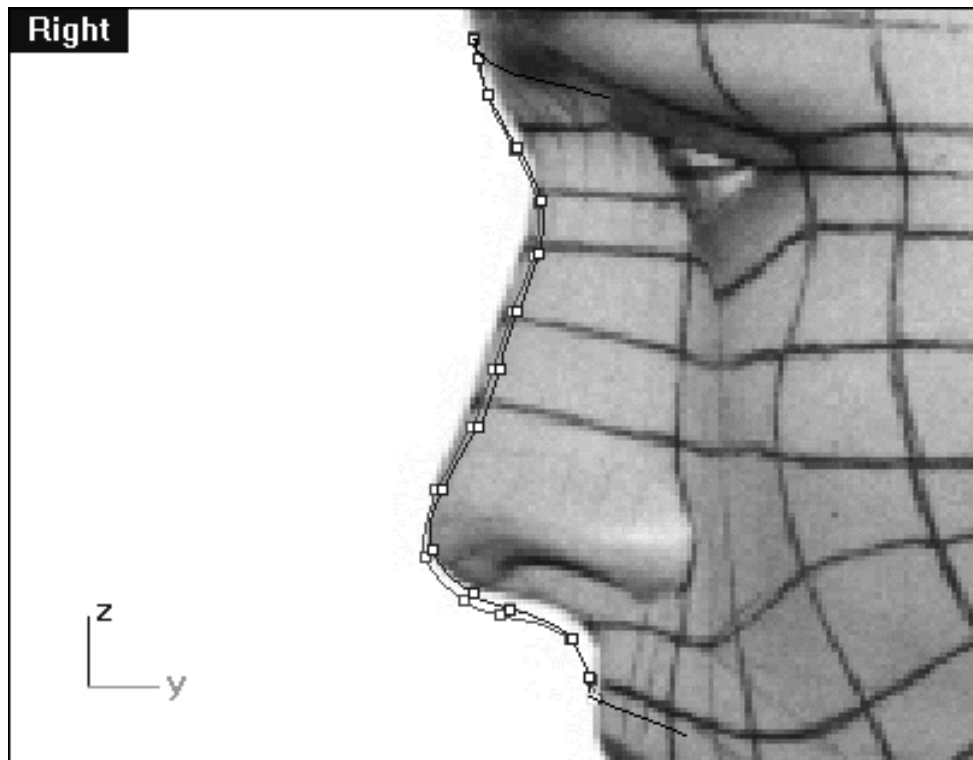
Obviously we will now have to further refine the points so that they are again positioned directly on top of those on the guide curve.

- Starting with the 1st point, move each point on the rebuilt interpolated curve so that it is in alignment with points on the guide curve -- zooming the view as required.
- Repeat the process with all the remaining points. Once done, your monitor should resemble the screenshot below:



This **Right Viewport** screenshot is a detailed view of all the currently displayed curves. Observe that the points on the rebuilt curve (dark blue) are now positioned directly on top of those of the guide curve (cyan).

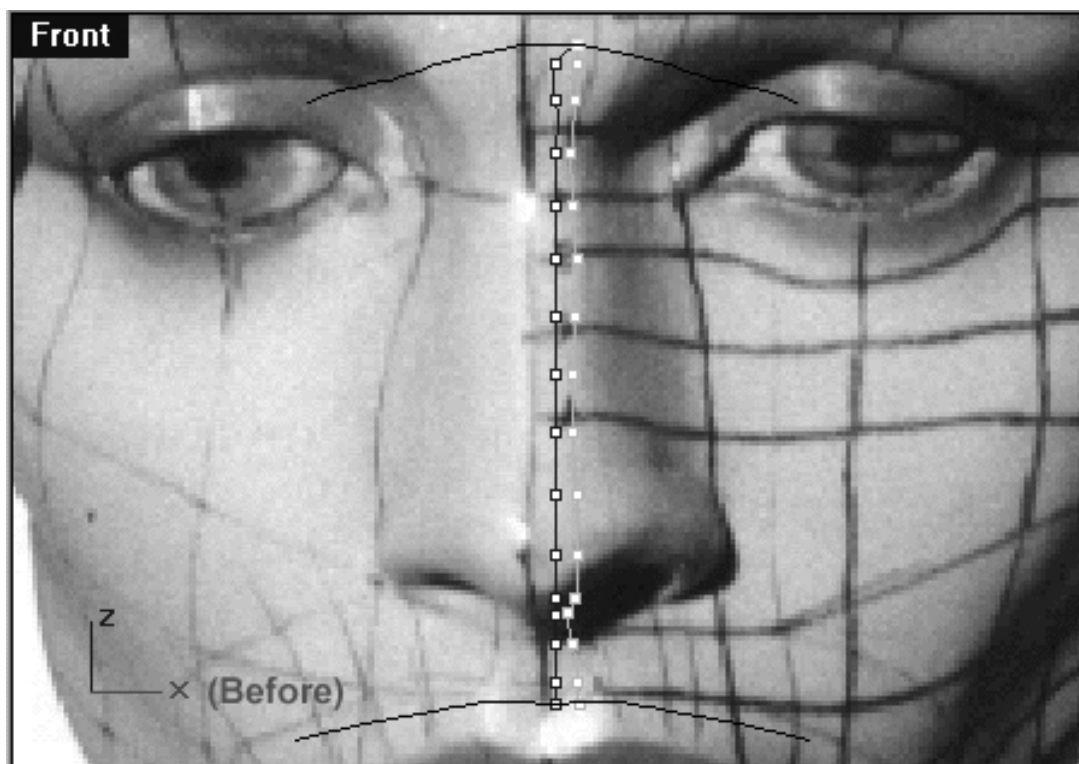
Congratulations! -- you've now completed the 2nd nose curve in the Right Viewport, your monitor should now resemble the screenshot below:



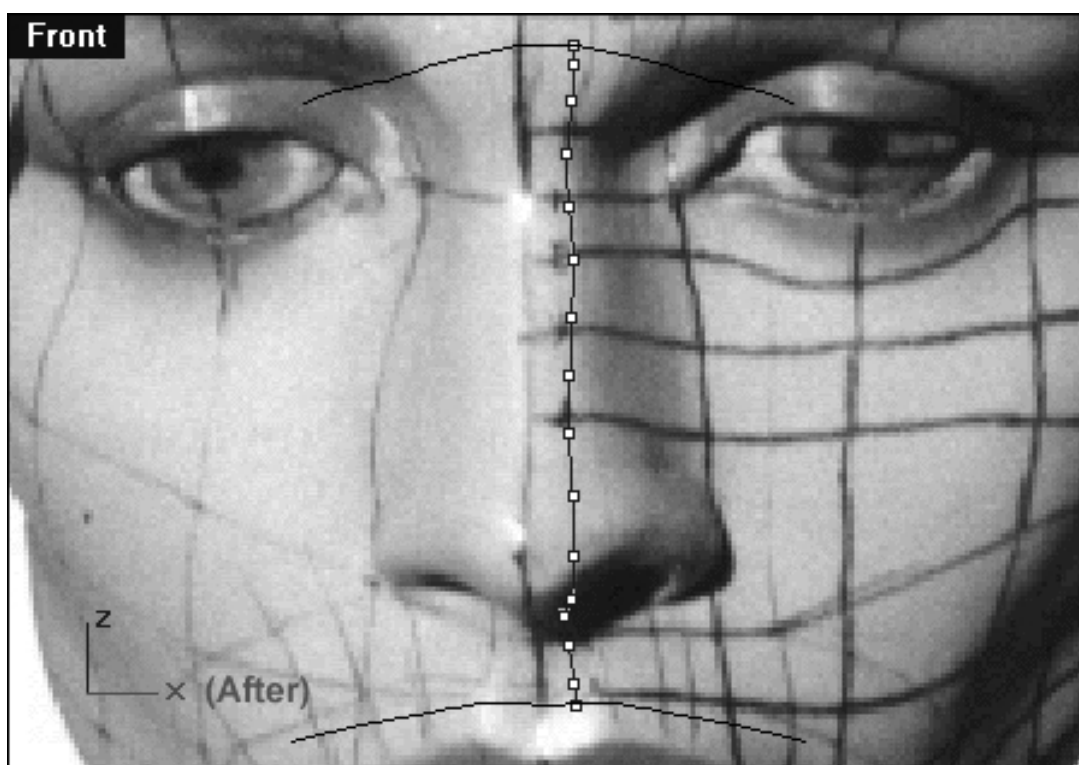
This **Right Viewport** screenshot shows the completed 2nd nose curve with the 16 points in their correct locations (for this view).

## Creating the 2nd Nose Curve Front View

- Open the Edit Layers dialogue and temporarily turn off the layer entitled: Noze\_Profile, press OK to complete the operation.
- If you've not done so already, select and display the edit points on the 2nd nose curve.
- Maximise the Front Viewport.
- Start by selecting the 1st edit point on the rebuilt interpolated curve, then whilst holding down the Shift key move it along the X axis until it is in alignment with the 1st point on the guide curve -- see the screenshot below entitled: (Before).
- Once done, continue working downward along the curve repeating the procedure with the remaining 15 points -- see the screenshot below entitled (After).



This **Front Viewport** screenshot shows the 1st point on the interpolated curve (blue) has now been moved along the X axis and into alignment with the 1st point on the guide curve (cyan).



This **Front Viewport** screenshot shows the now completed 2nd nose curve.

# Shutting Down the Scene

If you plan on continuing immediately to the next section then you can skip this procedure, however, we do recommend that you save your scene now anyway.

In the event that you wish to take a break and continue working later, than please perform the following procedure:

- Save the file.
- Unhide any objects that may no longer be visible. Type the command: Show at the command line and press Enter.
- Unlock any currently locked curves by typing the command: Unlock at the command line and pressing Enter.
- Turn off any edit points that may currently be displayed.
- Open the Edit Layers dialogue box and...
- Turn ON the layer entitled: SCENE START UP and make it the active layer.
- Turn ON the layer entitled: Photopoints.
- Turn OFF the layer entitled: Noze\_H\_guides.
- Turn OFF the layer entitled: Noze.
- Turn OFF the layer entitled: Noze Curve 2 GUIDE.
- With the exception of those mentioned, all other layers should be set to OFF.
- Press OK to complete the operation and exit.
- Perform a ZoomExtentsAll.
- SAVE THE FILE.

---

Go to the [NEXT PART](#)

RETURN to the Top of page -- [Click Here](#)

Written by Joseph R. Saltzman.

Co-produced in association with Steven Ståhlberg

©1998-1999 Cinemagic Productions Limited. All Rights Reserved.

Duplication of this document including images and text by any means is expressly forbidden without prior written consent of Cinemagic Productions Limited.

Web Site: <http://www.cmagic.co.uk> Telephone: +44 (0)1753 733 190 Fax: +44 (0)1753 736 619 email: [cmagic@cmagic.co.uk](mailto:cmagic@cmagic.co.uk)

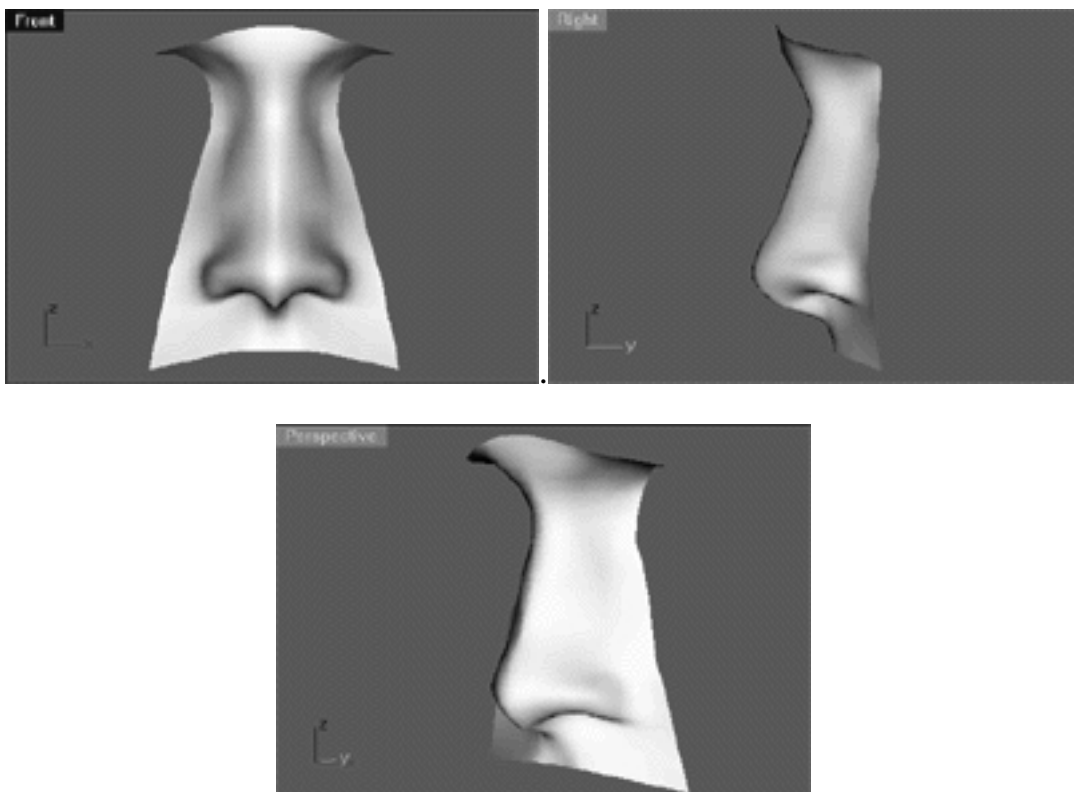
**RETURN** to previous page -- [Click Here](#)

**GOTO** the [NEXT LESSON](#)



## CREATING THE NOSE PART TWO

*(nose curves 3 & 4)*





---

## Contents:

- [Scene Setup](#)
- [Creating the 3rd Nose Curve, Right View](#)
- [Creating the 3rd Nose Curve, Front View](#)
- [Creating the 4th Nose Curve, Right View](#)
- [Creating the 4th Nose Curve, Front View](#)

- [Shutting Down the Scene](#)
- 

## Scene Setup

- If you've not done so already start a Rhinoceros session by **double clicking** on the desktop icon  the application will begin.
  - Choose File, Open from the menu bar and double click on **START\_A.3DM** in the file list, it will load and open.
  - Confirm at the Lower Status Bar the currently active layer is entitled SCENE START UP. If it is active proceed to the next step, if it's not then make it active by left clicking on the layer box, highlighting the correct layer and clicking on it.
  - Again, at the Layers Box on the Lower Status Bar this time right click on the box, the Edit Layers Dialogue box will open. Confirm the following switches have been enabled or disabled:
  - The Layer entitled: SCENE START UP should be ON.
  - The Layer entitled: Noze\_H\_Guides should be ON.
  - The Layer entitled: Noze should be ON and set to the ACTIVE LAYER.
  - The Layer entitled: Photopoints should be OFF.
  - All other layers should be set to OFF.
  - When you've finished making your changes ( if any ) click on OK.
  - Confirm that the grid display in the viewports has been disabled, if not turn it off now.
  - Confirm that no Osnaps are currently enabled, if any are disable them.
  - Confirm that no edit points are currently displayed, if any are hide them.
  - Zoom out all the viewports by selecting the Zoom Extents/Zoom Extents All Views icon  or by typing **ZoomExtentsAll** at the command line and pressing ENTER.
-




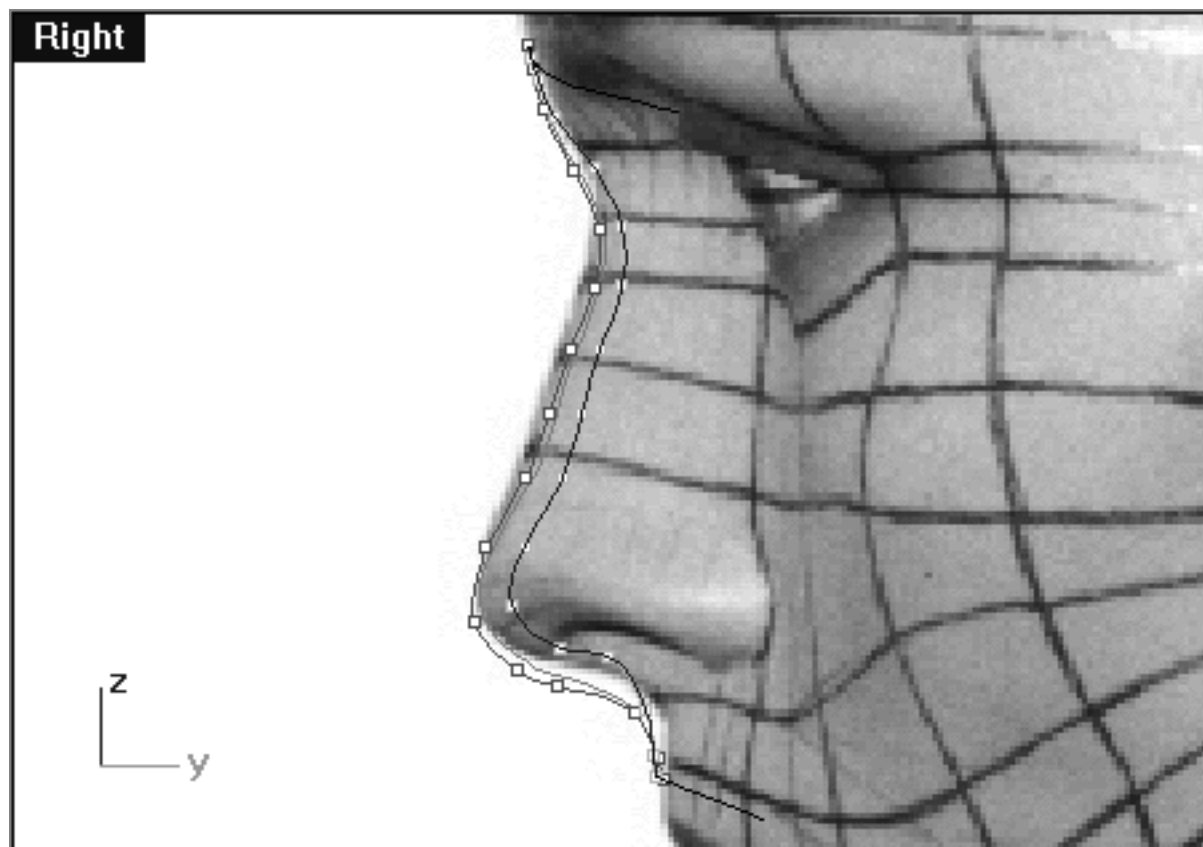
# Creating the 3rd Nose Curve

## Right View

- Maximise the Right Viewport.
- Turn off any currently displayed edit points.
- Open the Edit Layers dialogue, Turn ON the layer entitled: Nose Curve 3 GUIDE and Noze\_Profile, press OK to complete the operation.
- Select the 2nd nose curve and temporarily LOCK it -- type lock at the command line and press Enter.
- Select the Noze\_Profile curve and the Nose Curve 3 GUIDE and display their edit points.
- Once again, open the Edit Layers dialogue, LOCK the layers entitled: Nose Curve 3 GUIDE and Noze\_Profile, press OK to complete the operation.

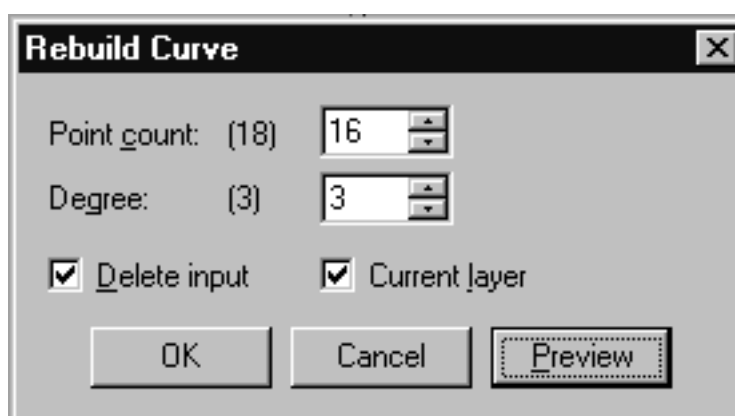
We can now begin to draw the 3rd nose curve, once again some general observations. This time, the 3rd nose curve will maintain a greater general distance from that of the profile and 1st nose curve, once again running to the inside along the Y axis. The distance should remain more constant in the area surrounding the tip of the nose and septum -- but again, will increase slightly. Expect that most of the edit points on the 3rd curve should be placed fairly parallel with the those of their sister points on the profile, however, there are a few "danger" areas to keep in mind. The 1st point (at the brow bone) will again need to be placed lower and behind the profile curve. The next hazard lies with points 15 and 16 which should be placed slightly higher and ahead of the profile curve.

- From the toolbar choose the create Curve, Interpolate Points icon  or type: **InterpCrv** at the command line and press Enter.
- Again, we will start drawing an interpolated curve beginning at the brow bone and work our way downward toward the upper lip along the Z axis, using **only 16** points! Start to draw the 3rd curve by placing your 1st point directly on top of that of the 1st point on the Noze Curve 3 GUIDE. Continue this procedure with all of the 15 remaining points -- when you've placed the last point press Enter to complete the operation. Once done, your monitor should resemble the screenshot below:



This **Right Viewport** screenshot shows the *Noze\_Profile* curve (in red) and the *Noze Curve 3 GUIDE* (in cyan) and the interpolated curve we just drew directly on top of it.

- The curve will now have to be rebuilt. Select the curve -- it will highlight, then at the command line type: Rebuild and press Enter.
- The Rebuild Curve dialogue box will appear -- enter the same values as in the screenshot below, then press OK to complete.

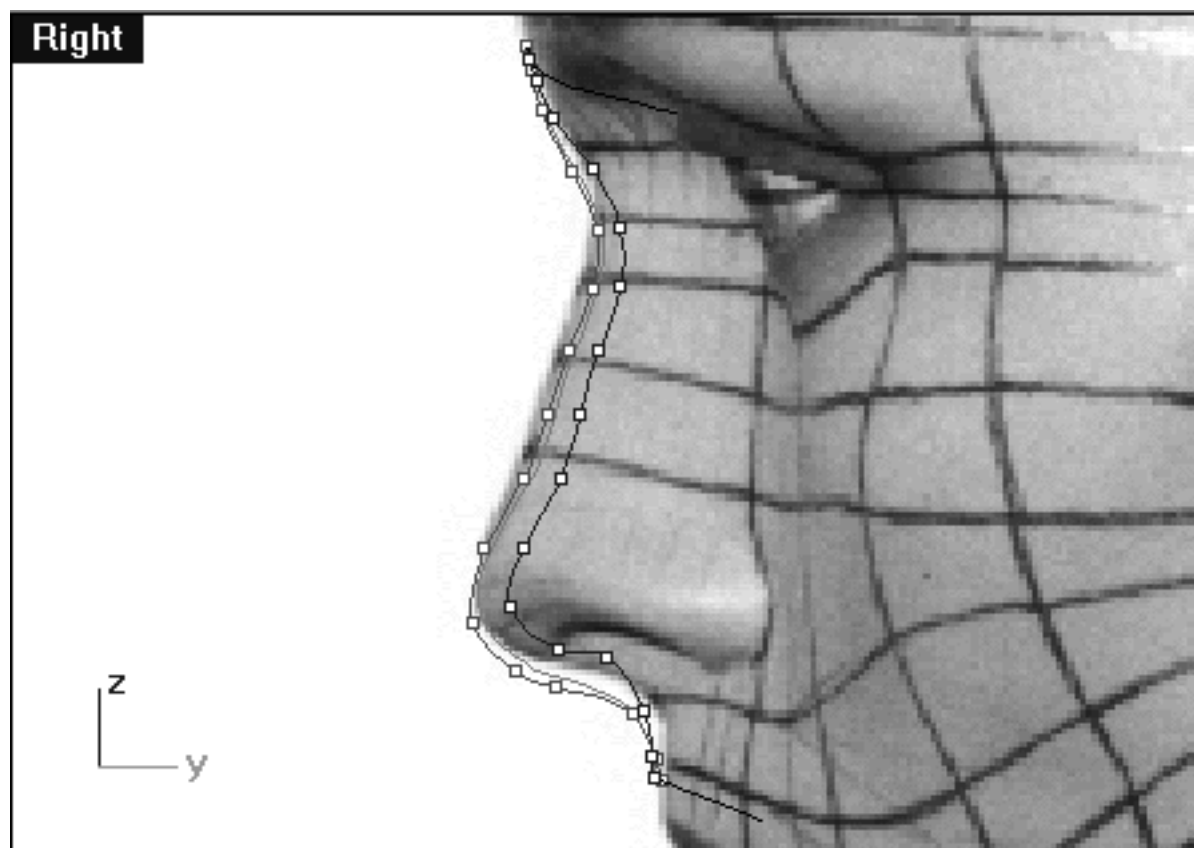


*This screenshot shows the Rebuild Curve dialogue box.*

The 3rd curve will now have been rebuilt. Once again, due to the automatic rebuilding process the point placement will have changed, thus requiring further refinement of the all the points.

- Select the rebuilt 3rd curve -- it will highlight, then display its edit points.

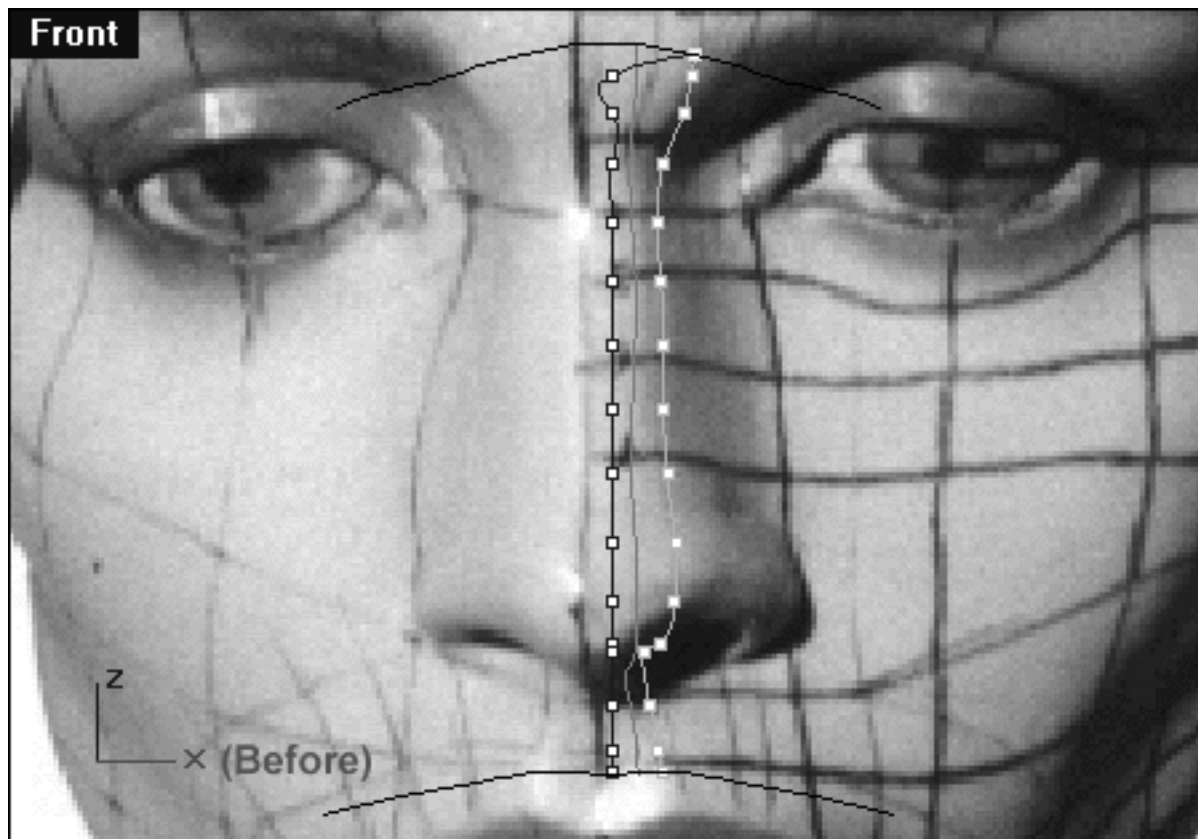
- Starting with the 1st point, move each point on the rebuilt interpolated curve so that it is in alignment with points on the guide curve -- zooming the view as required.
- Repeat the process with all the remaining points. Once done, your monitor should resemble the screenshot below:



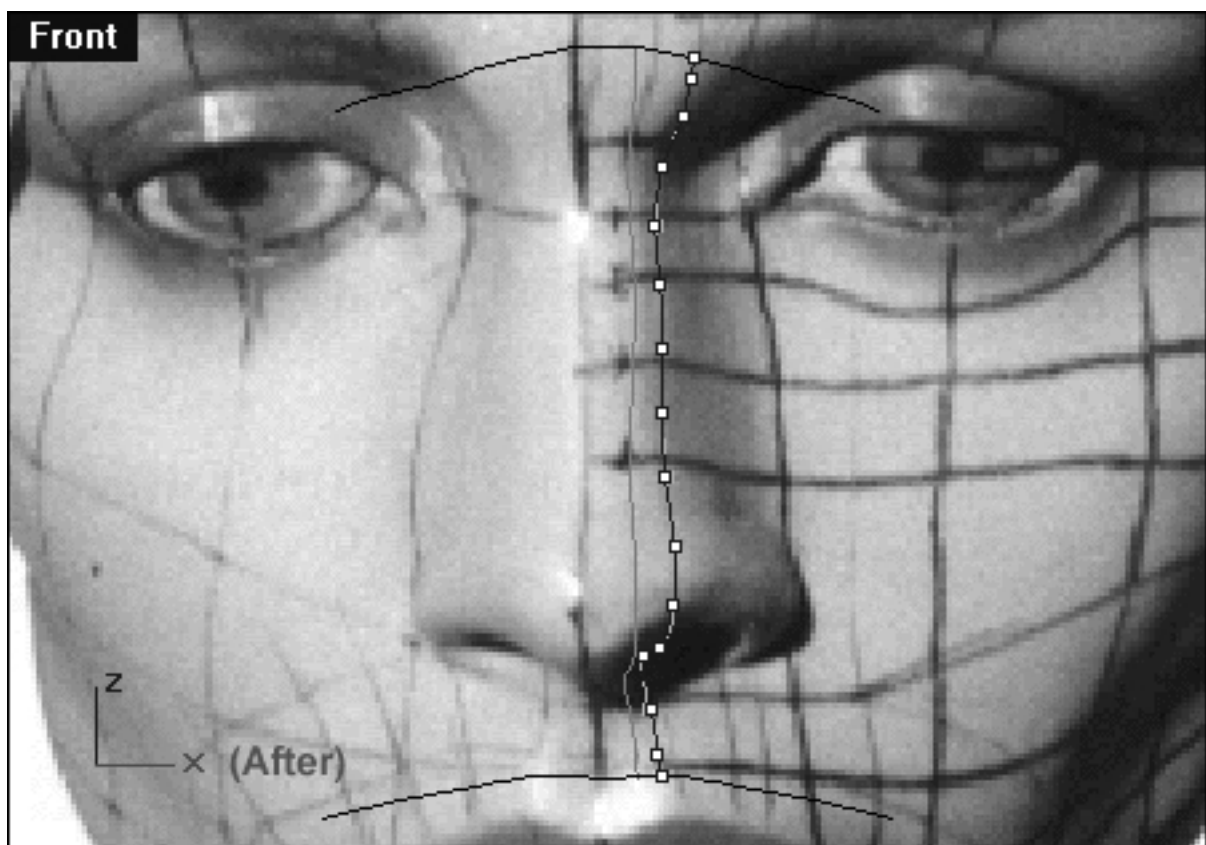
*This **Right Viewport** screenshot shows the completed 3rd nose curve with the 16 points now in their correct locations (for this view only).*

## Creating the 3rd Nose Curve Front View

- Open the Edit Layers dialogue, turn off the layer entitled: Noze\_Profile the press OK to complete the operation.
- Maximise the Front Viewport.
- Start by selecting the 1st edit point on the rebuilt 3rd nose curve, then whilst holding down the Shift key move it along the X axis until it is in alignment with the 1st point on the guide curve -- see the screenshot below entitled: (Before).
- Once done, continue working downward along the curve repeating the procedure with the remaining 15 points -- see the screenshot below entitled (After).



This **Front Viewport** screenshot shows the 1st point on the interpolated curve (blue) has now been moved along the X axis and into alignment with the 1st point on the guide curve (cyan).




This **Front Viewport** screenshot shows the now completed 3rd nose curve (the locked 2nd curve is also displayed).

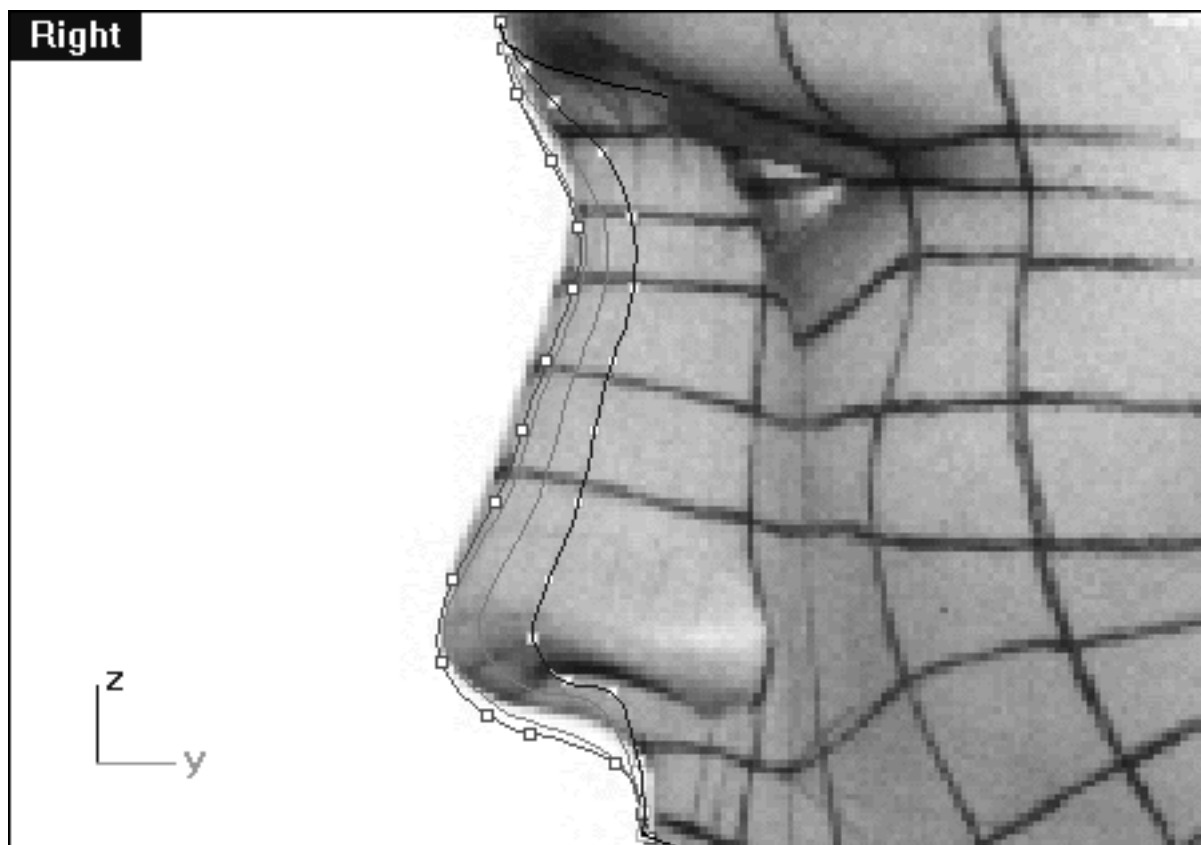
# Creating the 4th Nose Curve Right View

Here we go again...

- Maximise the Right Viewport.
- Turn off any currently displayed edit points.
- Open the Edit Layers dialogue, Turn off the layer entitled: Nose Curve 3 GUIDE, then Turn ON the layer entitled: Nose Curve 4 GUIDE and Noze\_Profile, press OK to complete the operation.
- Select the 3rd nose curve and temporarily LOCK it -- type lock at the command line and press Enter.
- Select the Noze\_Profile curve and the Nose Curve 4 GUIDE and display their edit points.
- Once again, open the Edit Layers dialogue, LOCK the layer entitled: Nose Curve 4 GUIDE and Noze\_Profile, press OK to complete the operation.

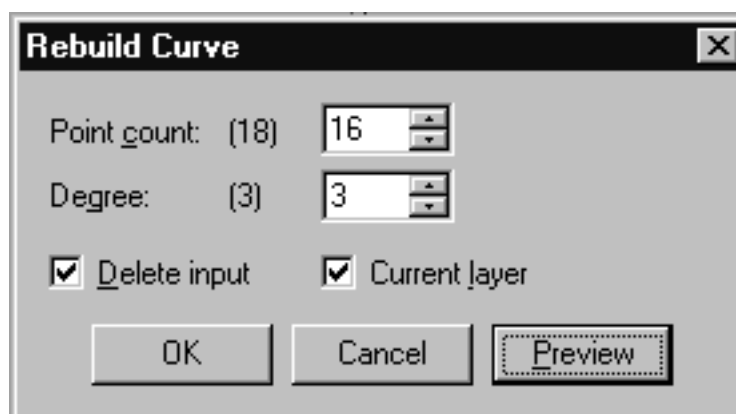
We can now begin to draw the 4th nose curve. This time, the 4th nose curve will maintain about the same general distance from that of the profile and 1st nose curve, once again running to the inside along the Y axis. This curve is quite important because it begins to define the nostril area, so pay particular attention here. Expect that most of the edit points on the 4th curve should be placed fairly parallel with the those of their sister points on the profile, with a few exceptions. The 1st point (at the brow bone) will again need to be placed lower and behind the profile curve, additionally points 2 and 3 are also below so beware, however, things will start to even out by about point 4. Point 13 is important because that's the nostril area, so exercise caution in that area. The next real hazard lies with point 15 which should be placed slightly higher and behind the profile curve, while point 16 should be placed ahead.

- From the toolbar choose the create Curve, Interpolate Points icon  or type: **InterpCrv** at the command line and press Enter.
- Again, we will start drawing an interpolated curve beginning at the brow bone and work our way downward toward the upper lip along the Z axis, using **only 16** points! Start to draw the 4th curve by placing your 1st point directly on top of that of the 1st point on the Noze Curve 4 GUIDE. Continue this procedure with all of the 15 remaining points -- when you've placed the last point press Enter to complete the operation. Once done, your monitor should resemble the screenshot below:



This **Right Viewport** screenshot shows the *Noze\_Profile* curve (in red) and the *Noze Curve 4 GUIDE* (in cyan) and the interpolated curve we just drew directly on top of it.

- The curve will now have to be rebuilt. Select the curve -- it will highlight, then at the command line type: Rebuild and press Enter.
- The Rebuild Curve dialogue box will appear -- enter the same values as in the screenshot below, then press OK to complete.



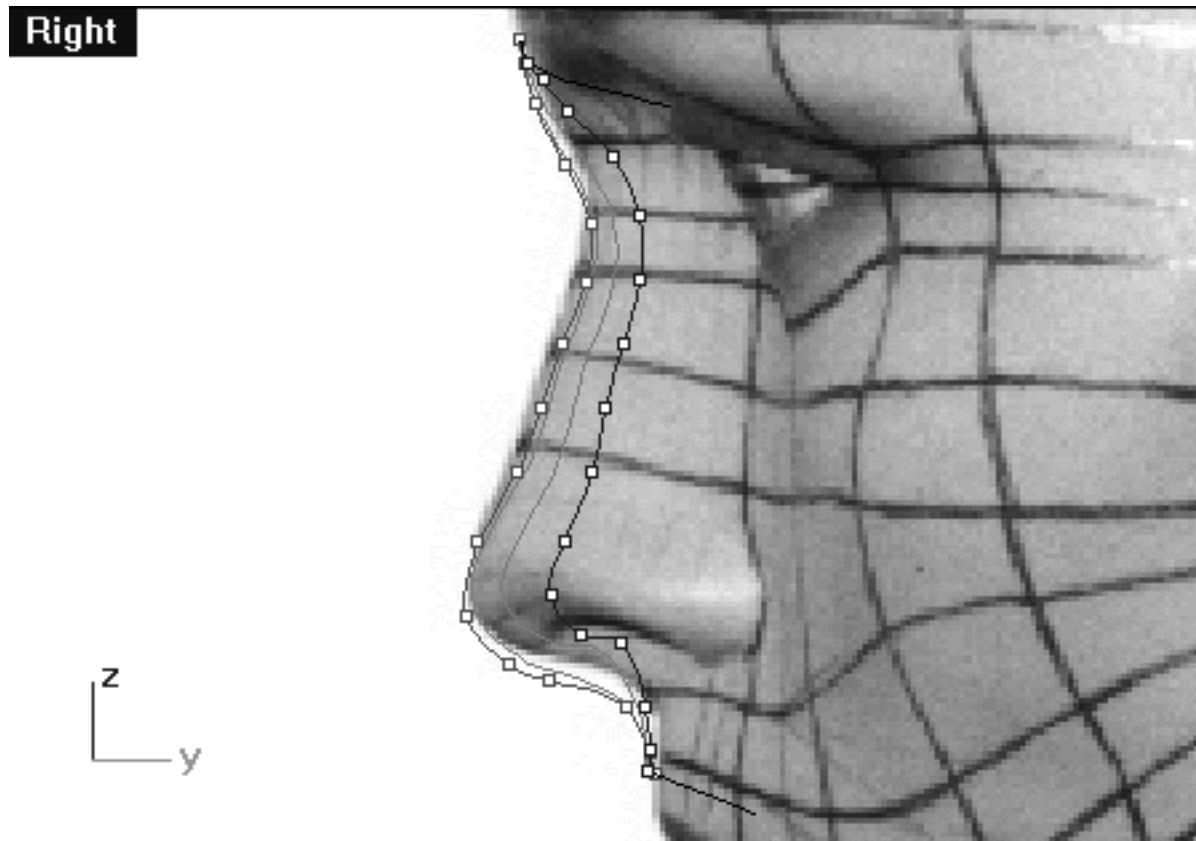
This screenshot shows the *Rebuild Curve* dialogue box.

The 4th curve will now have been rebuilt. Once again, due to the automatic rebuilding process the point placement will have changed, thus requiring further refinement of the all the points.

- Select the rebuilt 4th curve -- it will highlight, then display its edit points.



- Starting with the 1st point, move each point on the rebuilt interpolated curve so that it is in alignment with points on the guide curve -- zooming the view as required.
- Repeat the process with all the remaining points. Once done, your monitor should resemble the screenshot below:

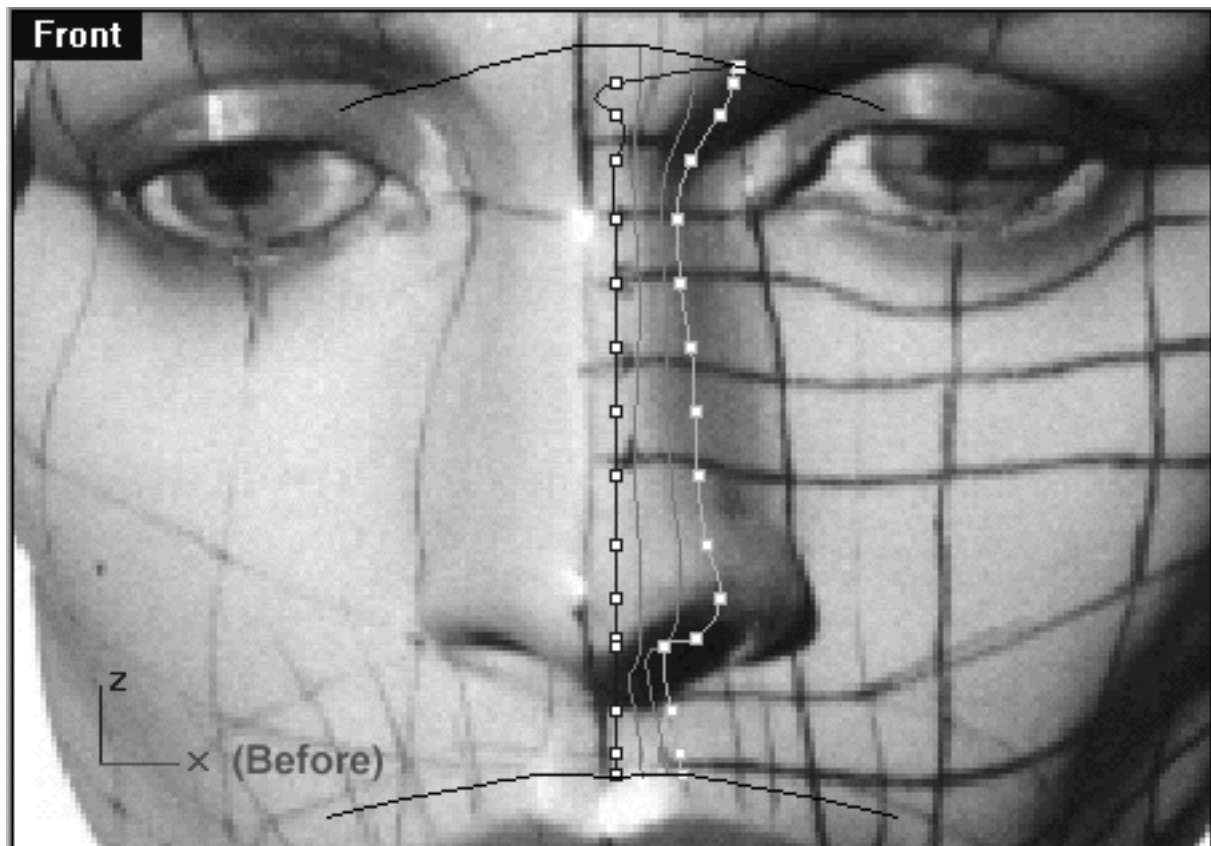


*This **Right Viewport** screenshot shows the completed 4th nose curve with the 16 points now in their correct locations (for this view only).*

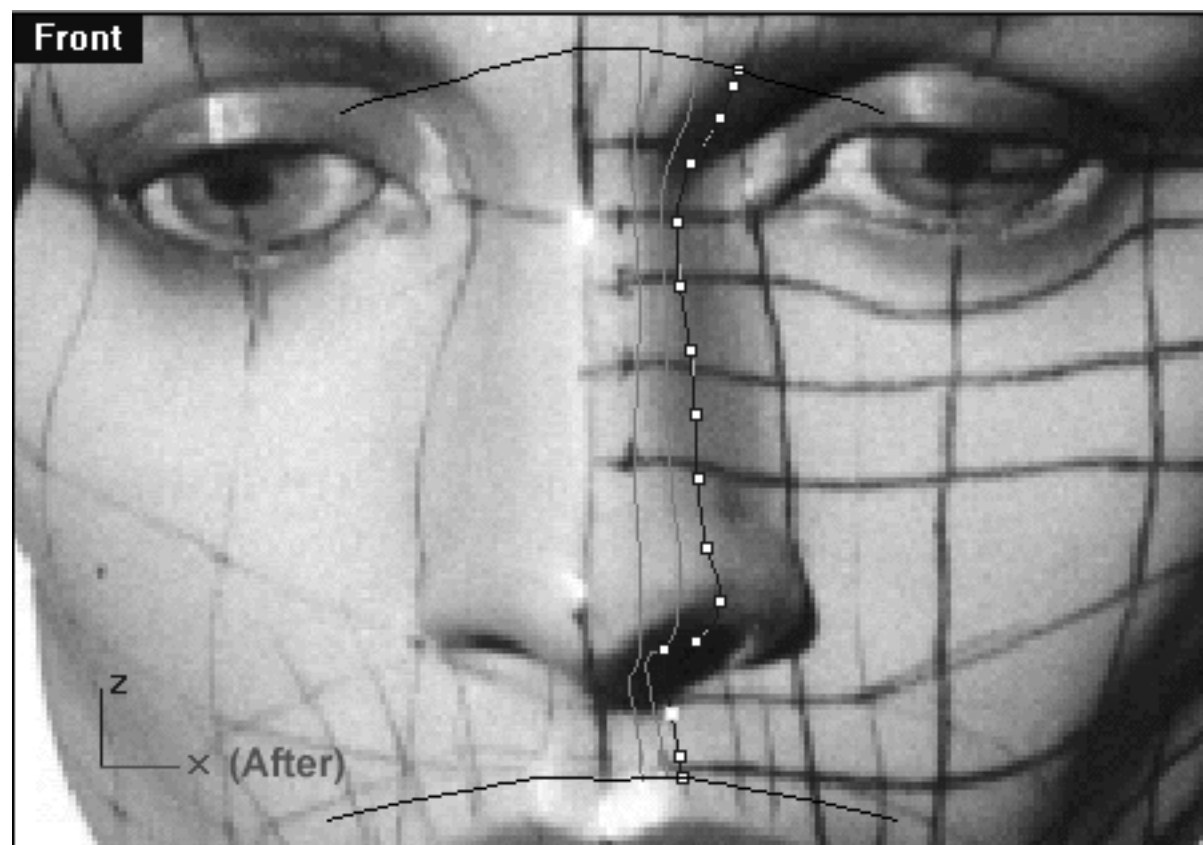
## Creating the 4th Nose Curve Front View

- Open the Edit Layers dialogue, turn off the layer entitled: Noze\_Profile the press OK to complete the operation.
- Maximise the Front Viewport.
- Start by selecting the 1st edit point on the rebuilt 4th nose curve, then whilst holding down the Shift key move it along the X axis until it is in alignment with the 1st point on the guide curve -- see the screenshot below entitled: (Before).

- Once done, continue working downward along the curve repeating the procedure with the remaining 15 points -- see the screenshot below entitled (After).



*This **Front Viewport** screenshot shows the 1st point on the interpolated curve (blue) has now been moved along the X axis and into alignment with the 1st point on the guide curve (cyan).*





This **Front Viewport** screenshot shows the now completed 4th nose curve (the locked 2nd & 3rd curve are also displayed).

---

## Shutting Down the Scene

If you plan on continuing immediately to the next section then you can skip this procedure, however, we do recommend that you save your scene now anyway.

In the event that you wish to take a break and continue working later, than please perform the following procedure:

- Save the file.
- Unhide any objects that may no longer be visible. Type the command: Show at the command line and press Enter.
- Unlock any currently locked curves by typing the command: Unlock at the command line and pressing Enter.
- Turn off any edit points that may currently be displayed.
- Open the Edit Layers dialogue box and...
- Turn ON the layer entitled: SCENE START UP and make it the active layer.
- Turn ON the layer entitled: Photopoints.

- Turn OFF the layer entitled: Noze\_H\_guides.
  - Turn OFF the layer entitled: Noze.
  - Turn OFF the layer entitled: Noze Curve 4 GUIDE.
  - With the exception of those mentioned, all other layers should be set to OFF.
  - Press OK to complete the operation and exit.
  - Perform a ZoomExtentsAll.
  - SAVE THE FILE.
- 

Go to the [NEXT PART](#)

RETURN to the Top of page -- [Click Here](#)

Written by Joseph R. Saltzman.

Co-produced in association with Steven Ståhlberg

©1998-1999 Cinemagic Productions Limited. All Rights Reserved.

Duplication of this document including images and text by any means is expressly forbidden without prior written consent of Cinemagic Productions Limited.

Web Site: <http://www.cmagic.co.uk> Telephone: +44 (0)1753 733 190 Fax: +44 (0)1753 736 619 email: [cmagic@cmagic.co.uk](mailto:cmagic@cmagic.co.uk)

qat290699

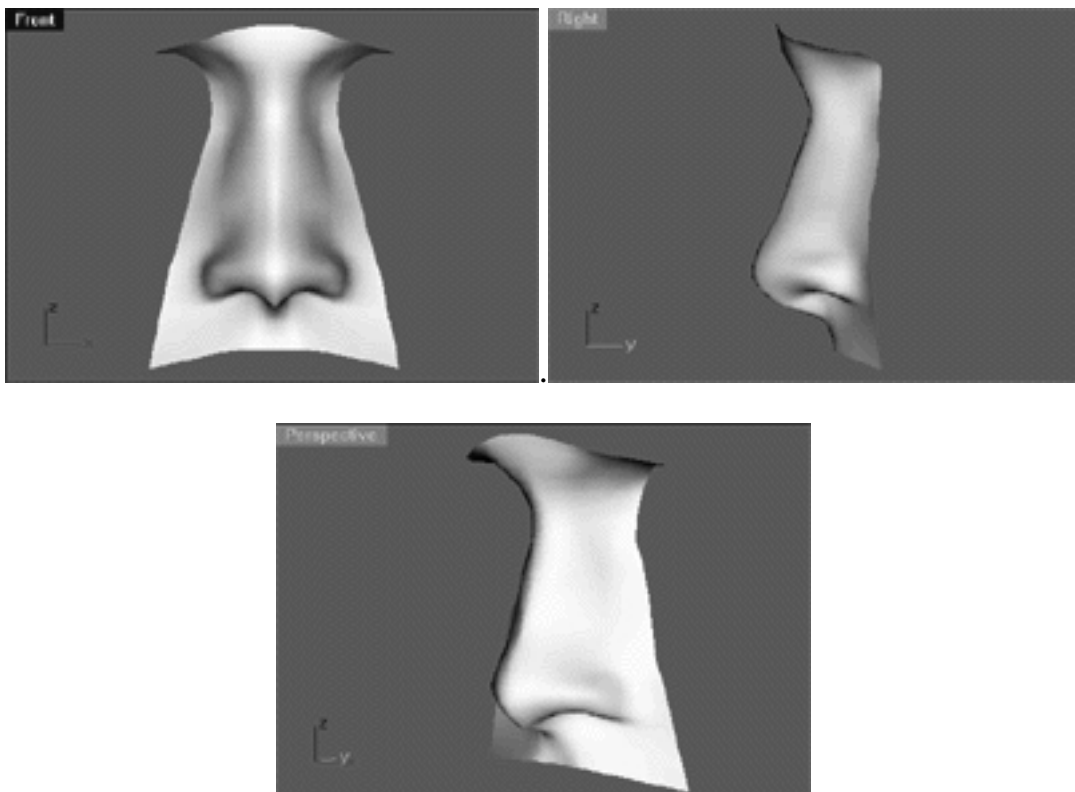
**RETURN** to previous page -- [Click Here](#)

**GOTO** the [NEXT LESSON](#)



## CREATING THE NOSE PART THREE

*(curves 5 & 6)*



---

## Contents:

- [Scene Setup](#)
- [Creating the 5th Nose Curve, Right View](#)
- [Creating the 5th Nose Curve, Front View](#)
- [Creating the 6th Nose Curve, Right View](#)


- [Creating the 6th Nose Curve, Front View](#)
  - [Shutting Down the Scene](#)
- 

## Scene Setup

- If you've not done so already start a Rhinoceros session by **double clicking** on the desktop icon




the application will begin.

- Choose File, Open from the menu bar and double click on **START\_A.3DM** in the file list, it will load and open.
  - Confirm at the Lower Status Bar the currently active layer is entitled SCENE START UP. If it is active proceed to the next step, if it's not then make it active by left clicking on the layer box, highlighting the correct layer and clicking on it.
  - Again, at the Layers Box on the Lower Status Bar this time right click on the box, the Edit Layers Dialogue box will open. Confirm the following switches have been enabled or disabled:
    - The Layer entitled: SCENE START UP should be ON.
    - The Layer entitled: Noze\_H\_Guides should be ON.
    - The Layer entitled: Noze should be ON and set to the ACTIVE LAYER.
    - The Layer entitled: Photopoints should be OFF.
    - All other layers should be set to OFF.
    - When you've finished making your changes ( if any ) click on OK.
    - Confirm that the grid display in the viewports has been disabled, if not turn it off now.
    - Confirm that no Osnaps are currently enabled, if any are disable them.
    - Confirm that no edit points are currently displayed, if any are hide them.
  - Zoom out all the viewports by selecting the Zoom Extents/Zoom Extents All Views icon  or by typing **ZoomExtentsAll** at the command line and pressing ENTER.
-

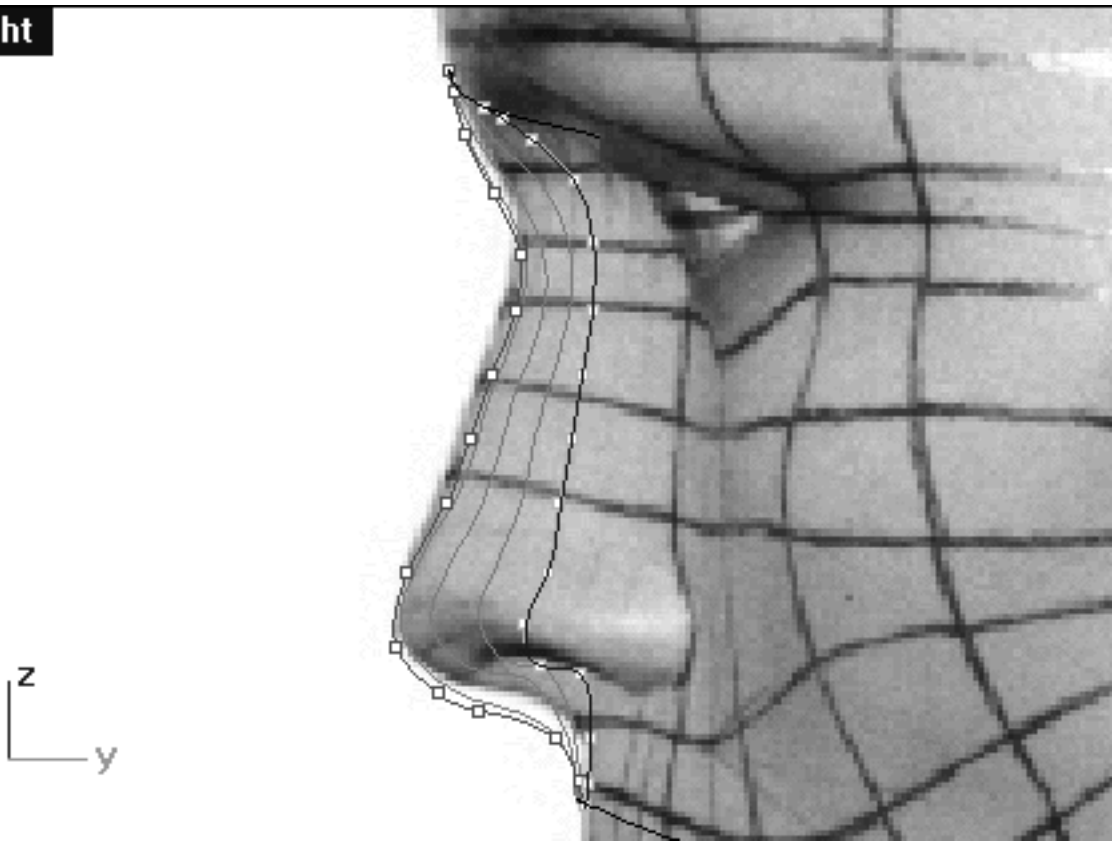
# Creating the 5th Nose Curve Right View

- Maximise the Right Viewport.
- Turn off any currently displayed edit points.
- Open the Edit Layers dialogue, Turn ON the layer entitled: Nose Curve 5 GUIDE and Noze\_Profile, press OK to complete the operation.
- Select the 2nd, 3rd and 4th nose curve and temporarily LOCK them -- type lock at the command line and press Enter.
- Select the Noze\_Profile curve and the Nose Curve 5 GUIDE and display their edit points.
- Once again, open the Edit Layers dialogue, LOCK the layer entitled: Nose Curve 5 GUIDE and Noze\_Profile, press OK to complete the operation.

We can now begin to draw the 5th nose curve. The 5th nose curve will maintain about the same general distance from that of the curves previously created, once again running to the inside along the Y axis. As with the previous curve, the 5th curve is quite important because it defines the nostril area, so pay particular attention here. Expect that most of the edit points on the 4th curve should be placed fairly parallel with the those of their sister points on the profile, with a few exceptions. The 1st point (at the brow bone) will again need to be placed lower and behind the profile curve, additionally points 2, & 3 are also below so beware, however, things will start to even out by about point 5. Points 12 & 13 are important because that's the nostril area, so exercise caution in that area. The next real hazard lies with point 15 which should be placed slightly lower and behind the profile curve, while point 16 should be slightly below and behind as well.

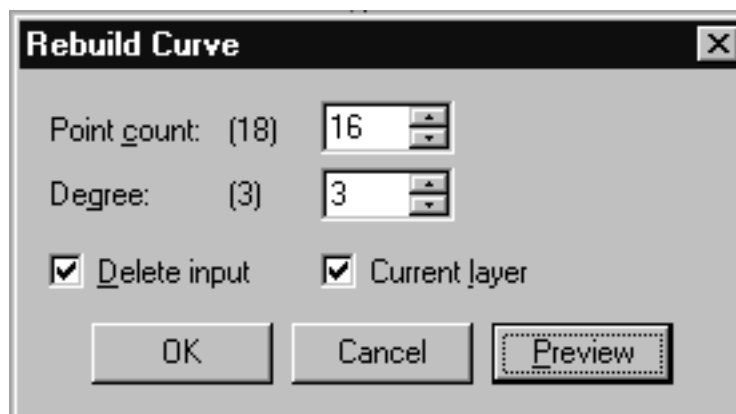
- From the toolbar choose the create Curve, Interpolate Points icon  or type: **InterpCrv** at the command line and press Enter.
- Again, we will start drawing an interpolated curve beginning at the brow bone and work our way downward toward the upper lip along the Z axis, using **only 16** points! Start to draw the 5th curve by placing your 1st point directly on top of that of the 1st point on the Noze Curve 5 GUIDE. Continue this procedure with all of the 15 remaining points -- when you've placed the last point press Enter to complete the operation. Once done, your monitor should resemble the screenshot below:

**Right**



This **Right Viewport** screenshot shows the Noze\_Profile curve (in red) and the Noze Curve 5 GUIDE (in cyan) and the interpolated curve we just drew directly on top of it.

- The curve will now have to be rebuilt. Select the curve -- it will highlight, then at the command line type: Rebuild and press Enter.
- The Rebuild Curve dialogue box will appear -- enter the same values as in the screenshot below, then press OK to complete.

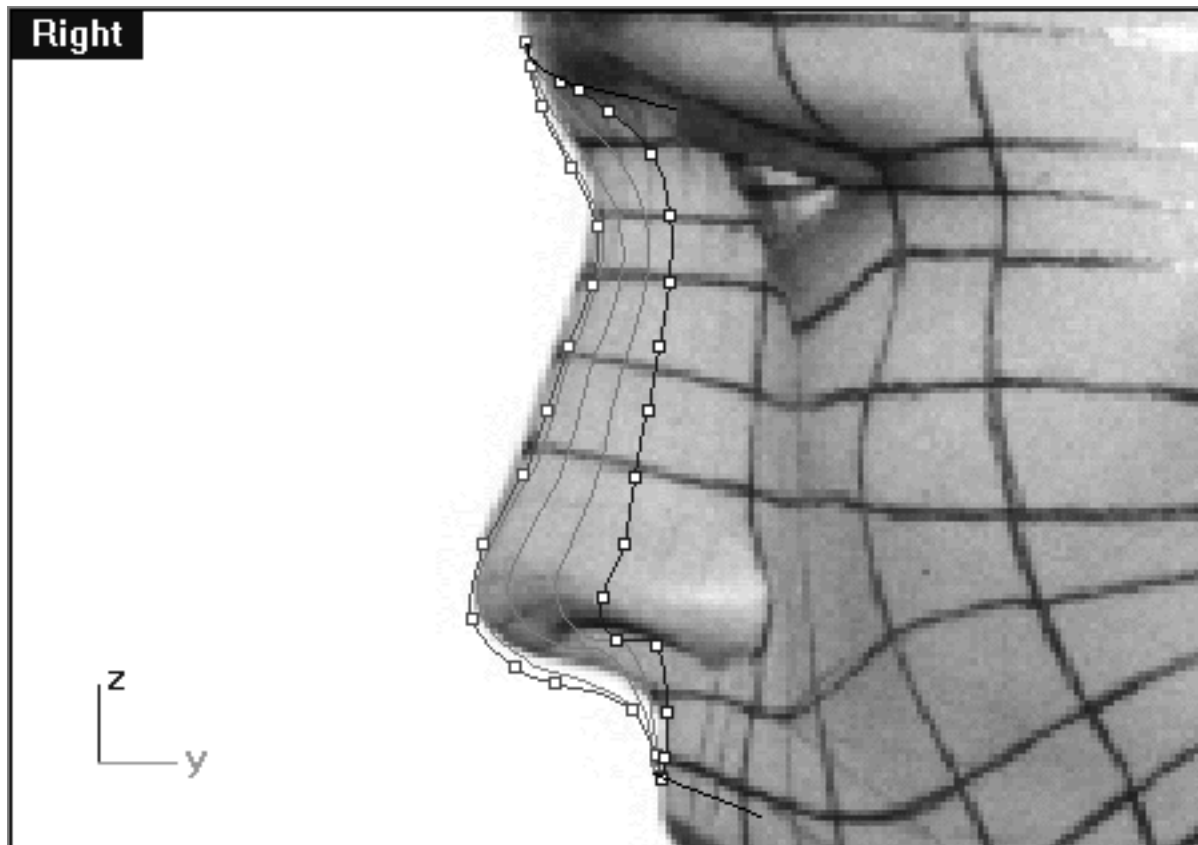


*This screenshot shows the Rebuild Curve dialogue*

The 5th curve will now have been rebuilt. Once again, due to the automatic rebuilding process the point placement will have changed, thus requiring further refinement of the all the points.

- Select the rebuilt 5th curve -- it will highlight, then display its edit points.

- Starting with the 1st point, move each point on the rebuilt interpolated curve so that it is in alignment with points on the guide curve -- zooming the view as required.
- Repeat the process with all the remaining points. Once done, your monitor should resemble the screenshot below:



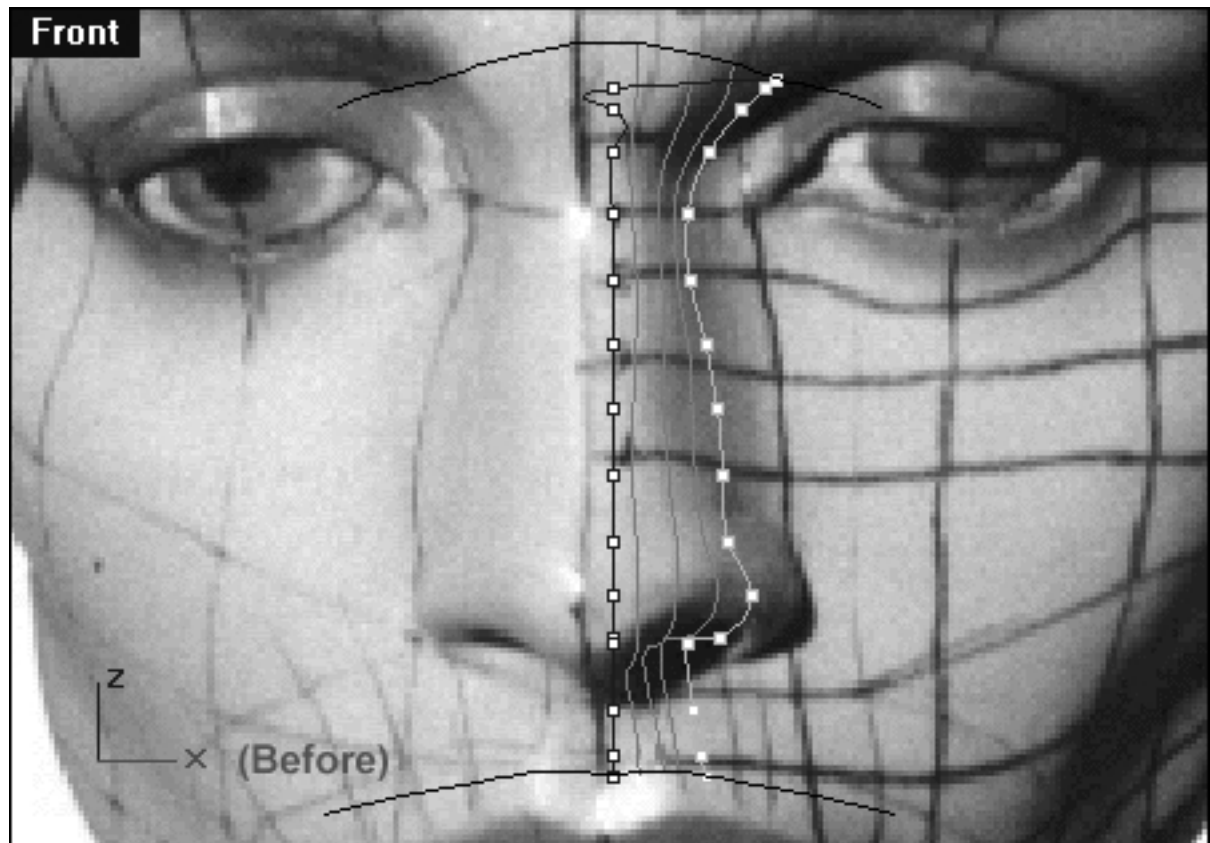
*This **Right Viewport** screenshot shows the completed 5th nose curve with the 16 points now in their correct locations (for this view only).*

## Creating the 5th Nose Curve Front View

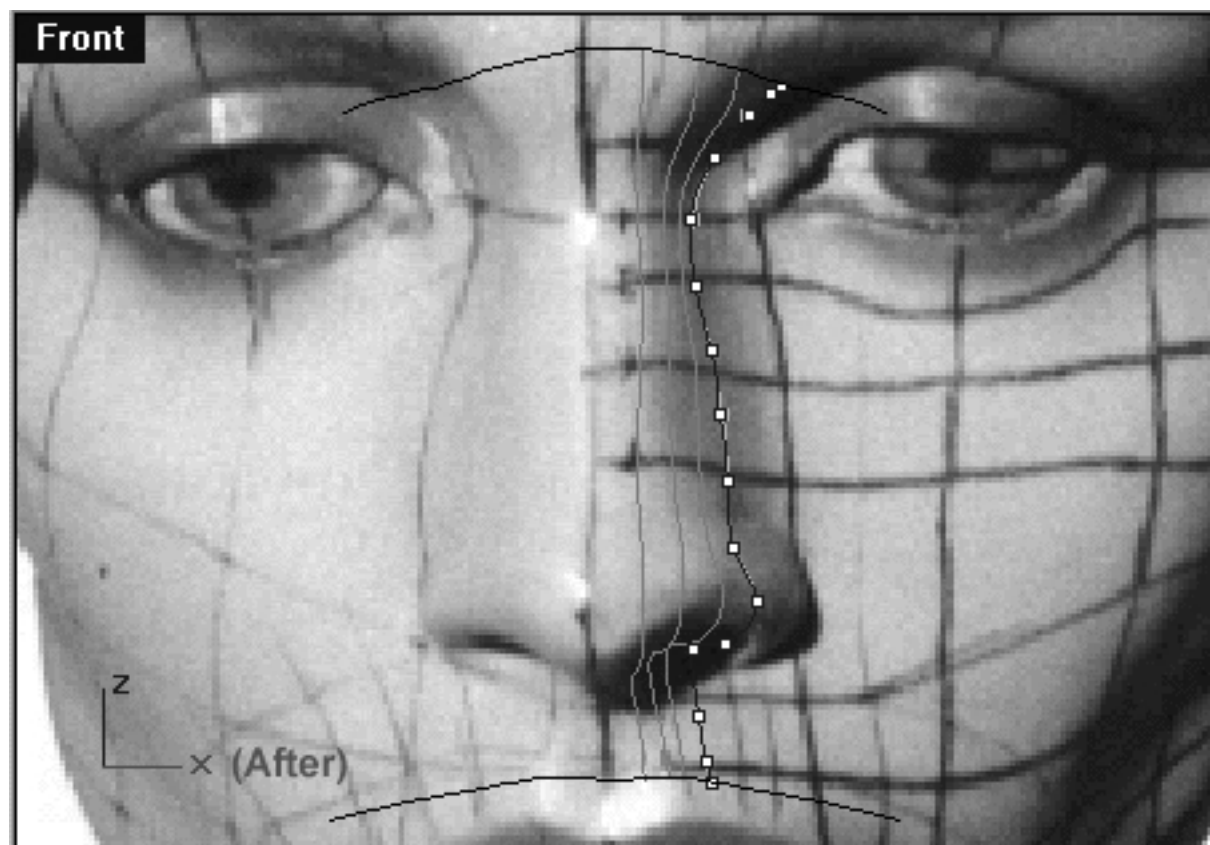
- Open the Edit Layers dialogue, turn off the layer entitled: Noze\_Profile the press OK to complete the operation.
- Maximise the Front Viewport.
- Start by selecting the 1st edit point on the rebuilt 5th nose curve, then whilst holding down the Shift key move it along the X axis until it is in alignment with the 1st point on the guide curve -- see the screenshot below entitled: (Before).



- Once done, continue working downward along the curve repeating the procedure with the remaining 15 points -- see the screenshot below entitled (After).



This **Front Viewport** screenshot shows the 1st point on the interpolated curve (blue) has now been moved along the X axis and into alignment with the 1st point on the guide curve (cyan).






This **Front Viewport** screenshot shows the now completed 5th nose curve (the locked 2nd, 3rd & 4th curves are also displayed).

---

## Creating the 6th Nose Curve Right View

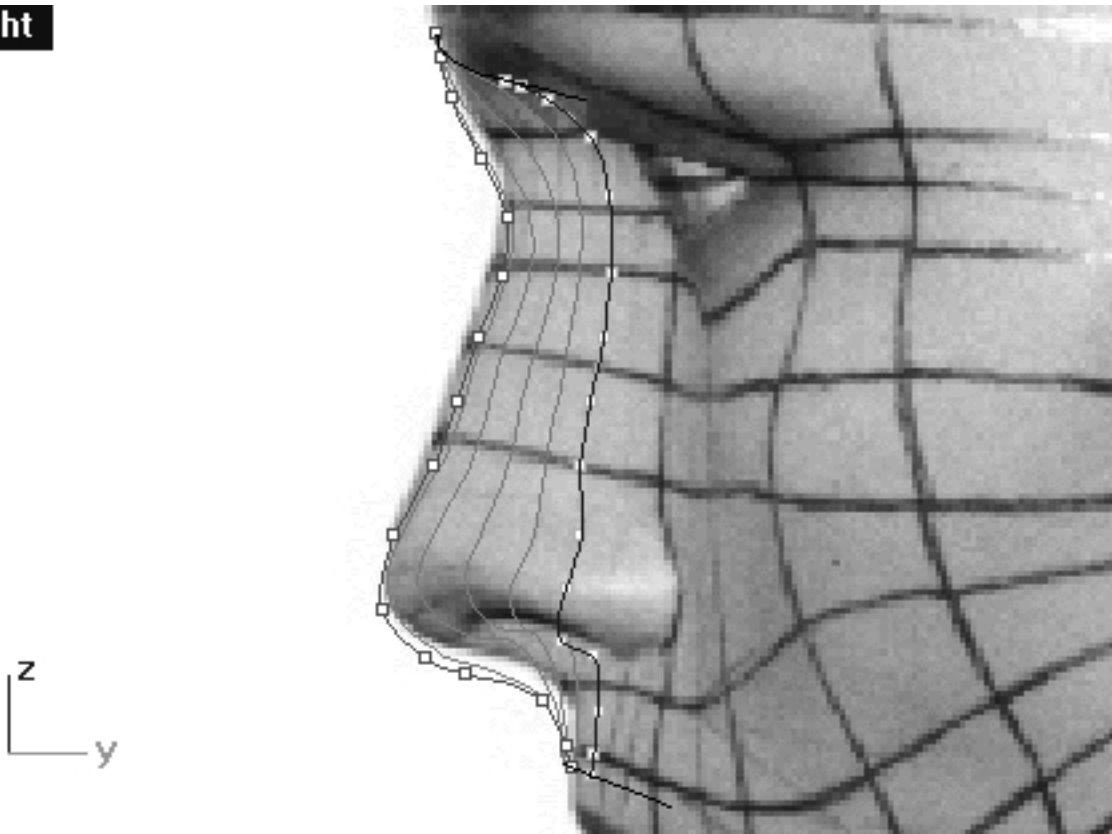
- Maximise the Right Viewport.
- Turn off any currently displayed edit points.
- Open the Edit Layers dialogue, Turn off the layer entitled: Nose Curve 5 GUIDE, then Turn ON the layer entitled: Nose Curve 6 GUIDE and Noze\_Profile, press OK to complete the operation.
- Select the 5th nose curve and temporarily LOCK it -- type lock at the command line and press Enter.
- Select the Noze\_Profile curve and the Nose Curve 6 GUIDE and display their edit points.
- Once again, open the Edit Layers dialogue, LOCK the layer entitled: Nose Curve 6 GUIDE and Noze\_Profile, press OK to complete the operation.

We can now begin to draw the 6th nose curve. The 6th nose curve will maintain about the same general distance from that of the curves previously created, once again running to the inside along the Y axis. As with the previous curve, the 6th curve is quite important because it defines the nostril and flare area, so pay particular attention here. Expect that most of the edit points on the 6th curve should be placed fairly parallel with the those of their sister points on the profile, with a few exceptions. The 1st point (at the brow bone) will again need to be placed even lower and behind the profile curve along the Y axis, additionally points 2, & 3 are also below so beware, however, things will start to even out by about point 6. Remember that the first five or so points really are defining the inner corner of the eye socket so this accounts for the increasingly downward slope in this view. Points 10 through 13 are important because that's the nostril and flare area, so exercise caution in that area and think about what you are doing. Both points 15 and 16 should be placed slightly lower and behind the profile curve.

- From the toolbar choose the create Curve, Interpolate Points icon  or type: **InterpCrv** at the command line and press Enter.

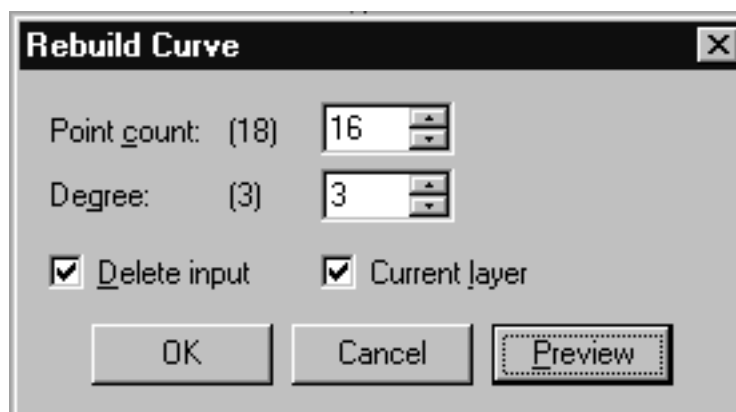
- Again, we will start drawing an interpolated curve beginning at the brow bone and work our way downward toward the upper lip along the Z axis, using **only 16** points! Start to draw the 6th curve by placing your 1st point directly on top of that of the 1st point on the Noze Curve 6 GUIDE. Continue this procedure with all of the 15 remaining points -- when you've placed the last point press Enter to complete the operation. Once done, your monitor should resemble the screenshot below:

**Right**



*This **Right Viewport** screenshot shows the Noze\_Profile curve (in red) and the Noze Curve 6 GUIDE (in cyan) and the interpolated curve we just drew directly on top of it.*

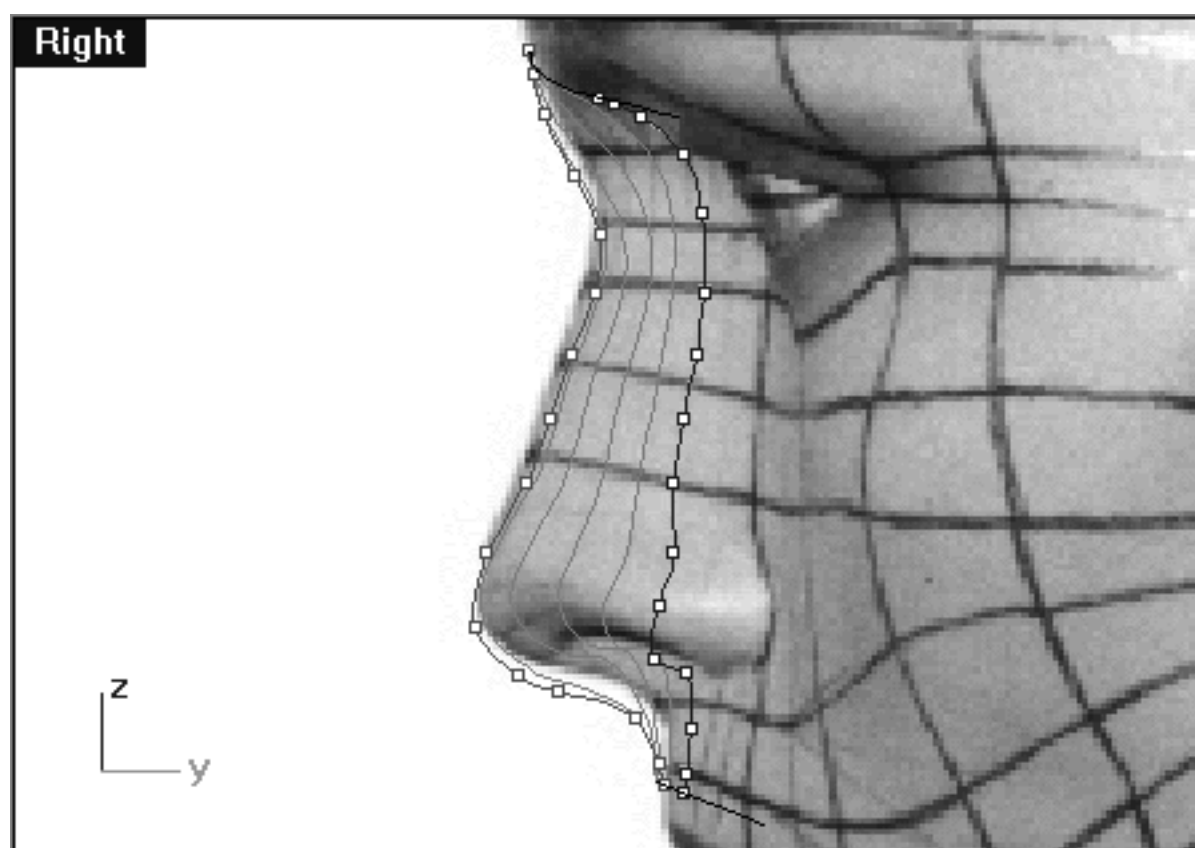
- The curve will now have to be rebuilt. Select the curve -- it will highlight, then at the command line type: Rebuild and press Enter.
- The Rebuild Curve dialogue box will appear -- enter the same values as in the screenshot below, then press OK to complete.



*This screenshot shows the Rebuild Curve dialogue box*

The 6th curve will now have been rebuilt. Once again, due to the automatic rebuilding process the point placement will have changed, thus requiring further refinement of the all the points.

- Select the rebuilt 6th curve -- it will highlight, then display its edit points.
- Starting with the 1st point, move each point on the rebuilt interpolated curve so that it is in alignment with points on the guide curve -- zooming the view as required.
- Repeat the process with all the remaining points. Once done, your monitor should resemble the screenshot below:



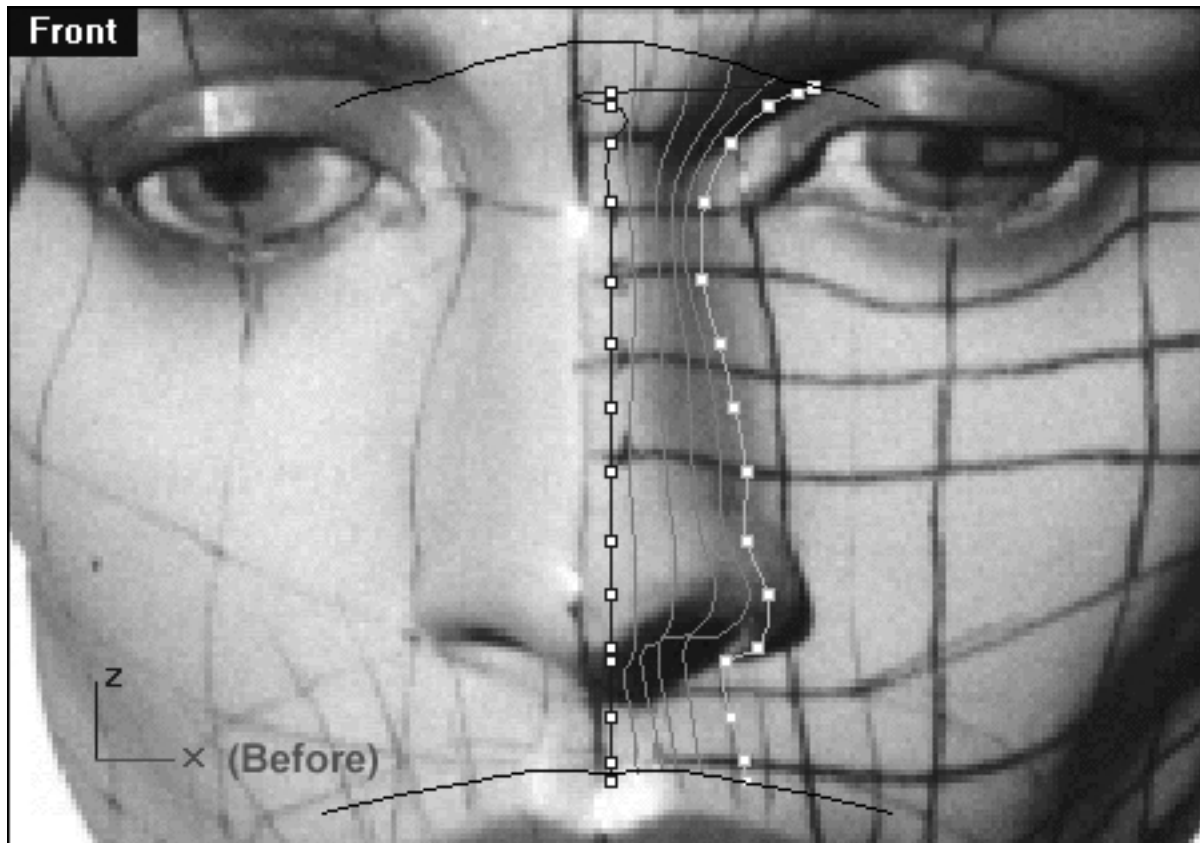
*This **Right Viewport** screenshot shows the completed 6th nose curve with the 16 points now in their correct locations (for this view only).*

---

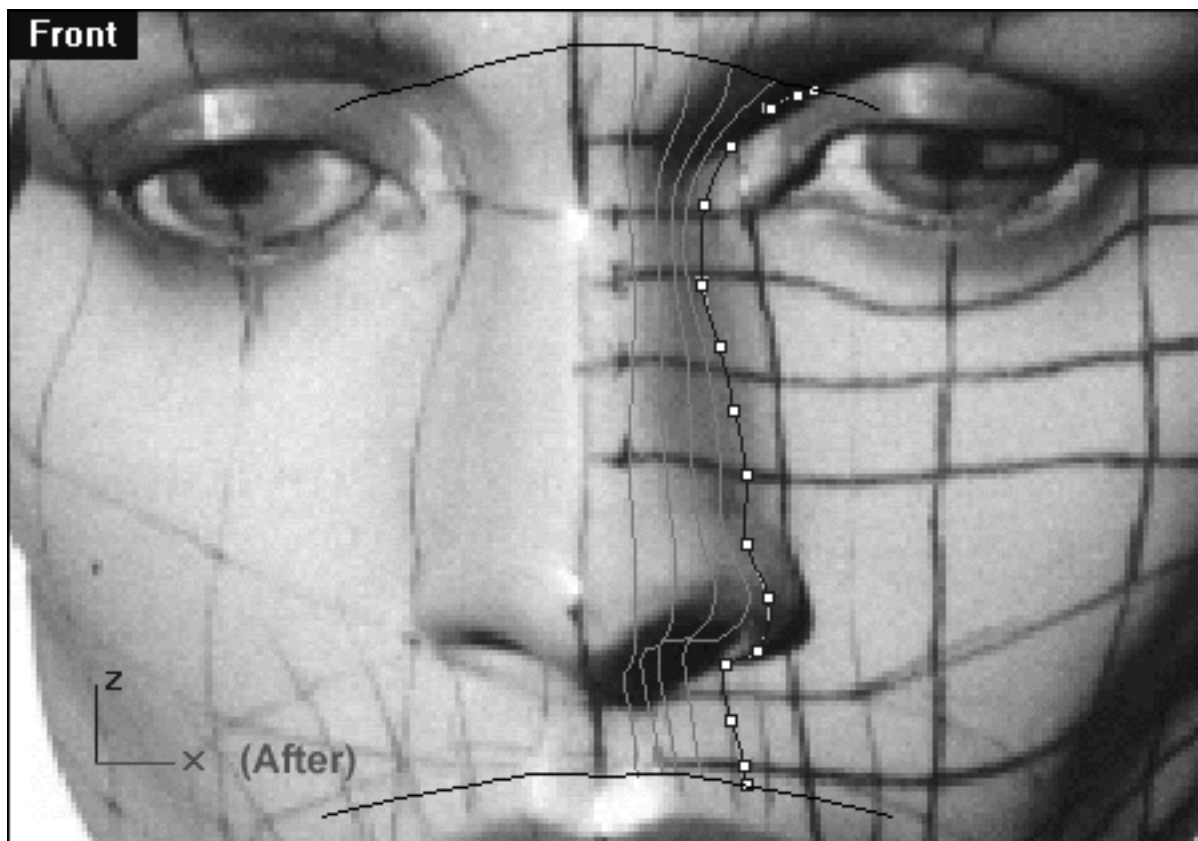
## Creating the 6th Nose Curve Front View

- Open the Edit Layers dialogue, turn off the layer entitled: Noze\_Profile the press OK to complete the operation.
- Maximise the Front Viewport.

- Start by selecting the 1st edit point on the rebuilt 6th nose curve, then whilst holding down the Shift key move it along the X axis until it is in alignment with the 1st point on the guide curve -- see the screenshot below entitled: (Before).
- Once done, continue working downward along the curve repeating the procedure with the remaining 15 points -- see the screenshot below entitled (After).



*This **Front Viewport** screenshot shows the 1st point on the interpolated curve (blue) has now been moved along the X axis and into alignment with the 1st point on the guide curve (cyan).*



This **Front Viewport** screenshot shows the now completed 6th nose curve (the locked 2nd, 3rd, 4th & 5th curves are also displayed).

## Shutting Down the Scene

If you plan on continuing immediately to the next section then you can skip this procedure, however, we do recommend that you save your scene now anyway.

In the event that you wish to take a break and continue working later, than please perform the following procedure:

- Save the file.
- Unhide any objects that may no longer be visible. Type the command: Show at the command line and press Enter.
- Unlock any currently locked curves by typing the command: Unlock at the command line and pressing Enter.
- Turn off any edit points that may currently be displayed.
- Open the Edit Layers dialogue box and...
- Turn ON the layer entitled: SCENE START UP and make it the active layer.

- Turn ON the layer entitled: Photopoints.
  - Turn OFF the layer entitled: Noze\_H\_guides.
  - Turn OFF the layer entitled: Noze.
  - Turn OFF the layer entitled: Noze Curve 6 GUIDE.
  - With the exception of those mentioned, all other layers should be set to OFF.
  - Press OK to complete the operation and exit.
  - Perform a ZoomExtentsAll.
  - SAVE THE FILE.
- 

Go to the [NEXT PART](#)

RETURN to the Top of page -- [Click Here](#)

Written by Joseph R. Saltzman.

Co-produced in association with Steven Ståhlberg

©1998-1999 Cinemagic Productions Limited. All Rights Reserved.

Duplication of this document including images and text by any means is expressly forbidden without prior written consent of Cinemagic Productions Limited.

Web Site: <http://www.cmagic.co.uk> Telephone: +44 (0)1753 733 190 Fax: +44 (0)1753 736 619 email: [cmagic@cmagic.co.uk](mailto:cmagic@cmagic.co.uk)

qat300699

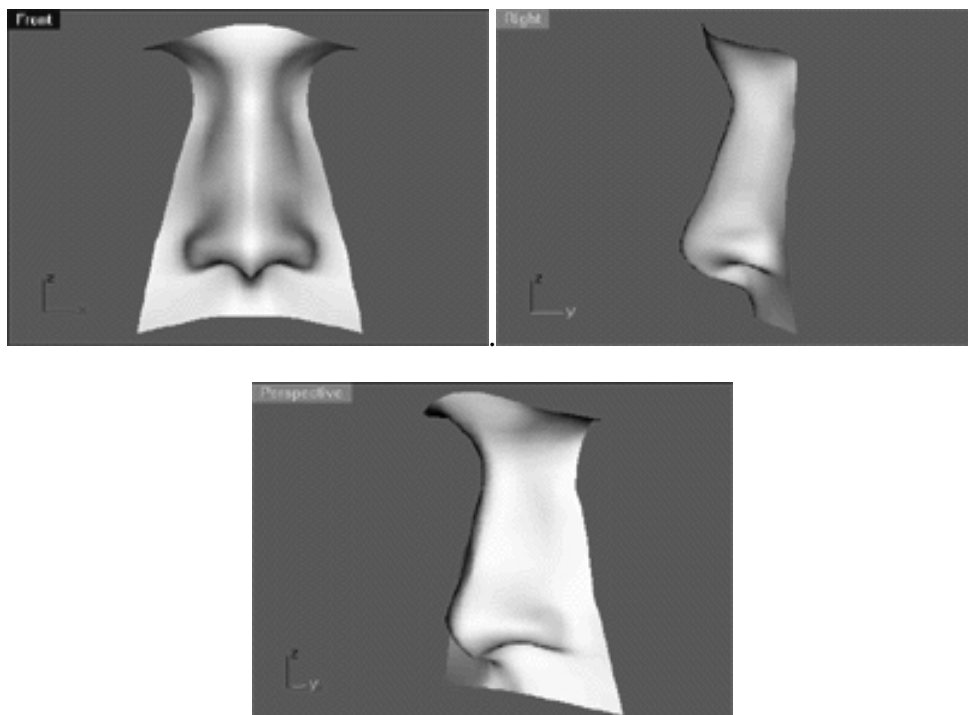
**RETURN** to previous page -- [Click Here](#)

**GOTO** the [NEXT LESSON](#)



## CREATING THE NOSE PART FOUR

*(curves 7 and 8)*



---

### Contents:

- [Scene Setup](#)
  - [Creating the 7th Nose Curve, Right View](#)
  - [Creating the 7th Nose Curve, Front View](#)
  - [Creating the 8th Nose Curve, Right View](#)
  - [Creating the 8th Nose Curve, Front View](#)
  - [The Test Loft](#)
  - [Shutting Down the Scene](#)
-

# Scene Setup



- If you've not done so already start a Rhinoceros session by **double clicking** on the desktop icon  the application will begin.
- Choose File, Open from the menu bar and double click on **START\_A.3DM** in the file list, it will load and open.
- Confirm at the Lower Status Bar the currently active layer is entitled SCENE START UP. If it is active proceed to the next step, if it's not then make it active by left clicking on the layer box, highlighting the correct layer and clicking on it.
- Again, at the Layers Box on the Lower Status Bar this time right click on the box, the Edit Layers Dialogue box will open. Confirm the following switches have been enabled or disabled:
  - The Layer entitled: SCENE START UP should be ON.
  - The Layer entitled: Noze\_H\_Guides should be ON.
  - The Layer entitled: Noze should be ON and set to the ACTIVE LAYER.
  - The Layer entitled: Photopoints should be OFF.
  - All other layers should be set to OFF.
  - When you've finished making your changes ( if any ) click on OK.
  - Confirm that the grid display in the viewports has been disabled, if not turn it off now.
  - Confirm that no Osnaps are currently enabled, if any are disable them.
  - Confirm that no edit points are currently displayed, if any are hide them.
- Zoom out all the viewports by selecting the Zoom Extents/Zoom Extents All Views icon  or by typing **ZoomExtentsAll** at the command line and pressing ENTER.

---


## Creating the 7th Nose Curve Right View

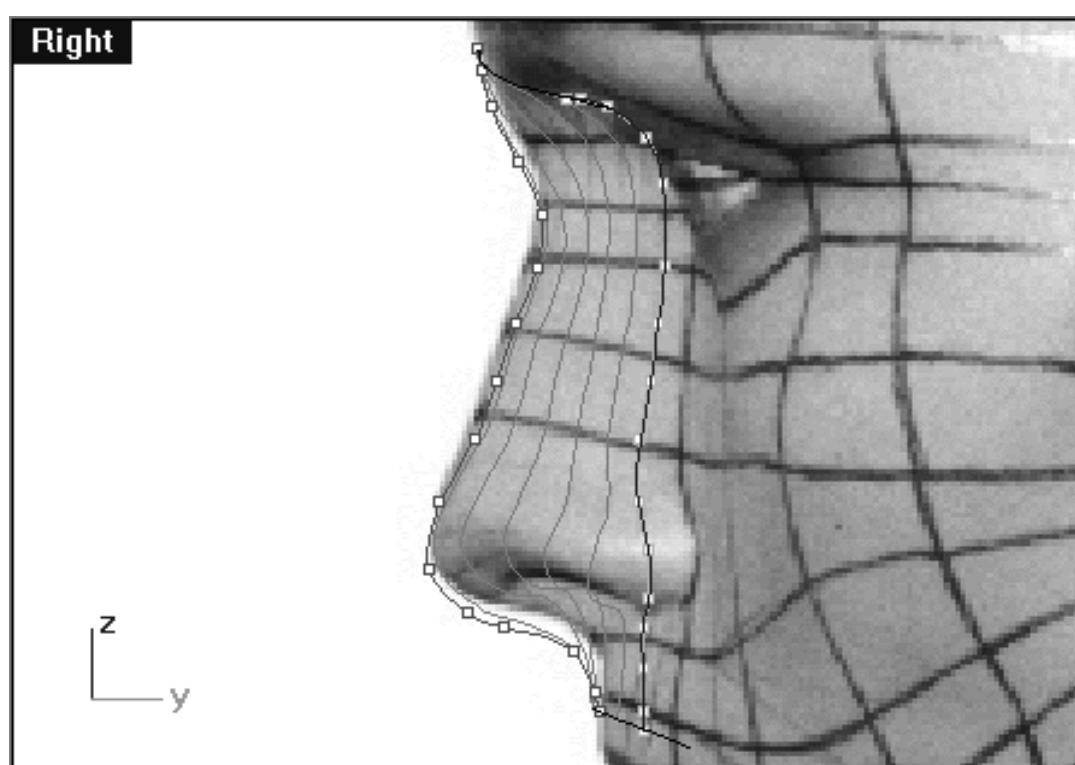
- Maximize the Right Viewport.
- Turn off any currently displayed edit points.
- Open the Edit Layers dialogue, Turn ON the layer entitled: Nose Curve 7 GUIDE and Noze\_Profile, press OK to complete the operation.



- Select the 6th, 5th, 4th, 3rd and 2nd nose curves and temporarily LOCK them -- type lock at the command line and press Enter.
- Select the Noze\_Profile curve and the Nose Curve 7 GUIDE and display their edit points.
- Once again, open the Edit Layers dialogue, LOCK the layer entitled: Nose Curve 7 GUIDE and Noze\_Profile, press OK to complete the operation.

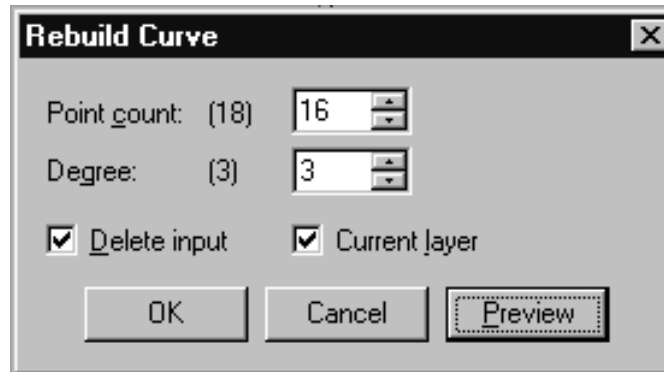
We can now begin to draw the 7th nose curve. The 7th nose curve will maintain about the same general distance from that of the curves previously created, once again running to the inside along the Y axis. As with the previous curve, the 7th curve is especially crucial because it defines the nostril and perhaps the largest bit of the flare area, so again, pay particular attention here. Expect that most of the edit points on the 7th curve should be placed fairly parallel with the those of their sister points on the profile, with a few exceptions. The 1st point (at the brow bone) will again need to be placed even lower and behind the profile curve along the Y axis, additionally point 2 is nearly parallel with the first point placed however it back along the Y axis a fair amount. Once again, things will start to even out by about point 6. Remember that the first five or so points really are defining the inner corner of the eye socket and continues to account for the increasingly downward slope in this view. Points 10 through 13 are important because that's the nostril and flare area, so exercise caution in that area and think about what you are doing -- point 11 is one to watch. Both points 15 and 16 should be placed slightly lower and at an angle behind the profile curve.

- From the toolbar choose the create Curve, Interpolate Points icon  or type: **InterpCrv** at the command line and press Enter.
- Again, we will start drawing an interpolated curve beginning at the brow bone and work our way downward toward the upper lip along the Z axis, using **only 16 points**! Start to draw the 7th curve by placing your 1st point directly on top of that of the 1st point on the Noze Curve 7 GUIDE. Continue this procedure with all of the 15 remaining points -- when you've placed the last point press Enter to complete the operation. Once done, your monitor should resemble the screenshot below:



This **Right Viewport** screenshot shows the Noze\_Profile curve (in red) and the Noze Curve 7 GUIDE (in cyan) and the interpolated curve we just drew directly on top of it.

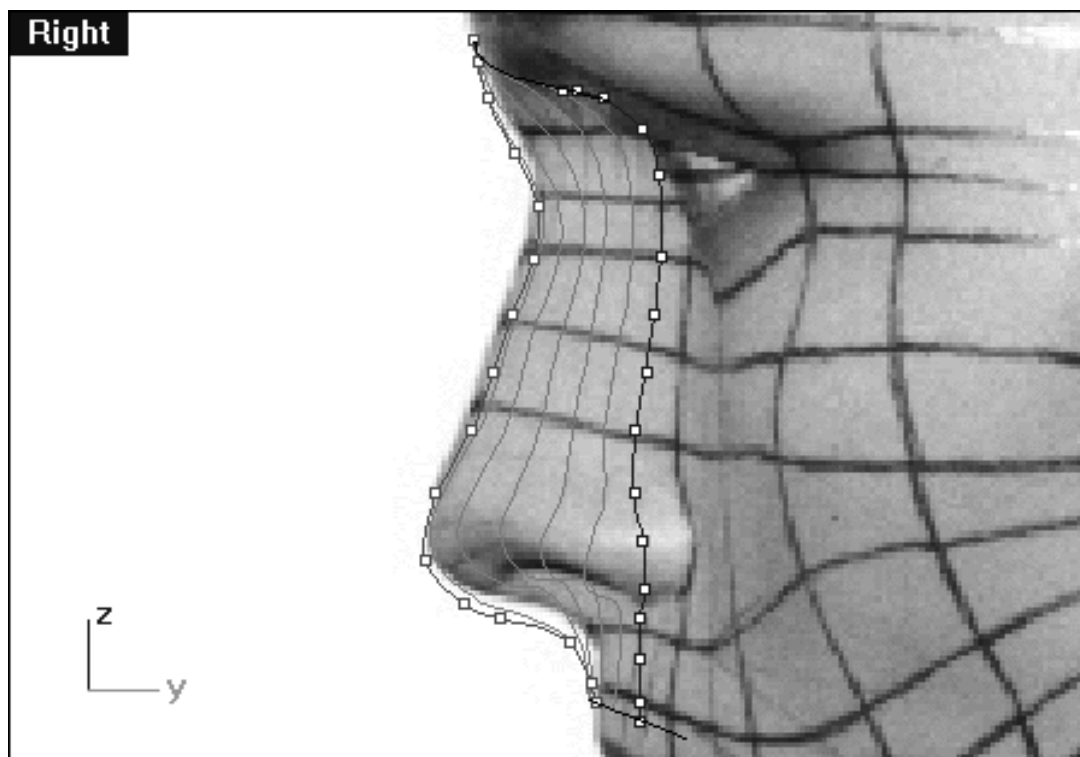
- The curve will now have to be rebuilt. Select the curve -- it will highlight, then at the command line type: Rebuild and press Enter.
- The Rebuild Curve dialogue box will appear -- enter the same values as in the screenshot below, then press OK to complete.



*This screenshot shows the Rebuild Curve dialogue box*

The 7th curve will now have been rebuilt. Once again, due to the automatic rebuilding process the point placement will have changed, thus requiring further refinement of the all the points.

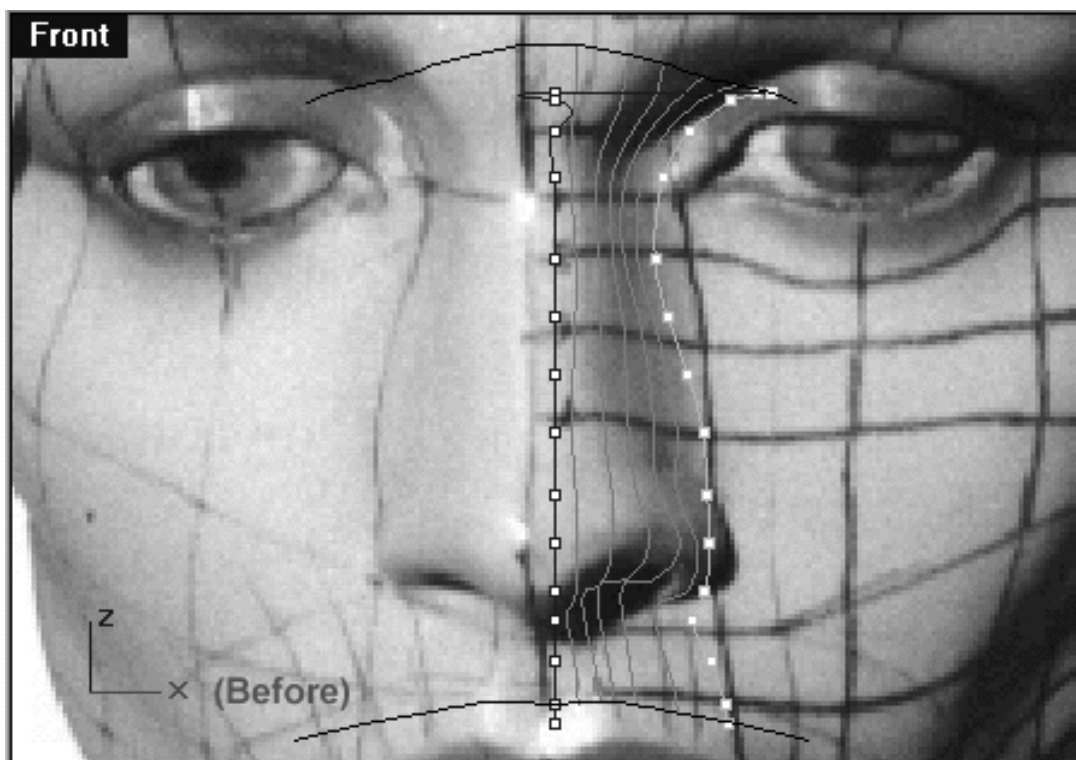
- Select the rebuilt 7th curve -- it will highlight, then display its edit points.
- Starting with the 1st point, move each point on the rebuilt interpolated curve so that it is in alignment with points on the guide curve -- zooming the view as required.
- Repeat the process with all the remaining points. Once done, your monitor should resemble the screenshot below:



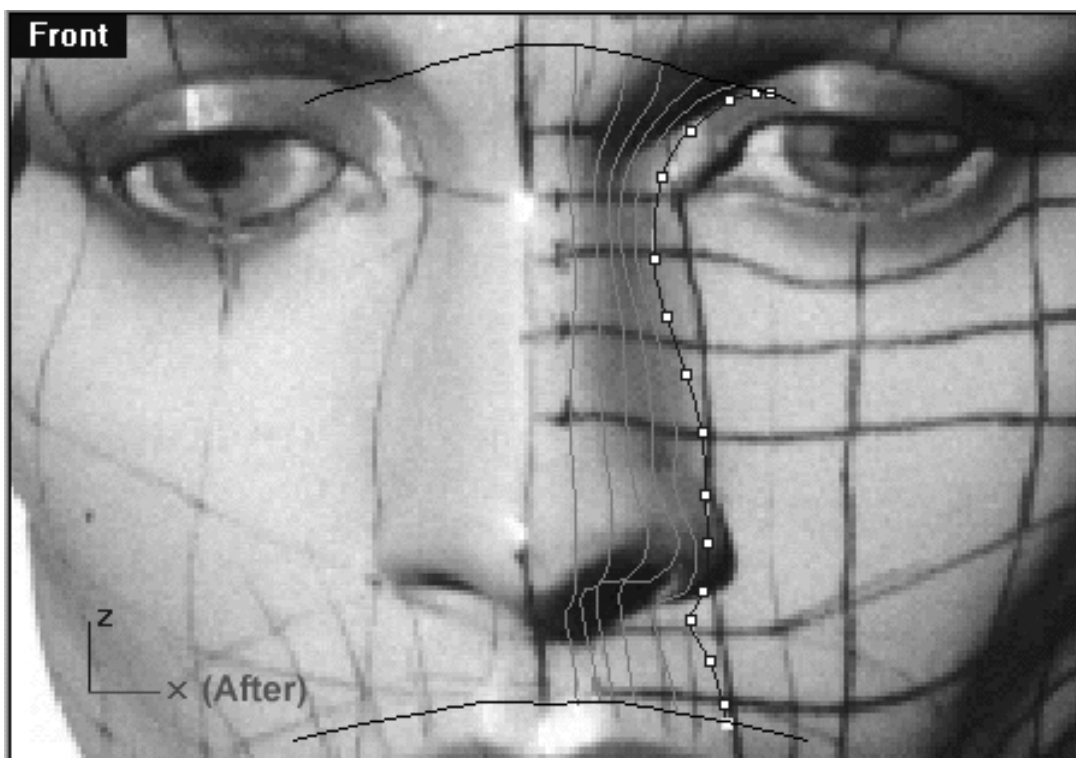
This **Right Viewport** screenshot shows the completed 7th nose curve with the 16 points now in their correct locations (for this view only).

## Creating the 7th Nose Curve Front View

- Open the Edit Layers dialogue, turn off the layer entitled: Noze\_Profile the press OK to complete the operation.
- Maximize the Front Viewport.
- Start by selecting the 1st edit point on the rebuilt 7th nose curve, ( Tip -- select the point in right view, then switch back to the front view) then whilst holding down the Shift key move it along the X axis until it is in alignment with the 1st point on the guide curve -- see the screenshot below entitled: (Before).
- Once done, continue working downward along the curve repeating the procedure with the remaining 15 points -- see the screenshot below entitled (After).



This **Front Viewport** screenshot shows the 1st point on the interpolated curve (blue) has now been moved along the X axis and into alignment with the 1st point on the guide curve (cyan).




This **Front Viewport** screenshot shows the now completed 7th nose curve (the locked 2nd, 3rd, 4th, 5th & 6th curves are also displayed).

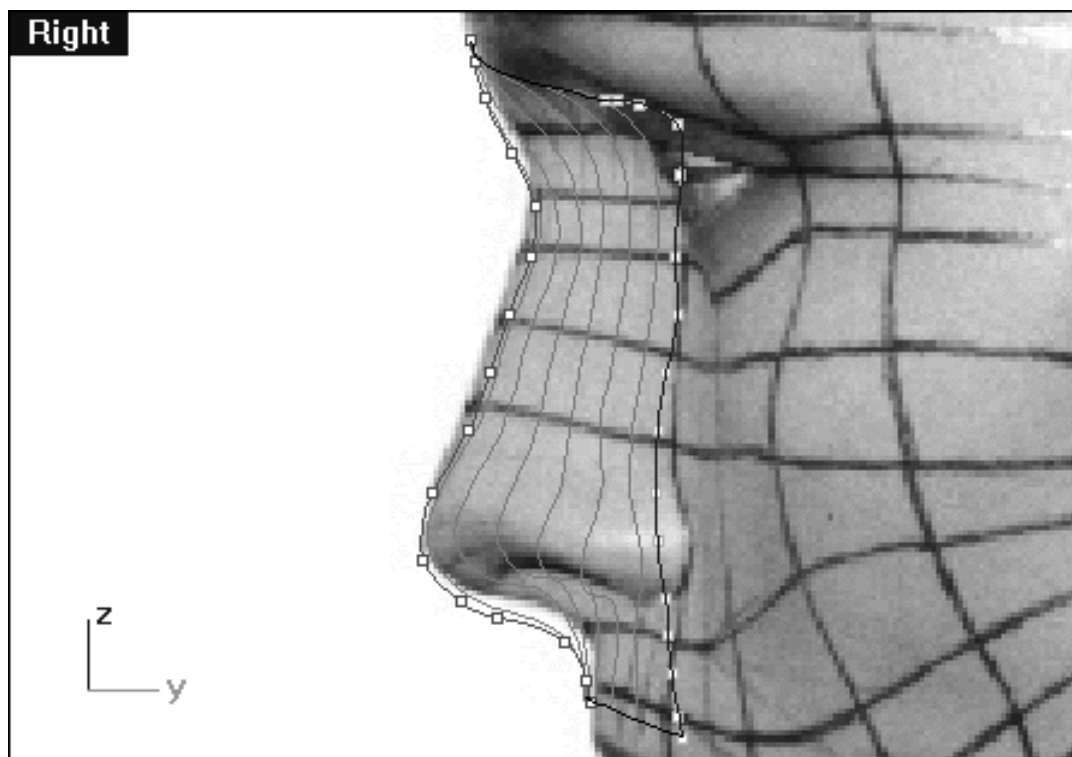
# Creating the 8th Nose Curve

## Right View

- Maximize the Right Viewport.
- Turn off any currently displayed edit points.
- Open the Edit Layers dialogue, Turn off the layer entitled: Nose Curve 7 GUIDE, then Turn ON the layer entitled: Nose Curve 8 GUIDE and Noze\_Profile, press OK to complete the operation.
- Select the 7th nose curve and temporarily LOCK it -- type lock at the command line and press Enter.
- Select the Noze\_Profile curve and the Nose Curve 8 GUIDE and display their edit points.
- Once again, open the Edit Layers dialogue, LOCK the layer entitled: Nose Curve 8 GUIDE and Noze\_Profile, press OK to complete the operation.

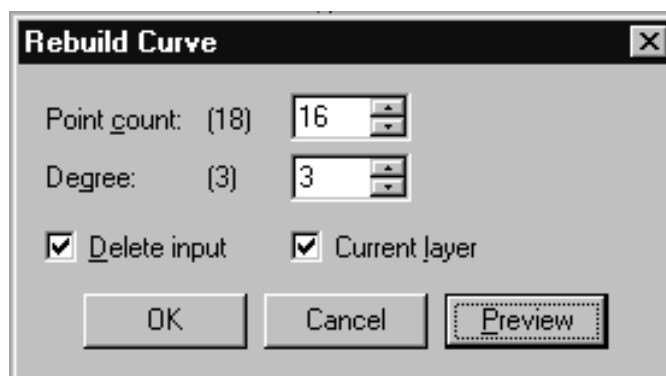
We can now begin to draw the 8th nose curve. The 8th nose curve will maintain about the same general distance from that of the curves previously created, once again running to the inside along the Y axis. As with the previous curve, the 8th curve is of key importance because it defines the nostril, the flare area and the side of nose where it meets with the face. Expect that most of the edit points on the 8th curve should be placed fairly parallel with the those of their sister points on the profile, with a few exceptions. The 1st point (at the brow bone) will again need to be placed even lower and behind the profile curve along the Y axis, additionally point 2 is slightly above the first point placed however it's located back along the Y axis. Once again, things will start to even out by about point 6. Remember that the first five or so points really are defining the very inner corner of the eye socket and continues to account for the increasingly downward and outward slope in this view. Points 10 through 13 are important because that's the nostril and flare area, so exercise caution in that area and think about what you are doing -- point 11 is one to watch. Both points 15 and 16 should be placed slightly lower and at an angle behind the profile curve.

- From the toolbar choose the create Curve, Interpolate Points icon  or type: **InterpCrv** at the command line and press Enter.
- Again, we will start drawing an interpolated curve beginning at the brow bone and work our way downward toward the upper lip along the Z axis, using **only 16** points! Start to draw the 8th curve by placing your 1st point directly on top of that of the 1st point on the Noze Curve 8 GUIDE. Continue this procedure with all of the 15 remaining points -- when you've placed the last point press Enter to complete the operation. Once done, your monitor should resemble the screenshot below:



This **Right Viewport** screenshot shows the *Noze\_Profile* curve (in red) and the *Noze Curve 8 GUIDE* (in cyan) and the interpolated curve we just drew directly on top of it.

- The curve will now have to be rebuilt. Select the curve -- it will highlight, then at the command line type: Rebuild and press Enter.
- The Rebuild Curve dialogue box will appear -- enter the same values as in the screenshot below, then press OK to complete.

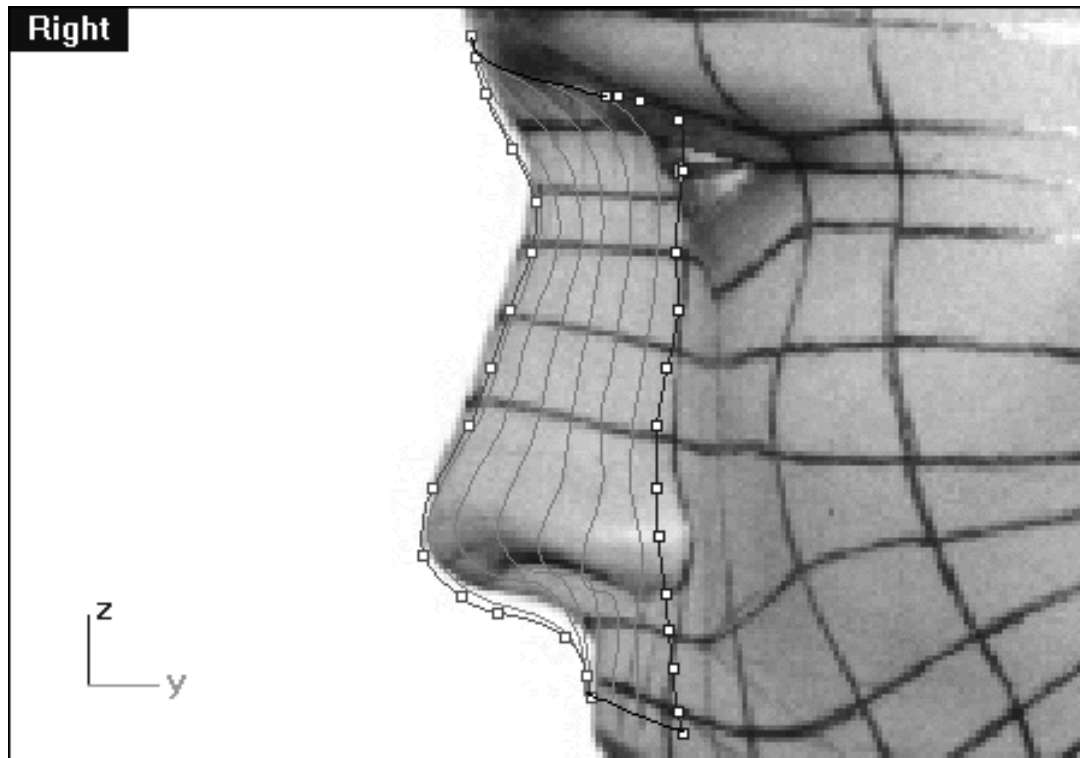


*This screenshot shows the Rebuild Curve dialogue box*

The 8th curve will now have been rebuilt. Once again, due to the automatic rebuilding process the point placement will have changed, thus requiring further refinement of the all the points.

- Select the rebuilt 8th curve -- it will highlight, then display its edit points.
- Starting with the 1st point, move each point on the rebuilt interpolated curve so that it is in alignment with points on the guide curve -- zooming the view as required.
- Repeat the process with all the remaining points. Once done, your monitor should resemble the screenshot below:

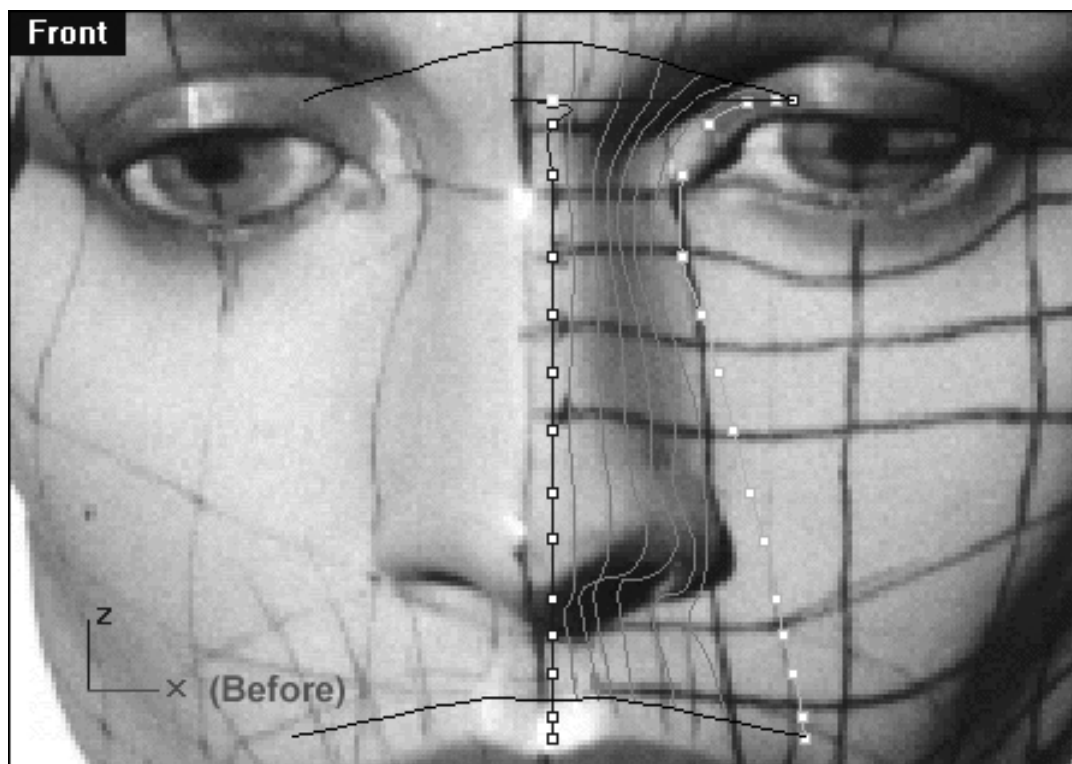




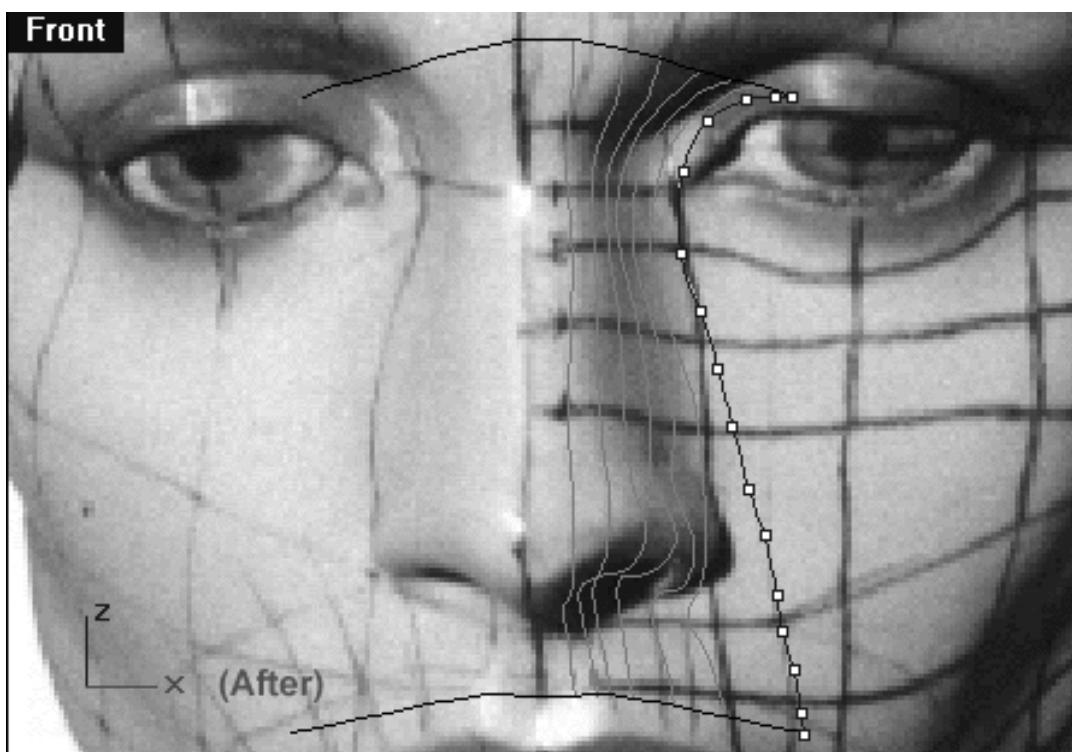
This **Right Viewport** screenshot shows the completed 8th nose curve with the 16 points now in their correct locations (for this view only).

## Creating the 8th Nose Curve Front View

- Open the Edit Layers dialogue, turn off the layer entitled: Noze\_Profile the press OK to complete the operation.
- Maximize the Front Viewport.
- Start by selecting the 1st edit point on the rebuilt 8th nose curve, ( Tip -- select the point in right view, then switch back to the front view) then whilst holding down the Shift key move it along the X axis until it is in alignment with the 1st point on the guide curve -- see the screenshot below entitled: (Before).
- Once done, continue working downward along the curve repeating the procedure with the remaining 15 points -- see the screenshot below entitled (After).



This **Front Viewport** screenshot shows the 1st point on the interpolated curve (blue) has now been moved along the X axis and into alignment with the 1st point on the guide curve (cyan).



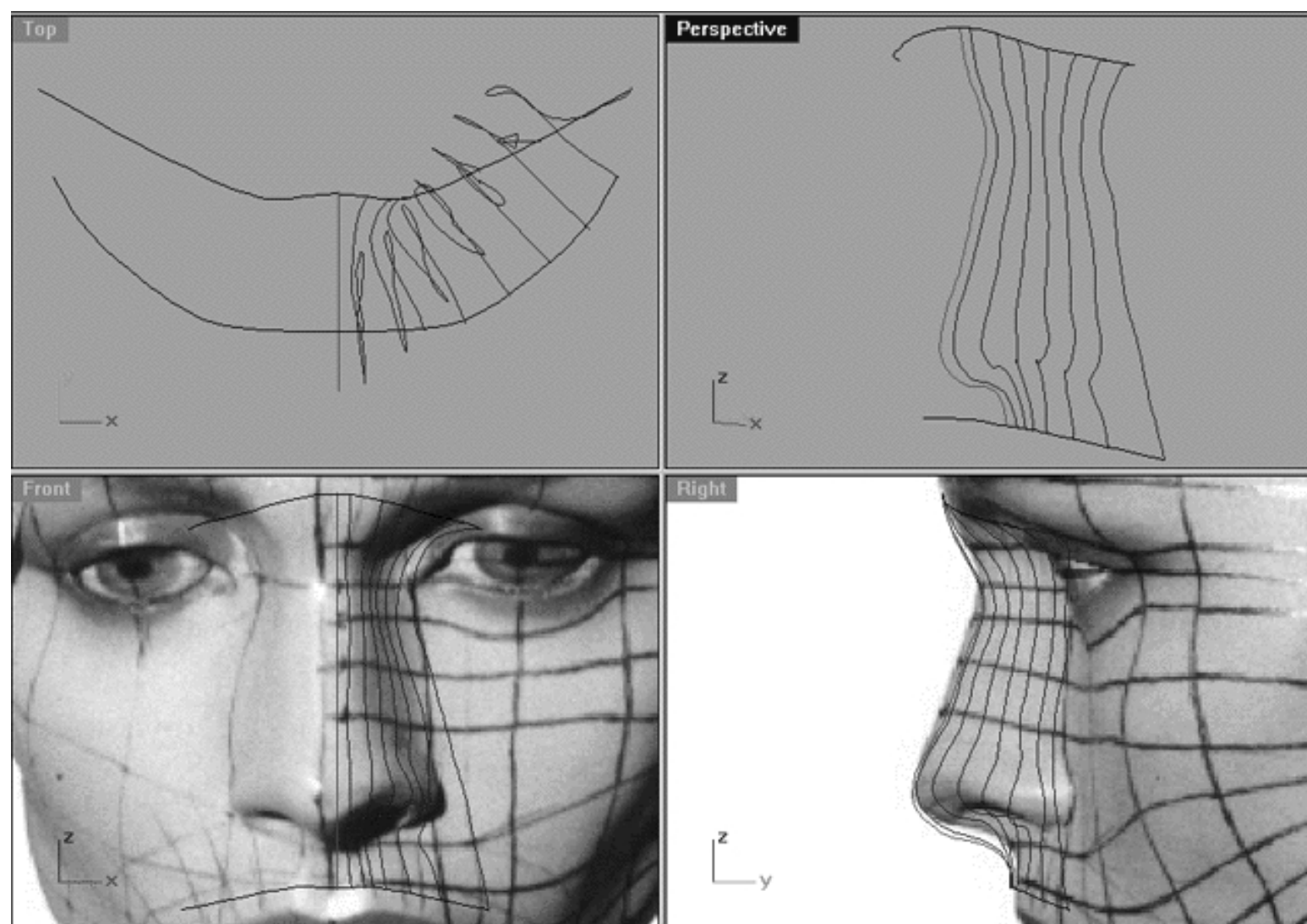
This **Front Viewport** screenshot shows the now completed 8th nose curve (the locked 2nd, 3rd, 4th, 5th, 6th & 7th curves are also displayed).




# The Test Loft

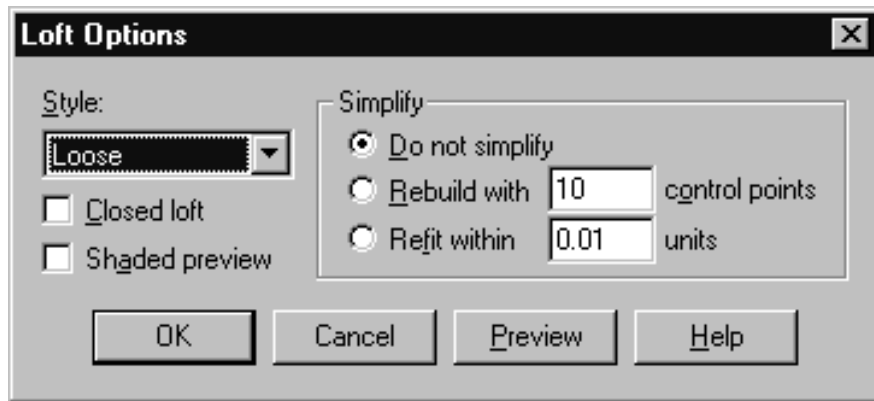
Now that we've completed constructing all 8 curves, this would be a great time to perform a test loft.

- Make All Viewports visible.
- Turn off any edit points that may be currently displayed.
- Open the Edit Layers dialogue, locate the layer entitled: Noze\_Profile and turn it ON. Next, create a new layer entitled: Noze\_Surface, assign its colour to black.
- Turn OFF the layer entitled: Noze Curve 8 Guide.
- Make Noze\_Surface the currently active layer.
- Press OK to exit the Edit Layers Dialogue box.
- At the command line type: Unlock and press Enter -- your monitor should now resemble the screenshot below:



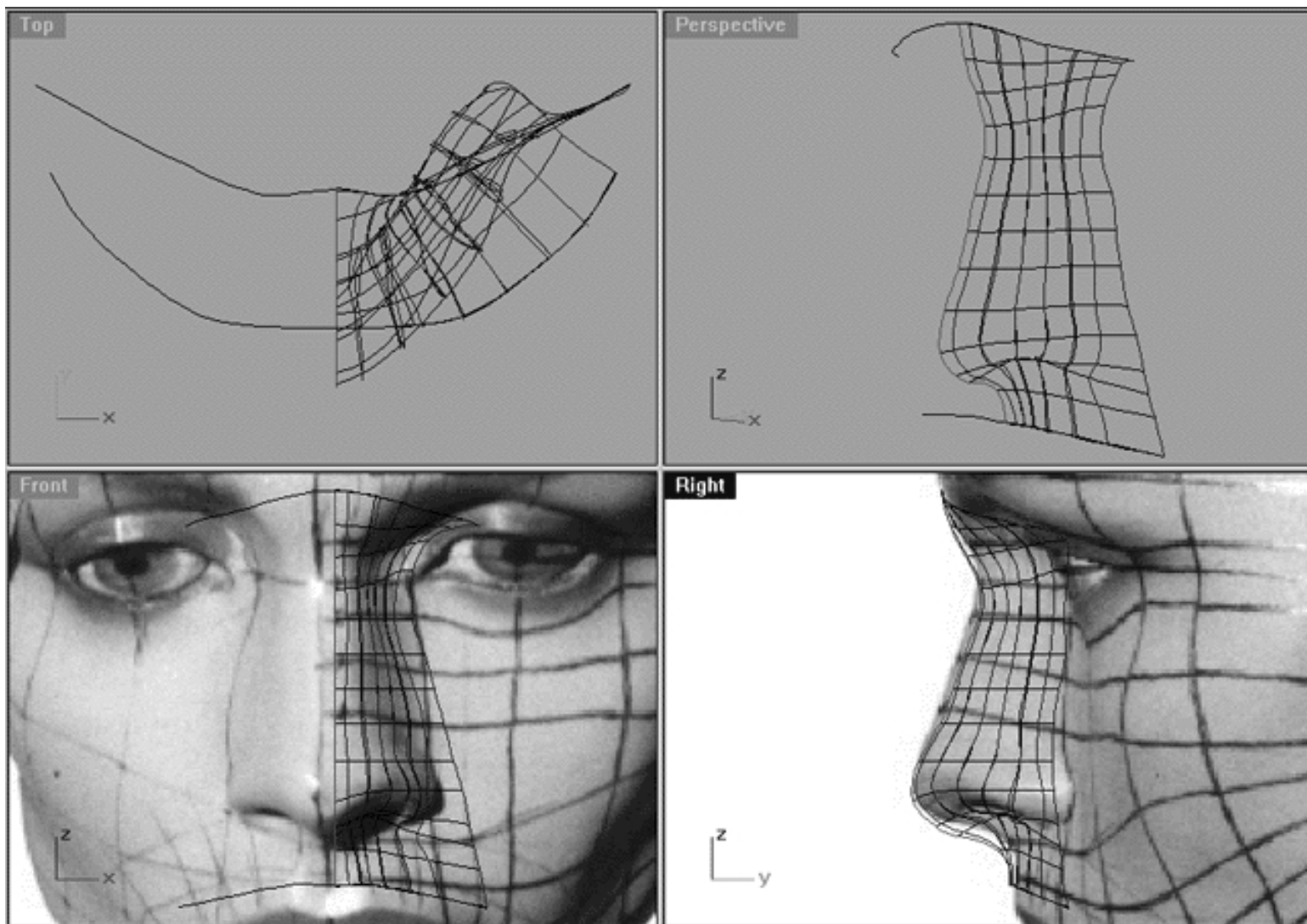
This **All Viewport** screenshot shows all 8 curves now ready for lofting.

- From the toolbar choose the Loft icon  and then in the Front Viewport begin by selecting the profile curve near its base -- it will highlight.
- Continue selecting each curve incrementally (i.e. 2 through 8) -- each curve will highlight as you do, once done, press Enter.
- The Loft Options dialogue will appear. Set the values as in the screenshot below, then press OK to complete the operation.

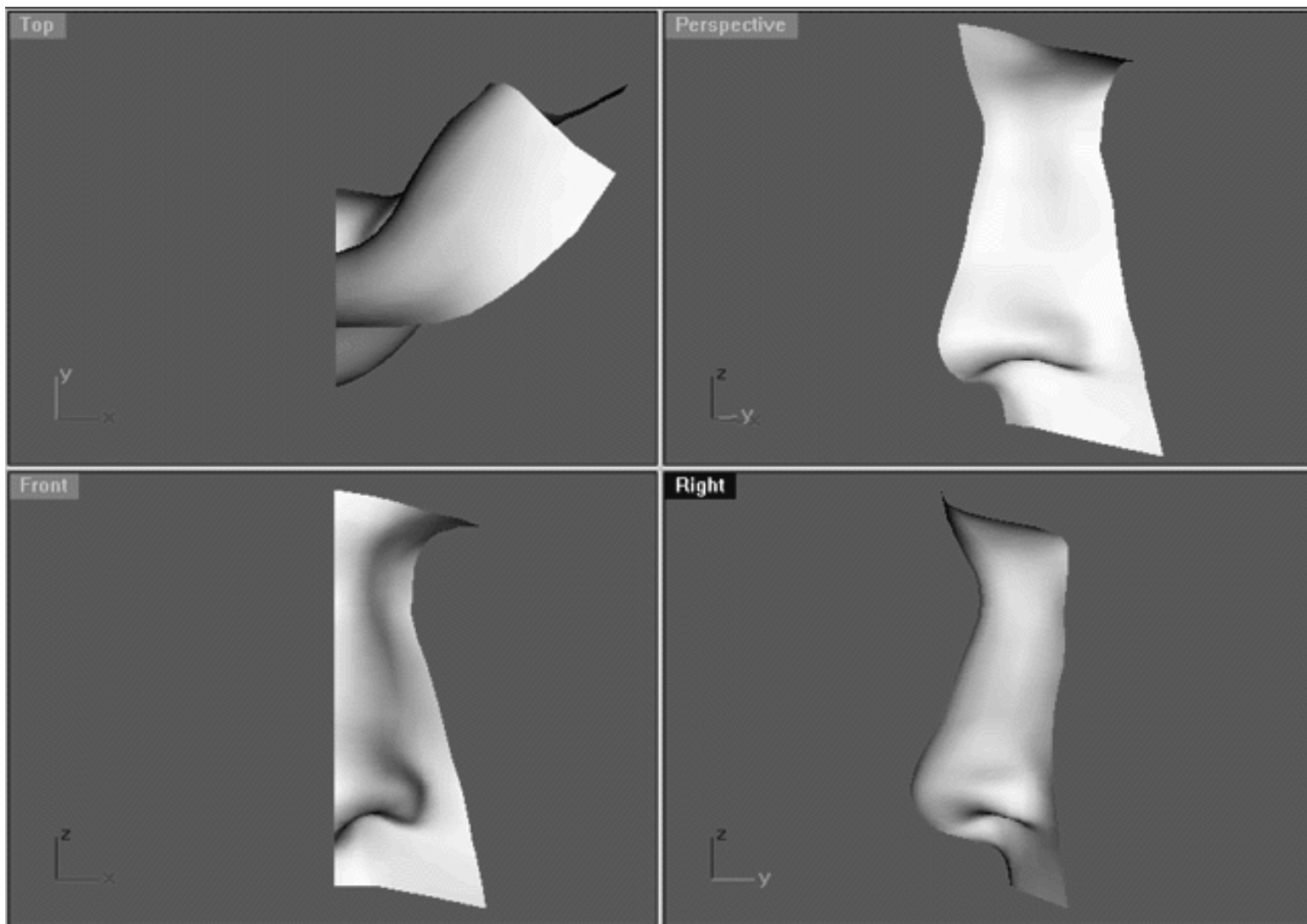


*This screenshot shows the Loft Options dialogue box.*

- Once done a new surface should appear -- your monitor should then resemble the screenshot below:



This **All Viewport** screenshot shows the surface produced by "loose" lofting the 8 nose curves.



This *All Viewport* screenshot shows a quick render of the surface -- looks great..!

---

## Shutting Down the Scene

If you plan on continuing immediately to the next section then you can skip this procedure, however, we do recommend that you save your scene now anyway.

In the event that you wish to take a break and continue working later, than please perform the following procedure:

- Save the file.
- Unhide any objects that may no longer be visible. Type the command: Show at the command line and press Enter.
- Unlock any currently locked curves by typing the command: Unlock at the command line and pressing Enter.
- Turn off any edit points that may currently be displayed.
- Open the Edit Layers dialogue box and...

- Turn ON the layer entitled: SCENE START UP and make it the active layer.
- Turn ON the layer entitled: Photopoints.
- Turn OFF the layer entitled: Noze\_H\_guides.
- Turn OFF the layer entitled: Noze.
- Turn OFF the layer entitled: Noze\_Profile.
- Turn OFF the layer entitled: Noze\_Surface.
- With the exception of those mentioned, all other layers should be set to OFF.
- Press OK to complete the operation and exit.
- Perform a ZoomExtentsAll.
- SAVE THE FILE.

---

Go to the [NEXT PART](#)

RETURN to the Top of page -- [Click Here](#)

Written by Joseph R. Saltzman.

Co-produced in association with Steven Ståhlberg

©1998-1999 Cinemagic Productions Limited. All Rights Reserved.

Duplication of this document including images and text by any means is expressly forbidden without prior written consent of Cinemagic Productions Limited.

Web Site: <http://www.cmagic.co.uk> Telephone: +44 (0)1753 733 190 Fax: +44 (0)1753 736 619 email: [cmagic@cmagic.co.uk](mailto:cmagic@cmagic.co.uk)

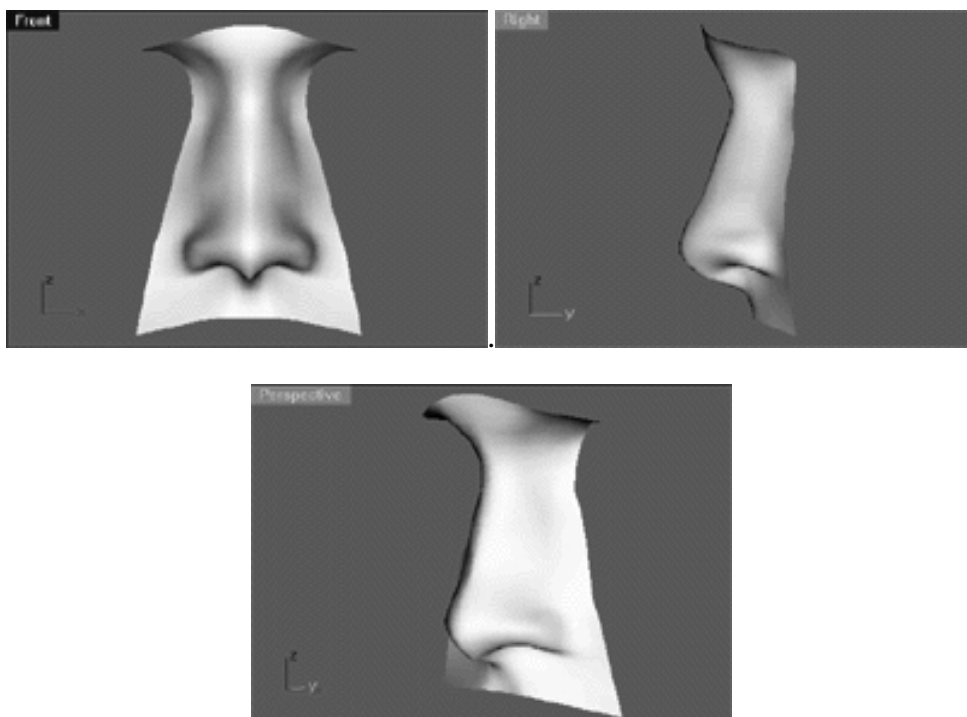
qat300699

**RETURN** to previous page -- [Click Here](#)

**GOTO** the NEXT LESSON



## CREATING THE NOSE PART FIVE





---

### Contents:

- [Scene Setup](#)
  - [Mirror -- Mirror](#)
  - [The Full Loft](#)
  - [The Sweet Smell of Success](#)
  - [Shutting Down the Scene](#)
- 

## Scene Setup

- If you've not done so already start a Rhinoceros session by **double clicking** on the desktop icon  the application will begin.

- Choose File, Open from the menu bar and double click on **START\_A.3DM** in the file list, it will load and open.
- Confirm at the Lower Status Bar the currently active layer is entitled SCENE START UP. If it is active proceed to the next step, if it's not then make it active by left clicking on the layer box, highlighting the correct layer and clicking on it.
- Again, at the Layers Box on the Lower Status Bar this time right click on the box, the Edit Layers Dialogue box will open. Confirm the following switches have been enabled or disabled:
- The Layer entitled: SCENE START UP should be ON.
- The Layer entitled: Noze\_H\_Guides should be ON.
- The Layer entitled: Noze should be ON and set to the ACTIVE LAYER.
- The Layer entitled: Photopoints should be OFF.
- The Layer entitled: Noze\_Surface should be ON.
- The Layer entitled: Noze\_Profile should be ON.
- All other layers should be set to OFF.
- When you've finished making your changes ( if any ) click on OK.
- Confirm that the grid display in the viewports has been disabled, if not turn it off now.
- Confirm that no Osnaps are currently enabled, if any are disable them.
- Confirm that no edit points are currently displayed, if any are hide them.
- Zoom out all the viewports by selecting the Zoom Extents/Zoom Extents All Views icon  or by typing **ZoomExtentsAll** at the command line and pressing ENTER.

---

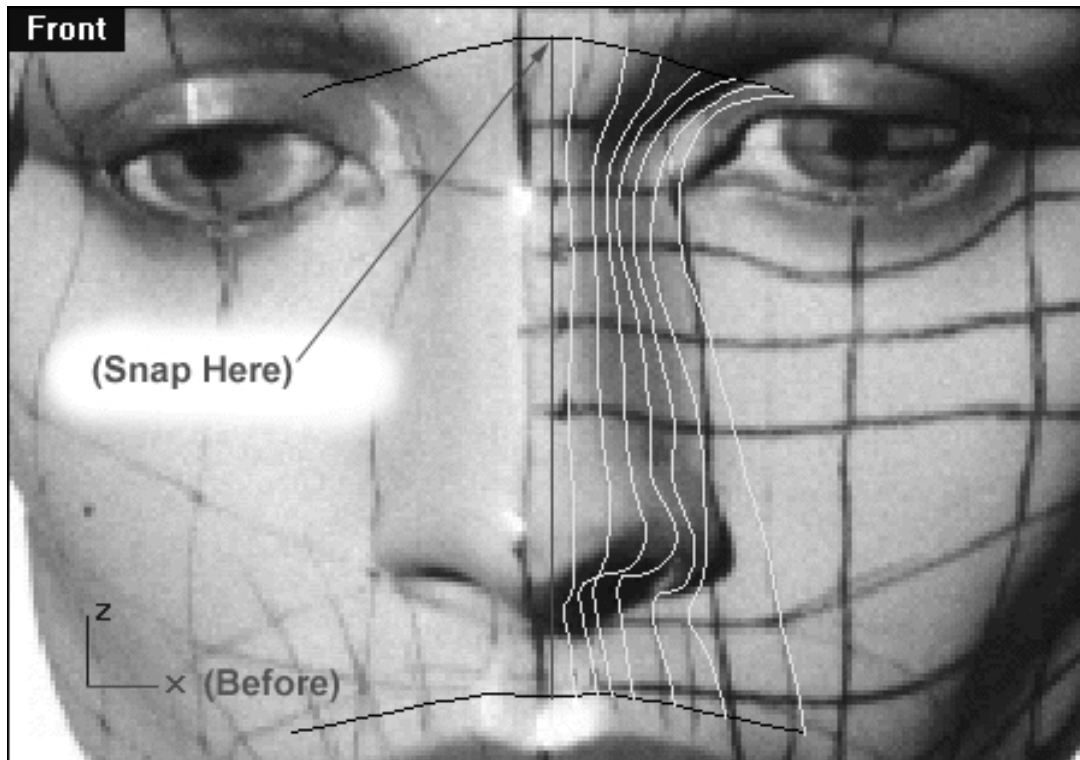
## Mirror -- Mirror

Now that we've seen the basic surface produced by lofting the 8 nose curves and it looks pretty good, we can now delete it in favour of creating a whole nose rather than just half. We will do this by simply mirroring the 8 curves that we've already created -- simple.

- Select the nose surface only (make sure you don't select any of the curves!) -- it will highlight, then press the delete key.



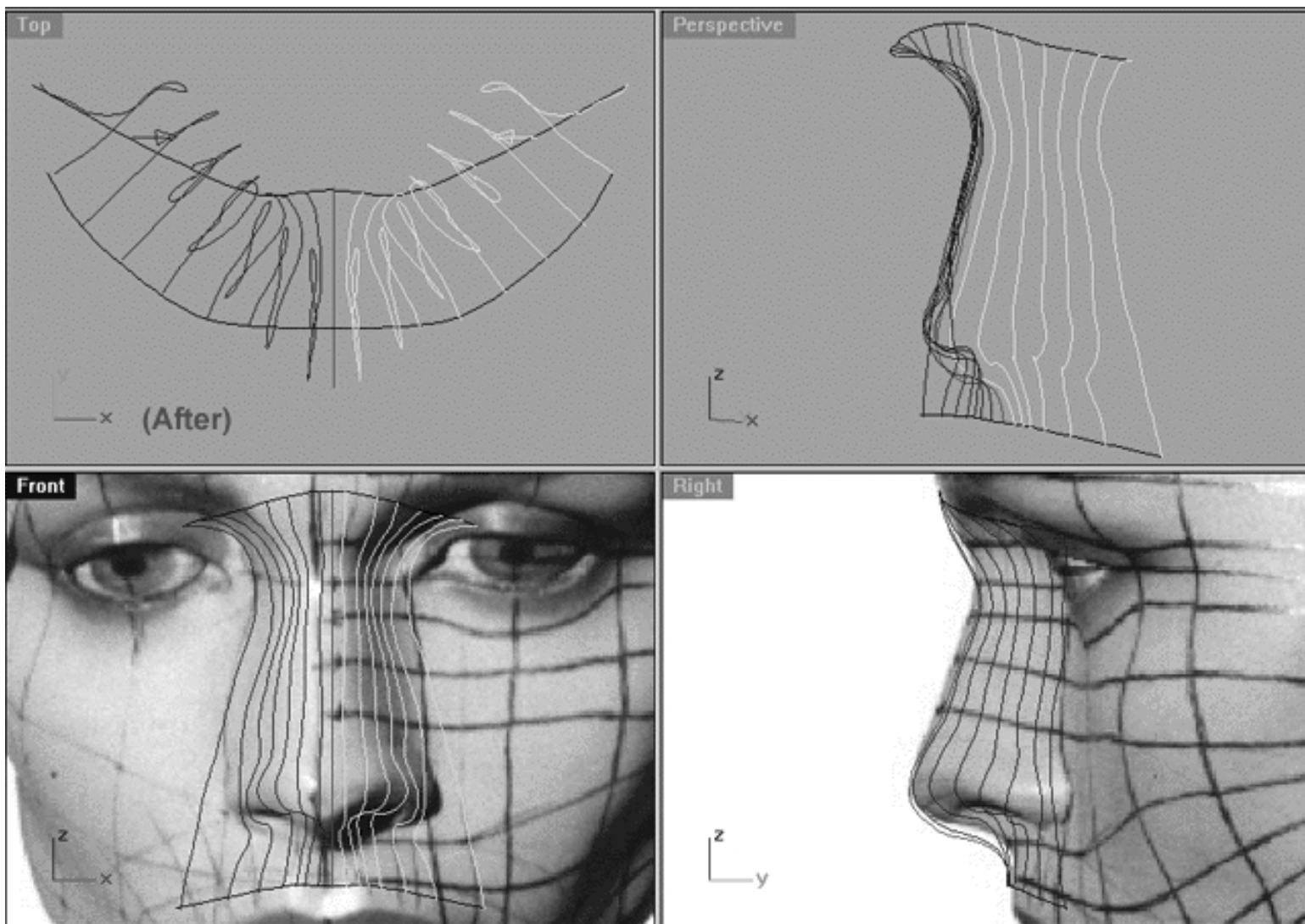
- Make the layer entitled: Noze currently ACTIVE.
- Next, whilst holding down the Ctrl key select the nose curves 2 through 8 only (don't select the profile curve).
- Activate Osnaps, End.
- From the toolbar choose the Mirror icon and snap to the end point at the top of the profile curve -- see the screenshot below.



*This **Front Viewport** screenshot shows that nose curves 2 - 8 have been selected. After choosing the mirror tool you should snap to the location indicated by the arrow.*

- Rotate the curves until they are aligned correctly (Tip -- when you get close hold down the Shift key, this make certain that the curves are aligned perfectly along the Z axis) then left click to complete the operation.
- Once done, your monitor should resemble the screenshot below:




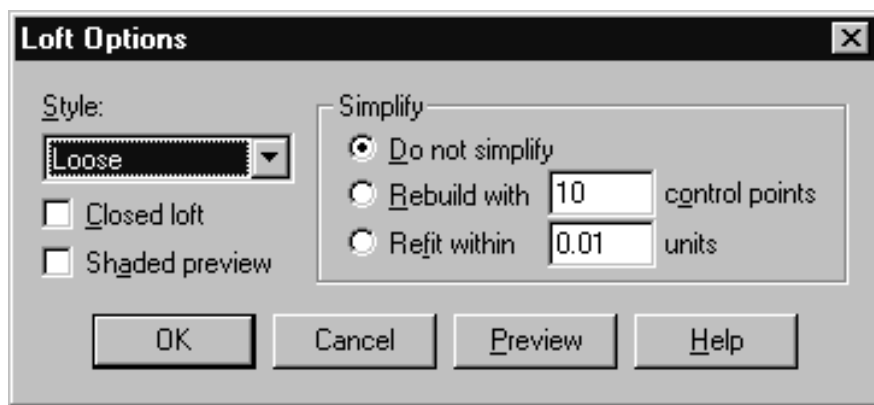


This **All Viewport** screenshot shows the result of mirroring. (The highlighted curves are the originals)

## The Full Loft

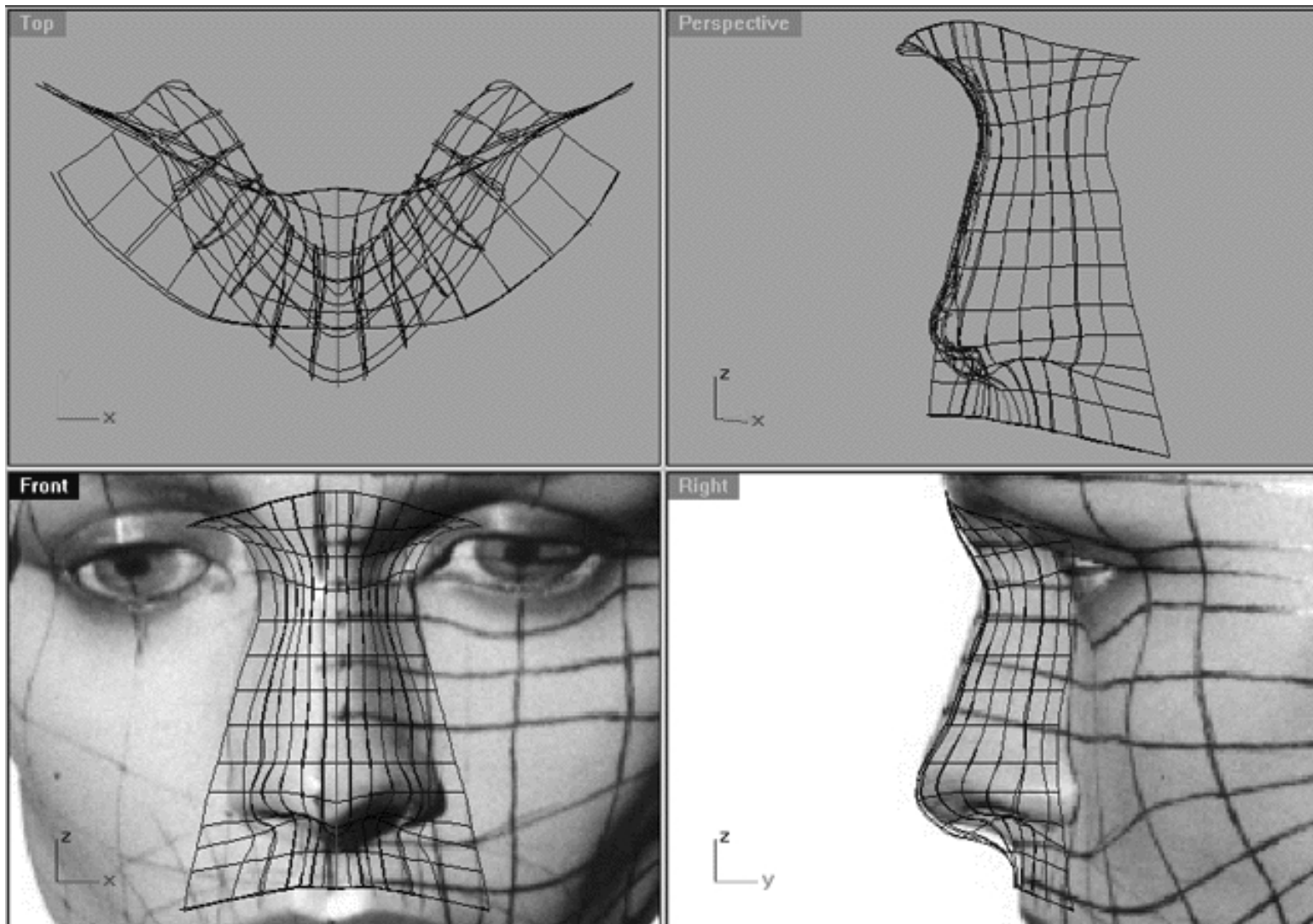
Now that we've got all the curves needed to produce an entire nose it's time to loft them up -- let's crack on.

- Make the layer entitled: Noze\_Surface currently ACTIVE.
- Make sure that none of the curves are currently selected (i.e. nothing should currently be highlighted).
- From the toolbar select the Loft icon  or type: Loft and the command line and press Enter.
- In the Front Viewport, start by selecting the left most curve near its base -- it will highlight. Next, working from left to right select all the remaining curves incrementally (again picking near the base of each curve). Once done, press Enter to complete the operation.
- The Loft Options dialogue will appear. Set the values as in the screenshot below, then press OK to complete the operation.

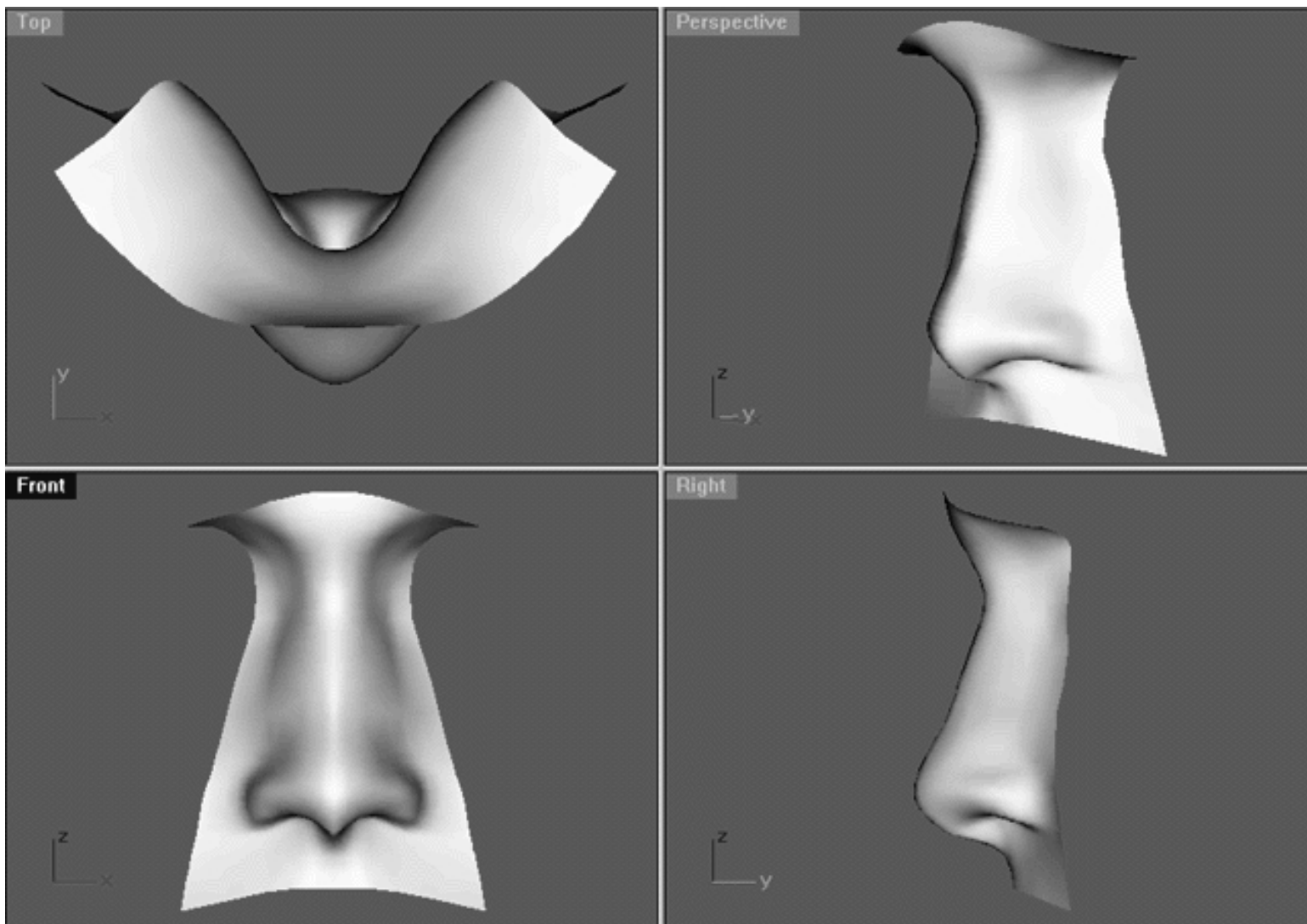


*This screenshot shows the Loft Options dialogue box*

- Once done a new surface should appear -- your monitor should then resemble the screenshot below:



*This **All Viewport** screenshot shows a wire frame view of the completed nose surface.*



This *All Viewport* screenshot shows the a quick render of the completed nose surface.

---

## The Sweet Smell of Success

Congratulations! The nose is now basically finished and wasn't nearly as difficult to construct as you might have first thought -- was it?

Of course, as always there is room for improvement and bit of further surface refinement would be a good idea provided the time permits. I'd suggest smoothing out the bridge of the nose and very tip a bit, also making both more rounded. The nostrils could use a bit more definition as well, but again, these are things you can always work on later. The main thing is that you've roughed in a really good shape and now have something worthwhile to work with.

---

## Shutting Down the Scene

- Save the file.
- Unhide any objects that may no longer be visible. Type the command: Show at the command line and press Enter.

- Unlock any currently locked curves by typing the command: Unlock at the command line and pressing Enter.
- Turn off any edit points that may currently be displayed.
- Confirm that no Osnaps are currently active, disable any that are.
- Left click on the Layer Info box at the Lower Status Bar, highlight the layer entitled SCENE START UP and click on it -- it should now become the active layer and its name should appear in the box.
- Open the Edit Layers Dialogue box and confirm that Layer(s): Noze\_Surface, Noze, Noze Curve 2 GUIDE through Noze Curve 8 GUIDE, Noze\_Profile, Noze\_H\_Guides are all set to OFF.
- Confirm that the layer entitled: Photopoints is ON.
- Press OK to complete the operation and exit.
- At this point only the background images in the Front and Right Viewports should be visible, no other geometry should be displayed.
- Perform a ZoomExtentsAll.
- SAVE THE FILE.

---

RETURN to the Top of page -- [Click Here](#)

Go back to the beginning of this section [Chapter 32](#)

**GOTO** the NEXT LESSON

Written by Joseph R. Saltzman.

Co-produced in association with Steven Ståhlberg  
©1998-1999 Cinemagic Productions Limited. All Rights Reserved.

Duplication of this document including images and text by any means is expressly forbidden without prior written consent of Cinemagic Productions Limited.  
Web Site: <http://www.cmagic.co.uk> Telephone: +44 (0)1753 733 190 Fax: +44 (0)1753 736 619 email: [cmagic@cmagic.co.uk](mailto:cmagic@cmagic.co.uk)

qat300699

**RETURN** to previous page -- [Click Here](#)

**GOTO** the NEXT LESSON



## SCULPTING THE FORM

*(part one of two)*



---

Skip to Part Two of this lesson -- [Click Here](#)

### Contents:

- [Scene Setup](#)
- [Art Takes Over](#)
- [Before & After, First Curve, Right View](#)
- [First Curve, Front View](#)
- [First Curve, Top View](#)
- [Second Curve, Right View](#)
- [Second Curve, Front View](#)
- [Second Curve, Top View](#)
- [Third Curve, Right View](#)
- [Third Curve, Front View](#)
- [Third Curve, Top View](#)
- [Shifting the Pole](#)
- [Scaling the Pole](#)
- [The Pole, A View From the Top](#)
- [A Comparison of Changes](#)



Before we proceed any further with this lesson an important caveat. This section is quite complex and contains many detailed operations. More than ever keep in mind that I've already created the geometry for you in advance and as such many if not all of the layer/object names will be the same as those listed within the tutorial text. As ever, when working you should always check inside the Edit Layers dialogue box **FIRST** to see if a layer name already exists before creating a new layer. In the likely event that the layer does already exist then name **YOUR** new layer something else!

For example, the tutorial text may say something like...

*"Create a new layer entitled: Nu\_MouthMerge\_Comp, set the layer colour to blue."*


What you should do is first check the list inside the Edit Layers dialogue box, does the layer already exist? If the answer is yes (and 99% of the time it will) then name your new layer something slightly different like...**MY\_Nu\_MouthMerge\_Comp**, thus avoiding the risk of overwriting any data!


It is also highly recommended that you save and backup your scene file with increased regularity during the course of this lesson.

---

## Scene Setup



- If you've not done so already start a Rhinoceros session by **double clicking** on the desktop icon  the application will begin.
- Choose File, Open from the menu bar and double click on **START\_B.3DM** (notice that we are NOT using the same file as in earlier chapters) in the file list, it will load and open.
- Confirm at the Lower Status Bar the currently active layer is entitled SCENE START UP. If it is active proceed to the next step, if it's not then make it active by Left clicking on the layer box, highlighting the correct layer and clicking on it.
- Again, at the Layers Box on the Lower Status Bar this time right click on the box, the Edit Layers Dialogue box will open. Confirm the following switches have been enabled or disabled:
  - The Layer entitled SCENE START UP should be ON.
  - All other layers should be set to OFF.
  - When you've finished making your changes ( if any ) click on OK.
  - Confirm that the grid display in the viewports has been disabled, if not turn it off now.
  - Confirm that no Osnaps are currently enabled, if any are disable them.

- Confirm that no edit points are currently displayed, if any are hide them.
- Zoom out all the viewports by selecting the Zoom Extents/Zoom Extents All Views icon  or by typing **ZoomExtentsAll** at the command line and pressing ENTER.

## Art Takes Over

Everything we've done up to this stage in the tutorial has been very much based around working systematically in each of the viewports in order to create, reshape or refine the edit points and general geometry of our head model. In some respects we've taken a very "scientific" approach to working which in some might feel has almost become mechanical in its execution. This lesson will mark a turning point in that we will now need to work more as a sculptor would, taking a far more natural, organic and ultimately artistic approach to our creation. This is not to say that we will abandon our previous methods of working as it still very important to work systematically, logically and with a high degree of forethought. In my view this is where things really start to get interesting and quite a bit more fun as we now begin to combine many of the separate surfaces we've previously created into something that should look like the head/face of a real human being. In essence this is where we start to put that "certain something" in to our model and attempt to transform it from something inanimate into an object that looks and "feels" alive.

As you might have guessed this will not be easy (what is?) and in many respects the results you are able to achieve will be up to you more than ever. This is the part of the tutorial that really can't be taught. Well, that's not quite true it can be taught to a certain degree however this is the point where you must really train yourself to "learn how to see". What I mean by this is you need to really LOOK at what you are creating, evaluate the shapes and decide on a course of action. This part takes TIME, you can't rush it as this is where modelling truly becomes an iterative and artistic process. Don't allow yourself to become depressed if you not getting the results you expected -- this part takes effort and patience.

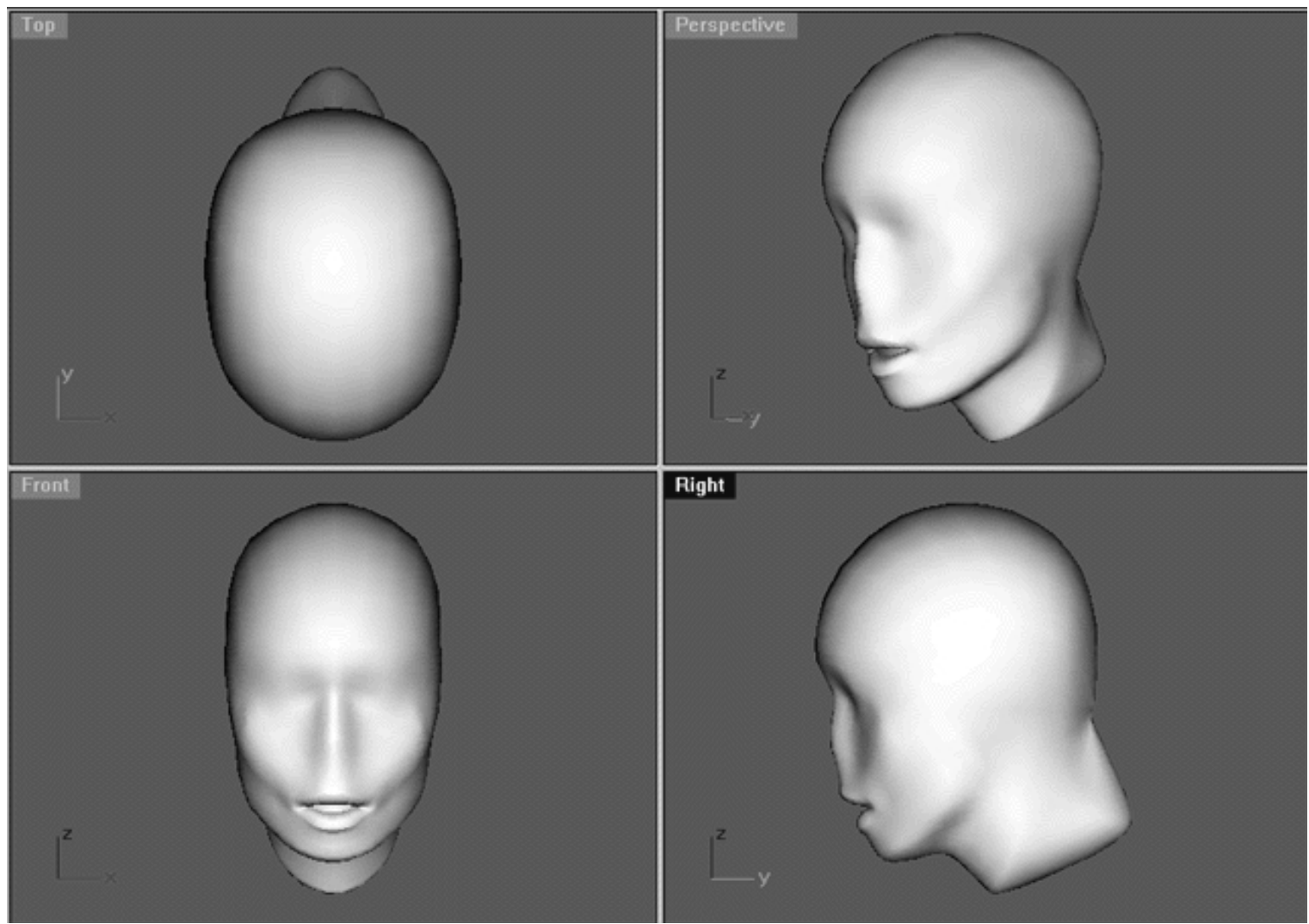
Believe me when I say that 99% of the time if your head model (or drawings) for that matter don't look right it's probably down to a problem with the overall scale or proportion. This is why most of the heads or other human characters that you see images of on the Internet don't look a well as they might.

Right then, let's get down to business...

- Open the Edit Layers dialogue box and turn on the following layers:
- Nu\_MouthMerge\_Comp\_OLD.
- Nu\_MouthMerge\_Comp\_Surf\_OLD.

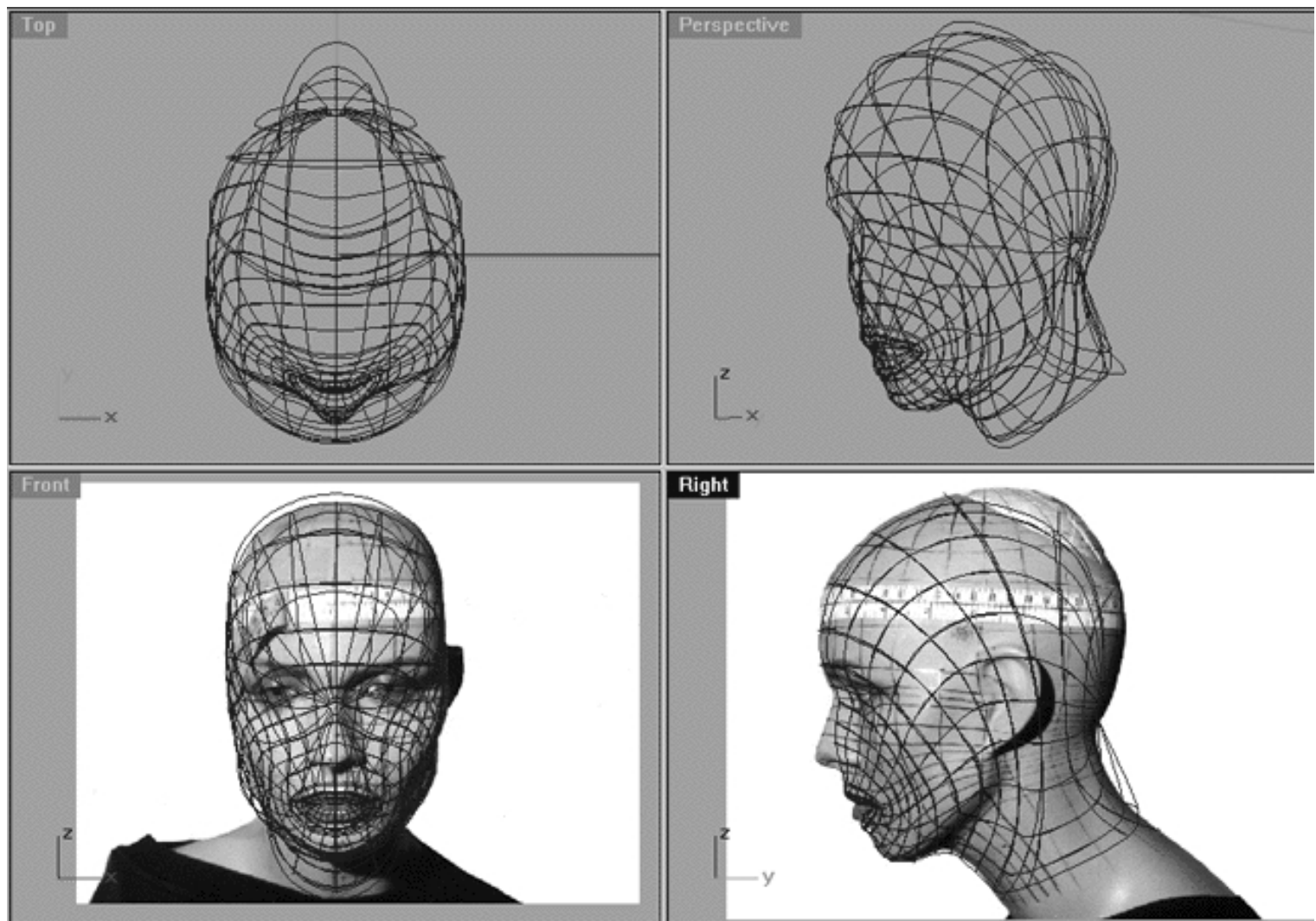
So that there is no confusion, the layer entitled: Nu\_MouthMerge\_Comp\_OLD are the radial curves that are to be lofted using the "loose" option. The layer entitled: Nu\_MouthMerge\_Comp\_Surf\_OLD is the surface that has been produced by loose lofting the layer entitled: Nu\_MouthMerge\_Comp\_OLD.

- Perform a "Shade All Viewports" and your monitor should look something like the screenshot below:



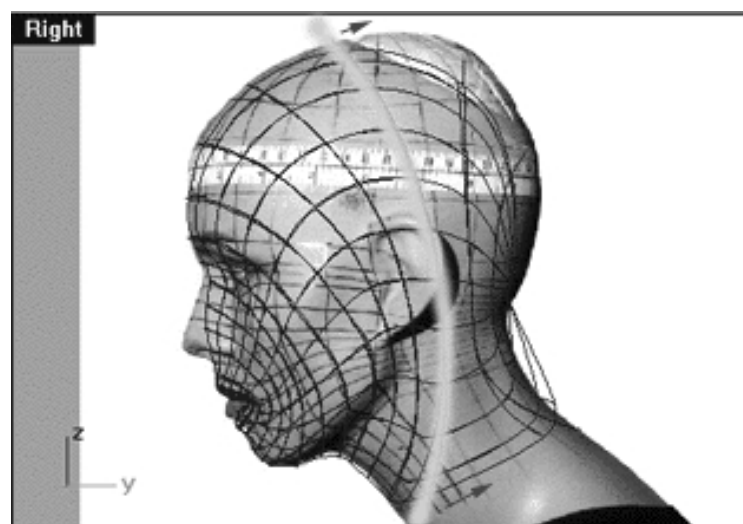
*This **All Viewport** screenshot show's the surface created by performing a loose loft on the layer entitled: Nu\_MouthMerge\_Comp\_Old. Despite the fact that the head looks jolly good (if we do say so ourselves) there are a few problems that need to be addressed. The nature of the problems will become more clear within the next screenshot.*





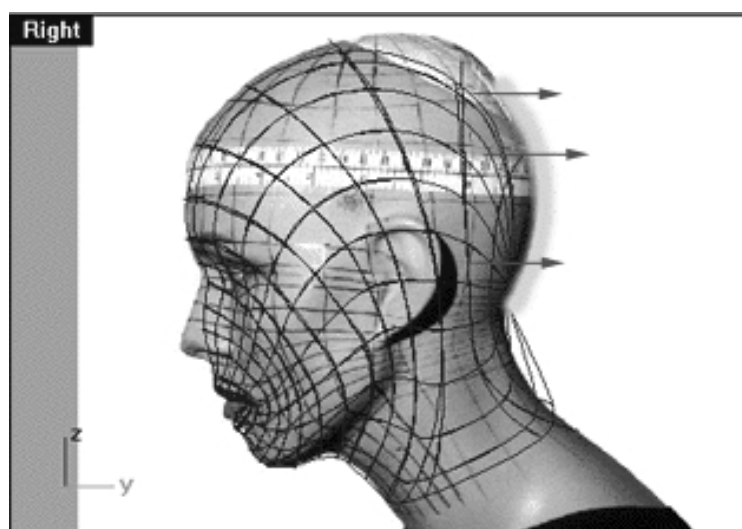
The above **All Viewport** screenshot shows the wireframe surface created by performing a loose loft on the layer entitled: *Nu\_MouthMerge\_Comp\_Old*. If you look closely you can see that there are some problems that need to be addressed, in the main they are:

- Looking at the **Right Viewport** for a moment, the isoparm that runs from north to south and bisects the head (running just behind the ear) could be placed in a better position. The first and main problem is that its bottom curves forward towards the base of the neck. You may recall that the reason this curve was placed like this was for purposes of projecting it so that we could build a radial surface parameterisation. Because our original head surface was initially built from a north/south pole style parameterisation the bottom of the neck was open. If we would have attempted to project the curve without first "bending" it forward and to the front of the neck there would have been no bottom surface for the curve to project itself onto.



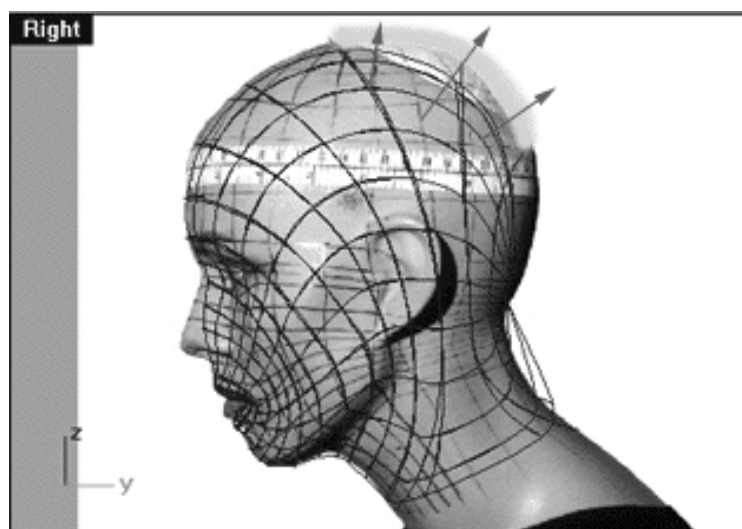
This **Right Viewport** screenshot shows that this isoparm could be more ideally placed.

- The back of the head should be extended further still. This is a very common mistake that artists often make and something that you should always double check. The human head has a great deal of "mass" behind the ear, much more than you might "think".



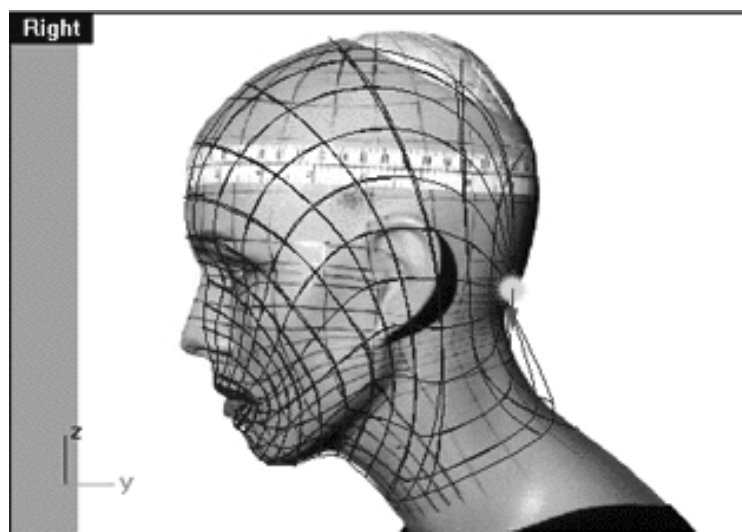
This **Right Viewport** screenshot shows that the mass of the skull behind the ear would benefit from being extended.

- The crown of the skull needs to also be scaled up a bit and made more full and rounded.



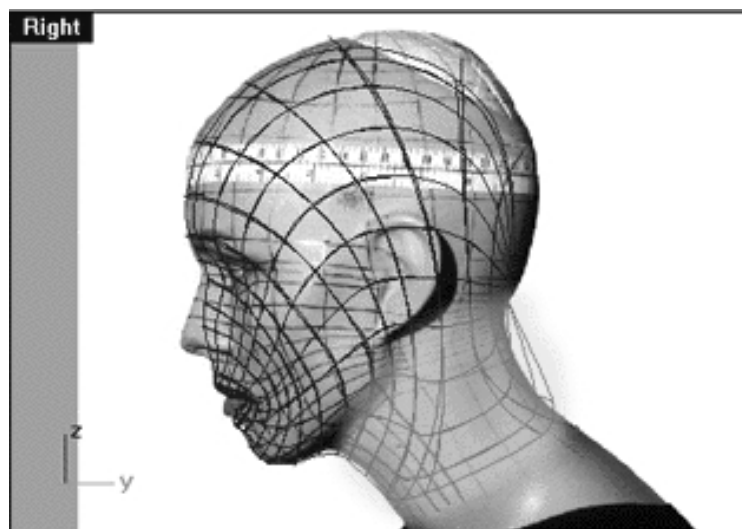
This **Right Viewport** screenshot shows that the crown of the skull needs to be moved upward and outward too.

- The pole at the base of the head/neck needs to be rearranged and should be made smaller in size and also moved downward slightly along the Z axis.



This **Right Viewport** screenshot shows the pole at the base of the head/neck. This really needs to be moved downward into the nape of the neck a bit more.

- The neck itself needs some work, it should be more rounded.



This **Right Viewport** screenshot shows the neck area which should be more rounded. This problem will be much improved by moving and adjusting the isoparms in the area from behind the ear to the rear pole. In other words, once you begin to address the other problems we've discussed the neck rounding of the neck will improve somewhat automatically. Despite this nice side effect refinement will still be required -- so you're not getting off that easily!

So as you can see from the previous screenshots, generally speaking ALL the isoparms located between the back of the ear and the rear pole at the base of the neck are in need of some adjustment.

Now that we've discussed some of the areas that we can readily improve the question becomes how do we actually go about it. I'm often asked by my students at this stage what is the best approach to use and how do we proceed from here? This is a good question to which there is no one right or wrong answer per se. For example, we know that we will want to move the isoparm that bisects the head behind the ear so that its base is more towards the centre of the neck -- but how?


Well here are just a few basic tips to help you:

- Try to avoid moving single points, it's best to move them as a group when possible.
- Try to always move at least 2 points at a time (when applicable) For example, when selecting a point to be moved in the Right View make sure that you've dragged a selection frame around the given point this way you should also have selected its "sister" point on the opposite side of the head too.
- For the time being try to avoid using the Scale command in Rhino. I know it's tempting but the problem is that as at the writing of this tutorial you can't select the centre of an object with Rhino. In my view it's pretty darn important to be able to quickly find the centre of an object, especially when scaling. Yes you can easily scale an object in Rhino, but that's not the problem. The problem is that you can't easily find the centre of the object, so you can't easily repeat the scaling operation should you need to. In our view this is currently a big weakness within Rhino, however, I'm quite confident that it is something that the developers will improve in future releases of the product -- it's still early days yet. Besides, none of these issues will stop you from getting the job done, multiple work rounds are available.
- Sometimes the Rotate command can be very useful. Say an isoparm curves forward and you want to move it backward why not consider rotating it into place?
- Take detailed notes so that you can remember what "moves" you made and what made you do them in the first place. Trust me, you wouldn't believe how often you'll return to a project after a day or so only to find that you can't remember where you were at or why you were doing something.
- Always make a back up copy of your project file before beginning any work and don't over write that file! This way, in the even of disaster you'll have something that's still good to return to.

## Refining the Head Shape

Before moving on any further this would be a very good time to save your work and also to make a backup copy as well (just in case the worst should happen). Next up we will also copy the curves on the Nu\_MouthMerge\_Comp\_Surf\_OLD layer and put the copies on a new layer entitled: Nu\_MouthMerge\_Comp. This way we can keep a "virgin" copy of our curves and only actually edit/refine the copies that we've placed on the new layer. This way if something goes horribly wrong or if we just want to easily compare between what we had previously and what we just done it will be easy and safe to do. Right then, let's crack on with it...

- Open the Edit Layers dialogue box, turn OFF the layer entitled: Nu\_MouthMerge\_Comp\_Surf\_OLD.
- Make certain the Layer entitled: Nu\_MouthMerge\_Comp\_OLD is ON -- confirm this is the case.
- Create a new layer entitled: Nu\_MouthMerge\_Comp, set the layer colour to blue.
- Make the Nu\_MouthMerge\_Comp layer the currently ACTIVE LAYER.
- With the curves on the Nu\_MouthMerge\_Comp\_OLD layer now visible, in Any Viewport frame select all the curves, they should all highlight. At the command line type: Copy and press Enter. The system will respond with the following prompt: **Point to copy from (Vertical InPlace):**
- Type IN and press ENTER. Then just click in any viewport with your mouse so that the curves are de-selected and no longer highlighted.

- Maximize the Perspective View, zoom in tightly and start by selecting the innermost mouth curve. When you do the Choose One Object dialogue box should appear saying #1 of 2 Curve, just click OK to this prompt. Now continue selecting working your way outward from curve to curve while holding down the Ctrl key each time before you click. Again that annoying Choose One Object dialogue box should appear saying #1 of 2 Curve, and once again just click OK to this prompt (and all others you may get like this). Repeat this procedure with each curve until you've selected the pole at the back of the head, zooming, panning and rotating the view as required to do so.
- When you've finished all the curves should be highlighted. From the toolbar choose the Edit Layers icon  and from its flyout select the change layer icon which will open the Layer for Object dialogue box. Locate the layer entitled: Nu\_MouthMerge\_Comp and double click on it, thus copying all the selected curves on to the appropriate layer.
- Minimise the Perspective View, and perform a ZoomExtentsAll.
- In the Edit Layers dialogue, temporarily turn off the layer entitled: Nu\_MouthMerge\_Comp\_OLD and press OK to exit.
- In the Right Viewport, carefully select all the curves with the EXCEPTION of the one running from north to south directly behind the ear. Once all the curves have been selected (with the exception of the one just mentioned) type the command: Hide at the command line and press Enter.
- Select the single remaining curve -- it will highlight, then display its edit points.
- Open the Edit Layers dialogue and once again turn ON the layer entitled: Nu\_MouthMerge\_Comp\_OLD and press OK to exit.
- In the Right Viewport, carefully select all the curves with the EXCEPTION of the one running from north to south directly behind the ear. Once all the curves have been selected (with the exception of the one just mentioned) this time type the command: Lock and press Enter.

You will now have locked and ghosted the curve running from north to south behind the ear on the layer entitled: Nu\_MouthMerge\_Comp\_OLD. This locked curve can now be used as a point of reference and a basis for comparison on which to base the editing that you will now perform to the copy located on the currently active layer (Nu\_MouthMerge\_Comp).

Now we will put some of this theory into practice by editing the curve on the currently active layer entitled: (Nu\_MouthMerge\_Comp). I will now show you the changes I've made to the curve. Once you've had a chance to study the before and after changes shown below, you should try achieve similar results on your own by editing the curves to match what I've done in the examples.

We are starting with the 1st curve located directly behind the ear and during the next few steps we will be working progressively rearward toward the back of the head adjusting and editing each curve until we reach the pole. Once you've had a chance to edit the first of these curves and feel satisfied you can then and only then move on to the next curve. This section is very important and you should not try to rush through it.

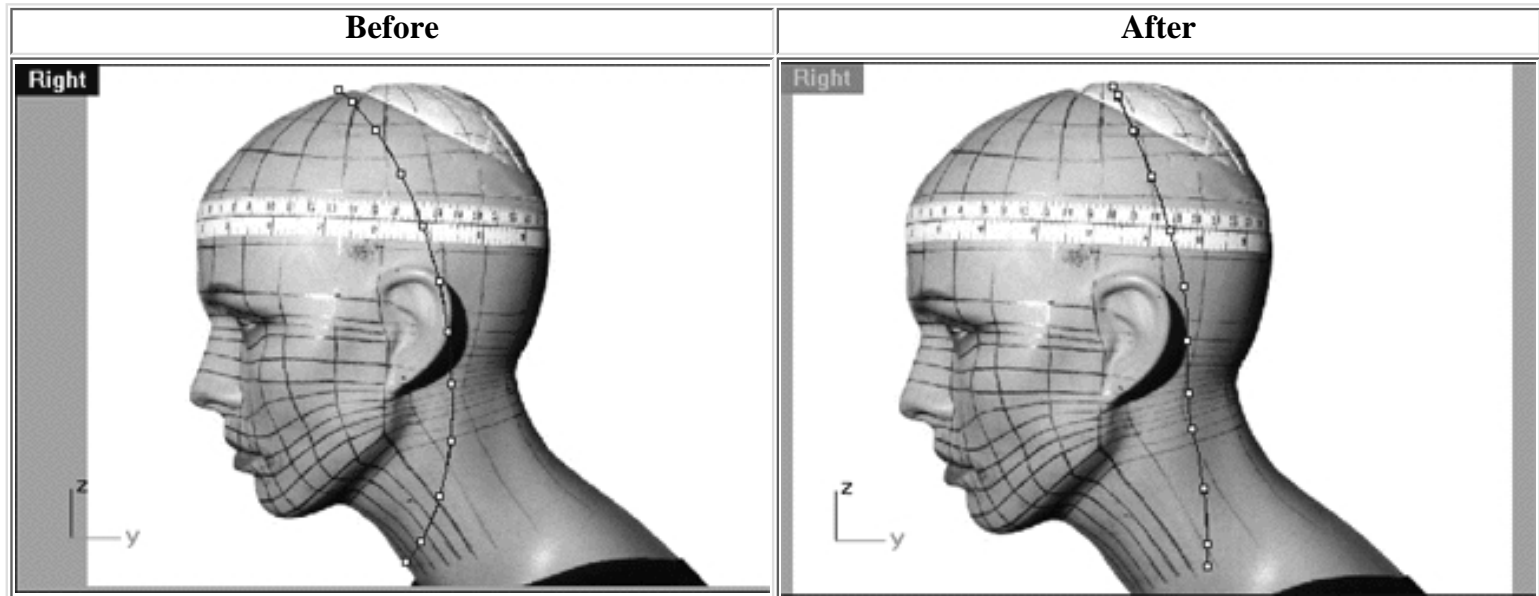
Please be aware that when you move on to the next curve in the sequence to be edited you will have repeat the setup procedure that we just did a few moments ago. For example, say you've just completed editing the curve behind the ear and now feel that you are ready to move on. Then do the following: (let's call it the progressive procedure):

## The Progressive Procedure:

- Hide any currently displayed edit points.
  - Type the command: Unlock at the command line and press Enter.
  - Type the command: Show at the command line and press Enter.
  - Open the Edit Layers dialogue box and temporarily turn OFF the layer entitled: Nu\_MouthMerge\_Comp\_OLD, then press OK to exit.
  - Select all the visible curves with the EXCEPTION of the one in the location that you plan on editing on the layer entitled: Nu\_MouthMerge\_Comp, they will highlight. Once done type the command: Hide at the command line and press Enter.
  - Select the curve that you now wish to edit on the layer entitled: Nu\_MouthMerge\_Comp and display it's edit points.
  - Open the Edit Layers dialogue box and temporarily turn ON the layer entitled: Nu\_MouthMerge\_Comp\_OLD, then press OK to exit.
  - Select all the visible curves with the EXCEPTION of the one in the location that you plan on editing on the layer entitled: Nu\_MouthMerge\_Comp\_OLD, they will highlight. Once done type the command: Hide at the command line and press Enter.
  - Okay, two curves now remain in the same location, however one will have it's edit points displayed. Just select the curve, (you will actually be selecting the one on the layer entitled: Nu\_MouthMerge\_Comp\_OLD, this is because the curve on the other layer has its points visible so you couldn't actually pick that curve even if you wanted to -- and in this case you certainly don't want to.) The selected curve will now highlight.
  - Once done, type the command: Lock at the command line and press Enter.
  - You may now begin editing the curve (The fun part).
-



## Before and After First Curve, Right View

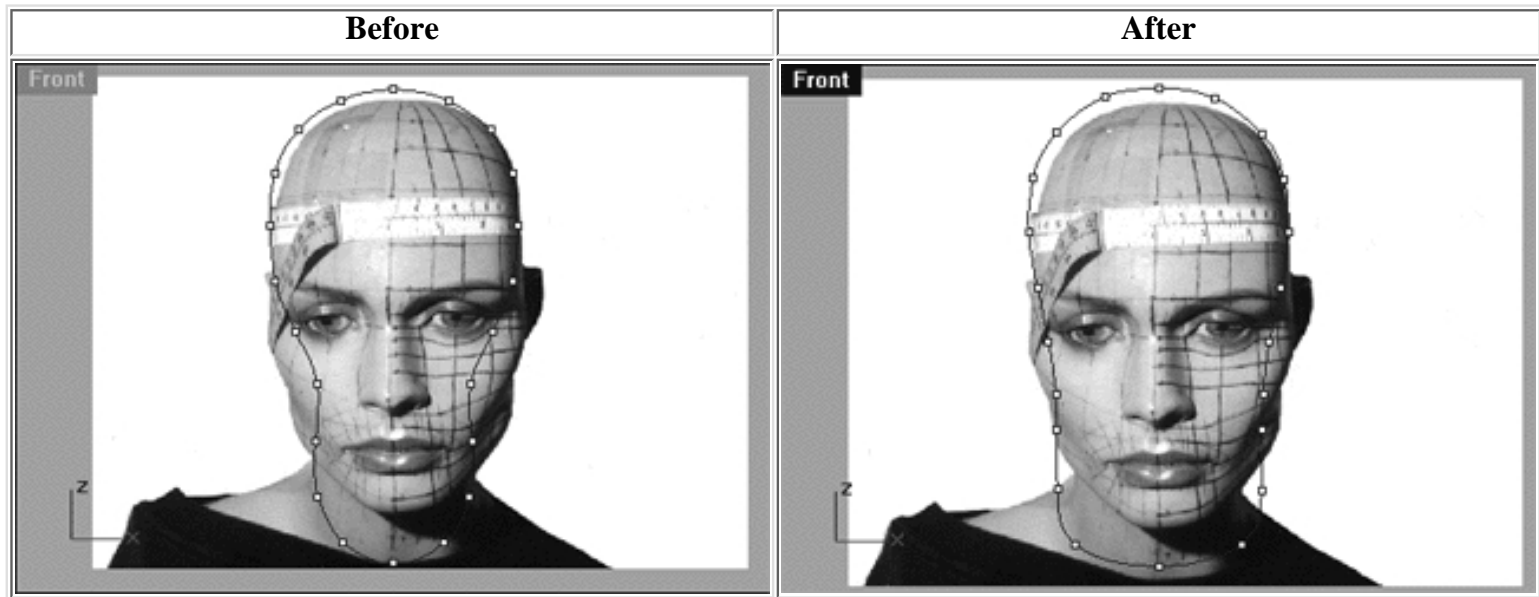


We now know that we need to fix the upper part of the head by making it larger and fuller at the top and also improve the shape of the neck at the bottom as well. To do this, we will start by concentrating on the isoparm located directly behind the ear as pictured in the screenshot entitled: "Before". We will now reposition this particular isoparm by refining it in the following manner. Firstly, working in the **Right Viewport** we will concentrate on the lowermost extent of the isoparm, essentially we will need to move it inward along the Y axis. Notice how in the "before" screenshot the isoparm curves forward with its last point located near the Adam's apple. Now look at the "after" screenshot, the isoparm is now much less curved in shape overall with its last point located more near the centre of the neck. Much the same procedure has been performed to the top most point too. Once again compare the before and after screenshots and notice that the top of the curve now curves forward much less.

---

# First Curve, Front View

Now let's take a look at some of the adjustments to be made to this curve whilst working in the Front Viewport.



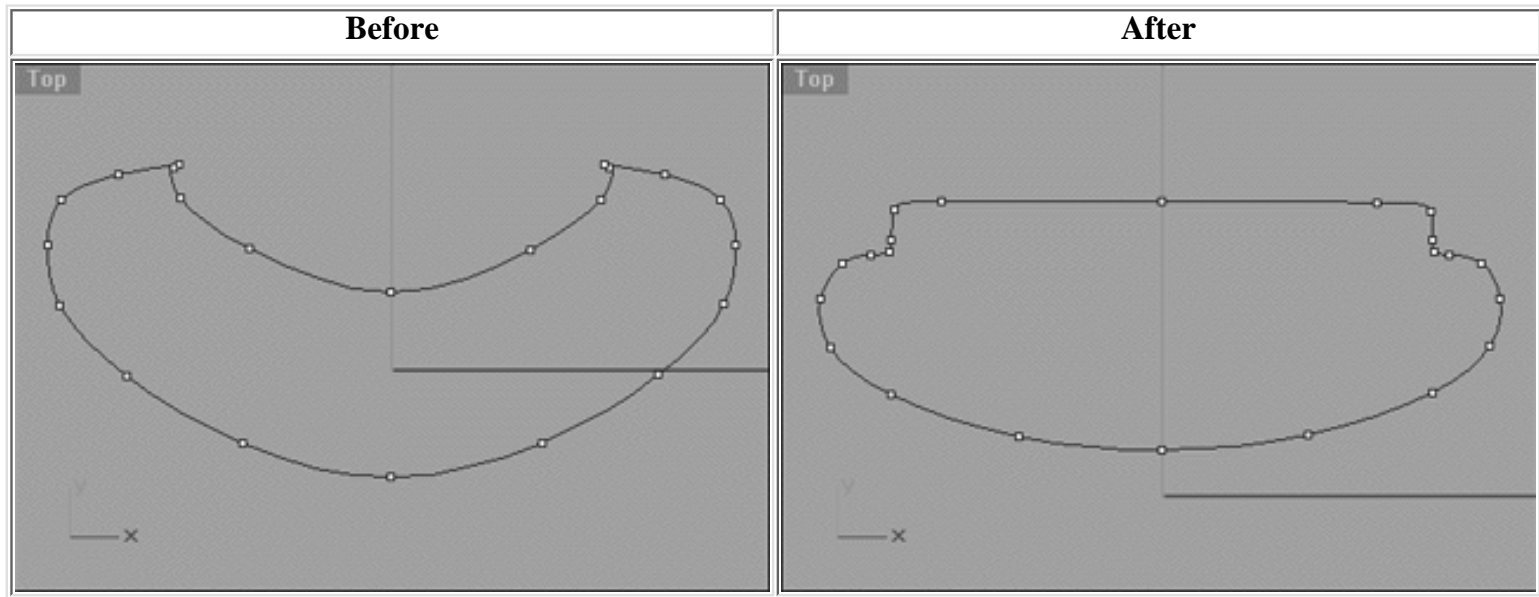
As ever we still need to work systematically and this means refining points in the **Front Viewport** as well. While in this particular view we really need to concentrate on moving the points at the base and sides of the neck outward along the *X* axis. Study the before and after screenshots, notice how I've made the base and sides "thicker". Don't forget to pay attention the points in the area of the cheek bones!

---



# First Curve, Top View

Now we can set about observing and adjusting the curve in the Top View, something like this...

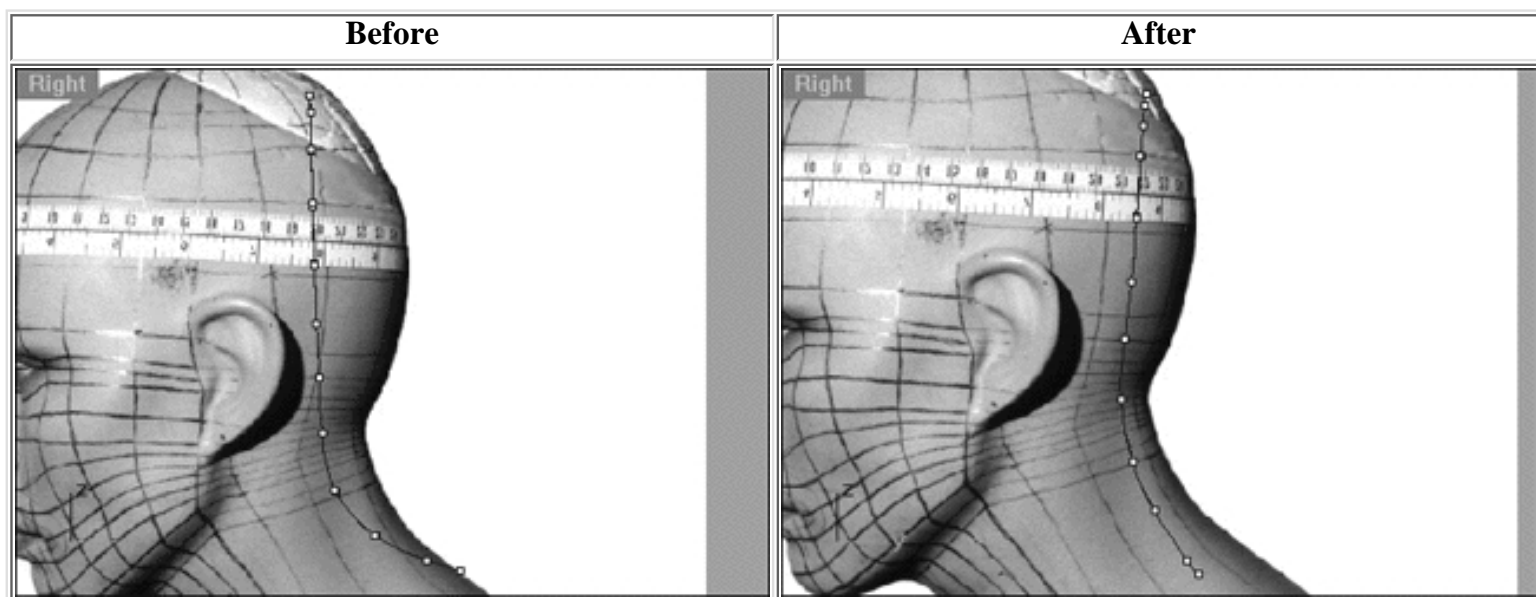


*Most of the changes we've now made can be seen rather clearly within the Top Viewport and when you've finished editing your monitor should resemble something like this. Remember it's important that you check what is going on in the Top Viewport -- the information it provides is rather important.*

When you feel satisfied with the work you've done you can then turn your attention to editing the next curve rearward. Remember that you will have to repeat the "progressive procedure" in order to properly set up the curves before you begin. If you don't remember what the "progressive procedure" is then -- [click here](#).

## Second Curve, Right View

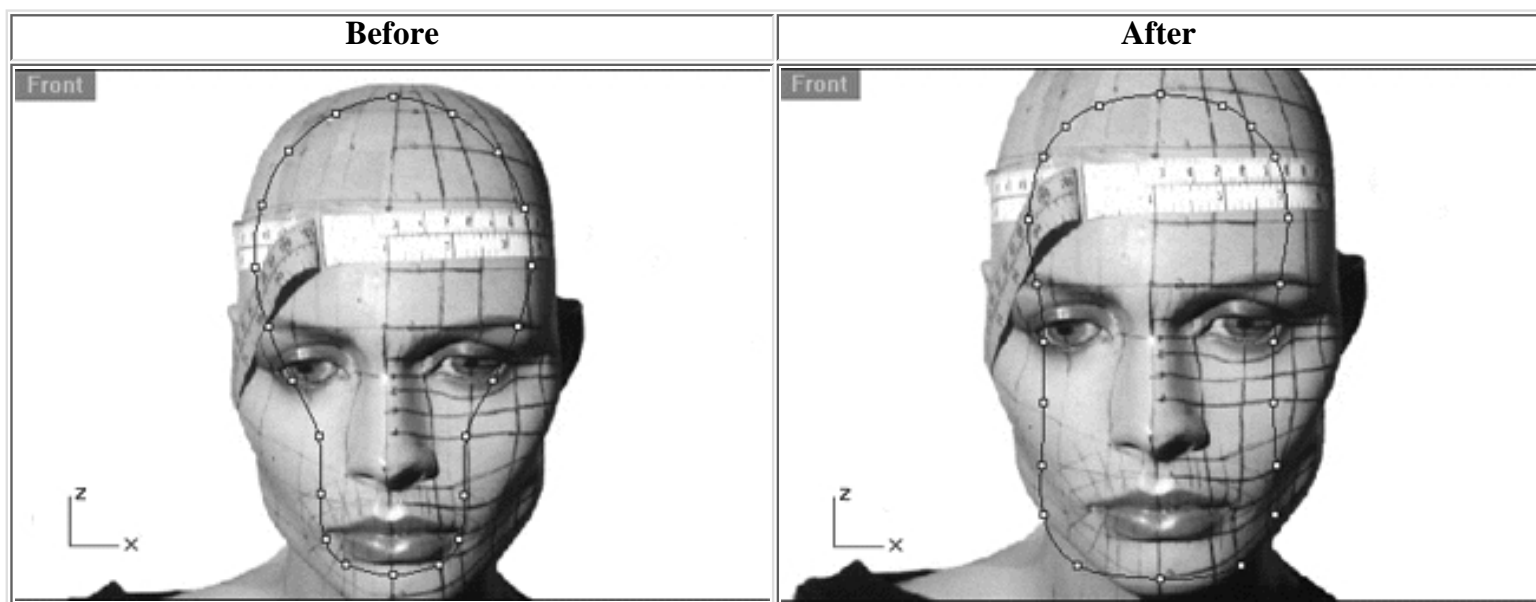
Now let's continue working toward the back of the head by now concentrating on the next isoparm.



*Like the previous isoparm this one also has curve to it, in this case it curves towards the back of the neck rather than the front as the last one did. Unfortunately this is exactly the opposite of what we'd like it to do. In this instance we want the base points of this isoparm to be moved inward and running more with the natural contour of the neck in that area. Compare the before and after screenshots and see how I've achieved this. Now look at the whole isoparm, again comparing the before and after screenshots. Observe how the isoparm has been moved back a bit along the Y axis and is now also on a slight angle as well. This will help in part to enlarge the crown of the skull and give us more of the mass that we require in that part of the head.*

## Second Curve, Front View

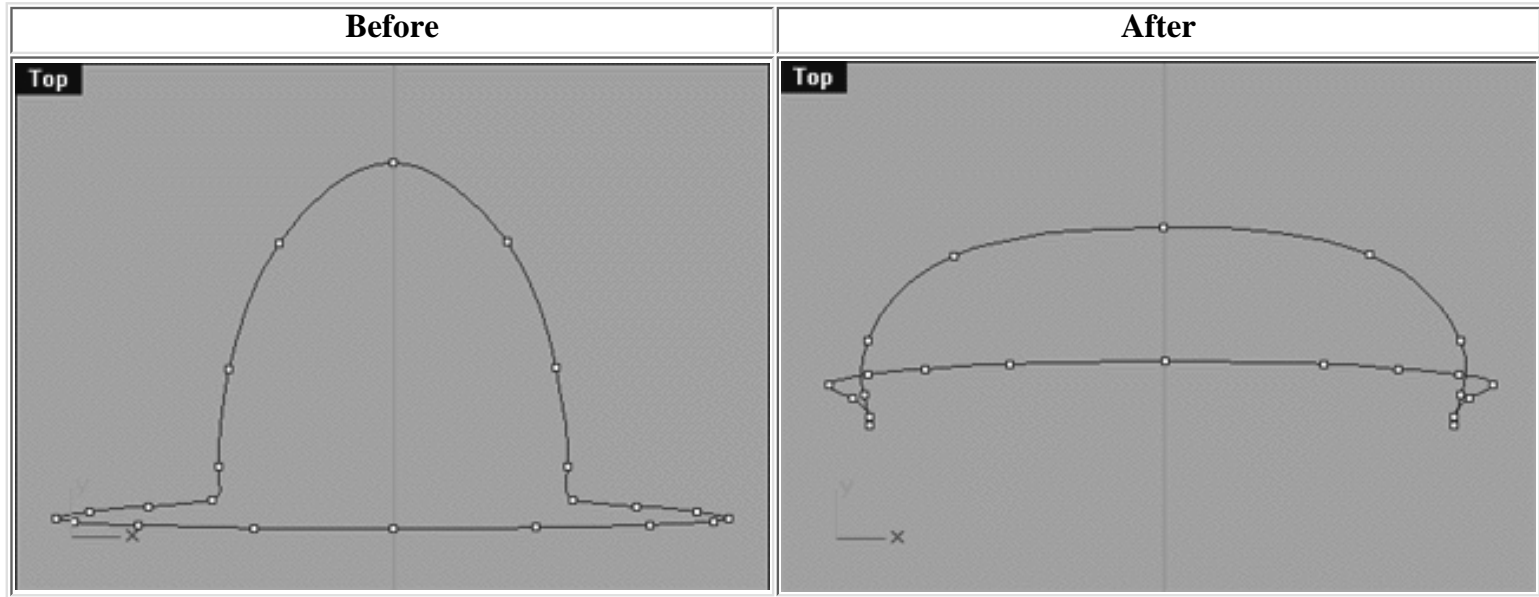
Again, changes must be made to the curve in the Front View as well...



*In the Front View even more work will be required. Starting from roughly the cheek bone area the points will need to be moved outward along the X axis on either side. In addition to this expansion the points at the base of the curve will need to be moved downward along the Z axis a bit. The upper portion of the curve is the most tricky and will require a bit of extra effort. Compare the before and after screenshots and notice how the upper portion of the curve has been moved downward along the Z axis and the points have been spaced along the curve to accommodate this change accordingly.*

## Second Curve, Top View

Again, it's time for observing and adjusting the curve in the Top View -- remember observation and comparison is your key to success.

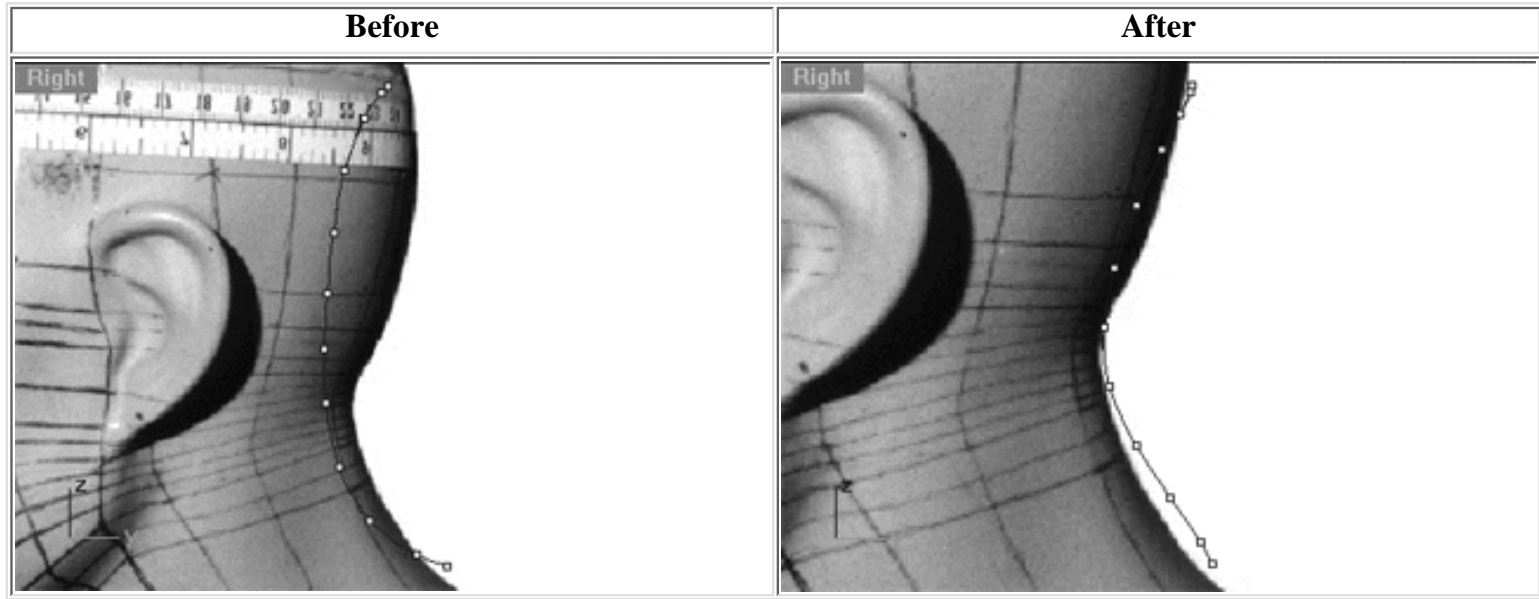


*Here the Top View tells the story of the refinements performed clearly. Notice how the points at the sides of the head and especially those at the base of the neck have been moved outward and extended along the X axis. Observe how the base of the neck is flatter and far more shallow it no longer comes to a point.*

Once again, when you feel satisfied with the work you've done you can then turn your attention to editing the next curve rearward. Remember that you will have to repeat the "progressive procedure" in order to properly set up the curves before you begin. If you don't remember what the "progressive procedure" is then -- [click here](#).

## Third Curve, Right View

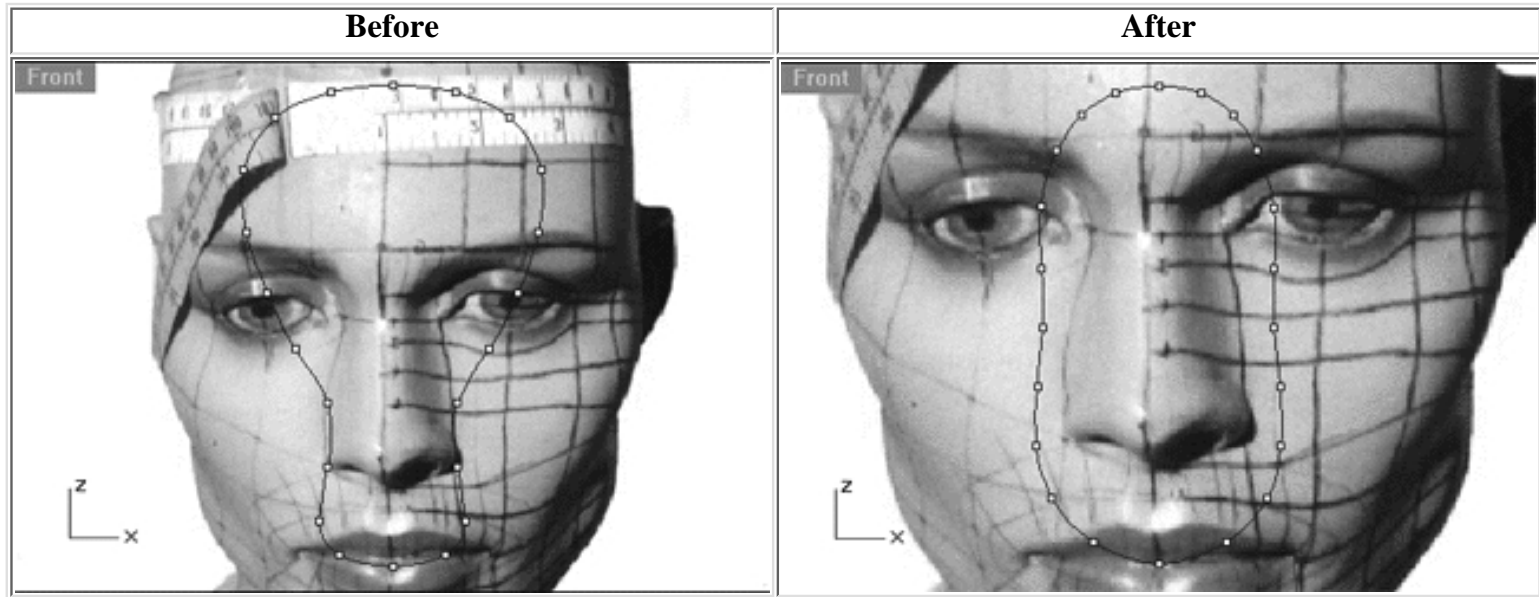
Slowly but surely we continue to make our way toward the back of the head, remembering to keep working systematically and with purpose.



*Working in the Right View, our task will be to move this isoparm further towards the back of the head overall. Some of the first areas of points to concentrate on are at the very top and the very bottom of the curve. Compare the before and after screenshots and notice how prior to refinement the ends of the curves sort of curl, down at the top and up at the bottom. Looking at the after screenshot you will see that the ends are much more straight with the isoparm following the overall angle of the head and neck more closely.*

## Third Curve, Front View

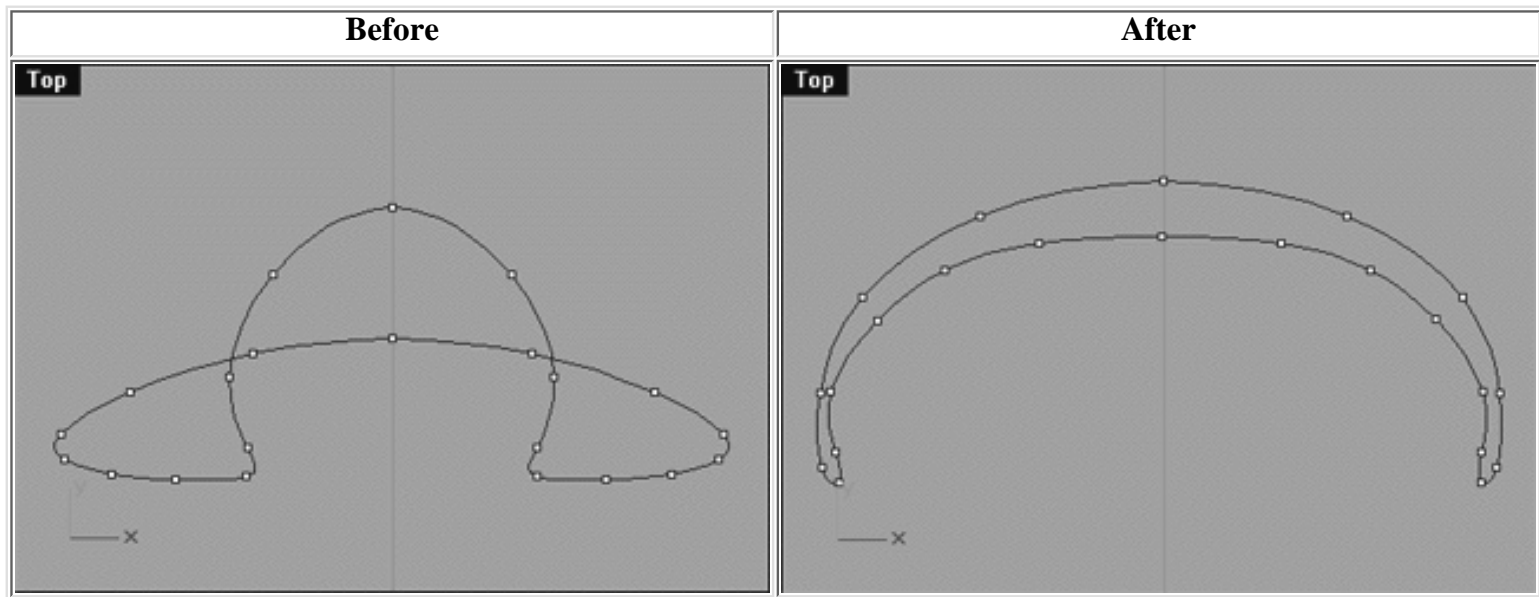
Big changes are called for in the Front view this time round -- and "roundness" is just what we are after, keep it in mind.



*In the Front View some substantial alterations are needed as well. Observe the before and after screenshots and notice how the before shape sort of resembles a light bulb, something we don't really want at all. The reason we want to avoid this light bulb shape is that it will produce at the base of the head and neck and we don't want that, we want that particular area to be more rounded with a nice pleasing shape. What we need to achieve is more of an oval "race track" shape which should help produce the look we are after. Notice how in the after screenshot the points have been spaced in a fairly even and logical manner, but remember they are spaced more closely at the top of the head than at the bottom.*

# Third Curve, Top View

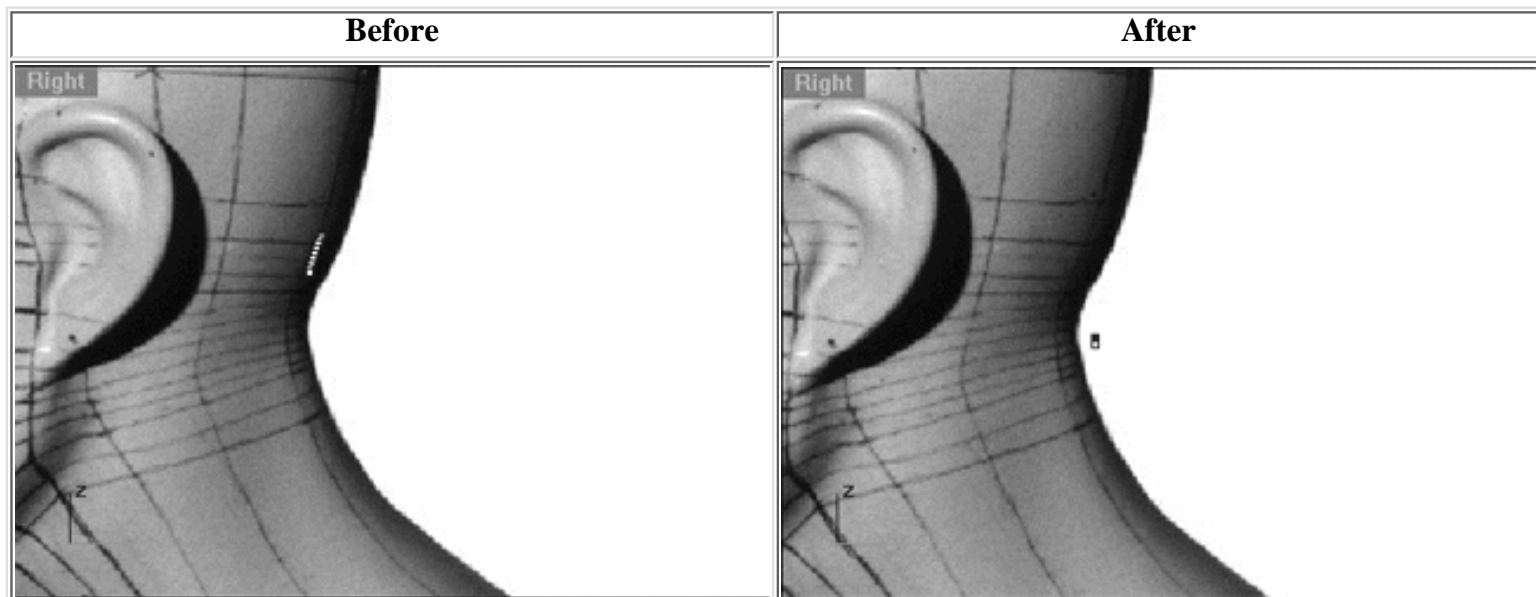
The Top viewport really tells the "roundness" story. Take time to observe the images and understand why this is.



*The Top View really shows the big change that you'll want to make. Compare the before and after screenshots, notice that after refinement the shape has now become similar to a crescent moon, thus widening, rounding, and fleshing out the back of the head and neck.*

Last but not least we need to reposition and refine the pole at the back of the head/neck. When you feel satisfied with the work you've done you can then turn your attention to editing the next curve rearward. Remember that you will have to repeat the "progressive procedure" in order to properly set up the curves before you begin. If you don't remember what the "progressive procedure" is then -- [click here](#).

# Shifting the Pole



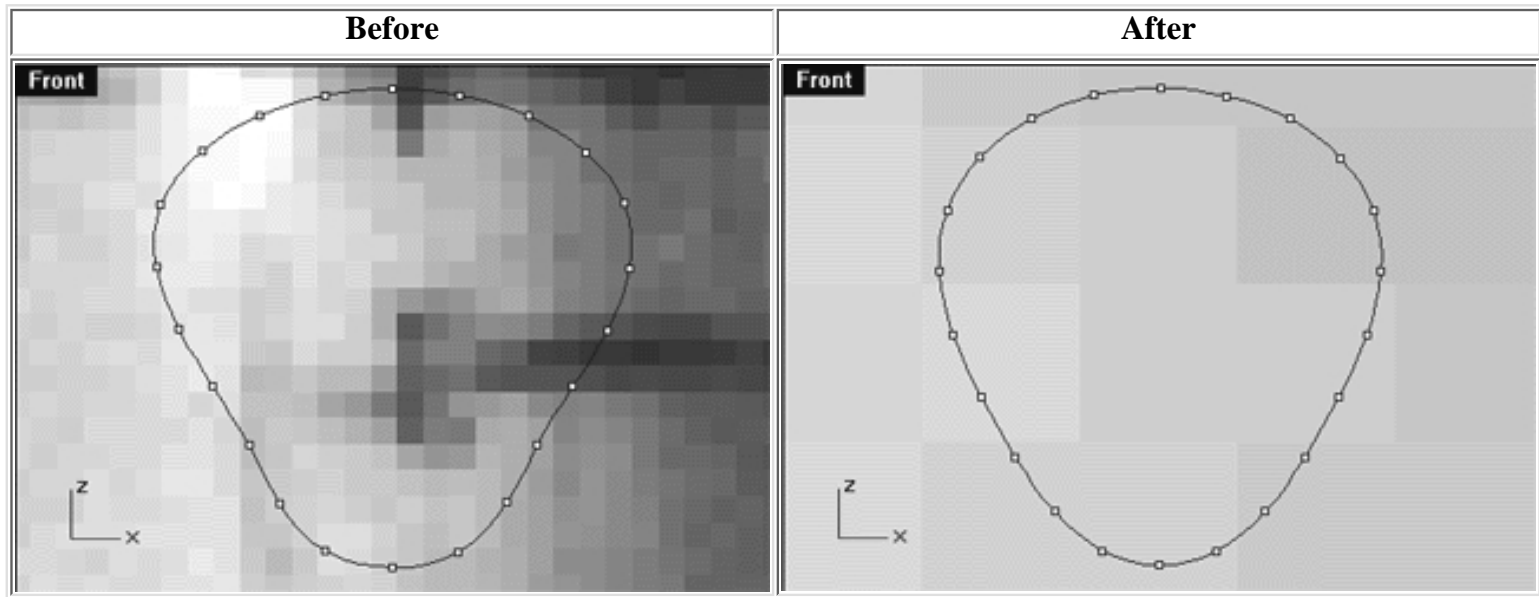
*Perhaps the biggest alteration that we will need to make in the case of this isoparm is to reposition the pole itself. Something else worth mentioning is that the prior to refinement the curve was on a bit of an angle, this is no longer the case and has been straightened. Observe the before and after screenshots taken from the Right Viewport and notice how the pole has been moved downward along the Z axis and also towards the back of the head along the Y. This change of position has been made in order to maintain the fullness of the skull while reducing the amount of pinching where all the isoparms begin to come together. Generally speaking, you can see that this is a far more logical location for it to be placed. Don't worry that it seems to be floating off the back of the head in space a bit, this is quite all right.*

---



# Scaling the Pole

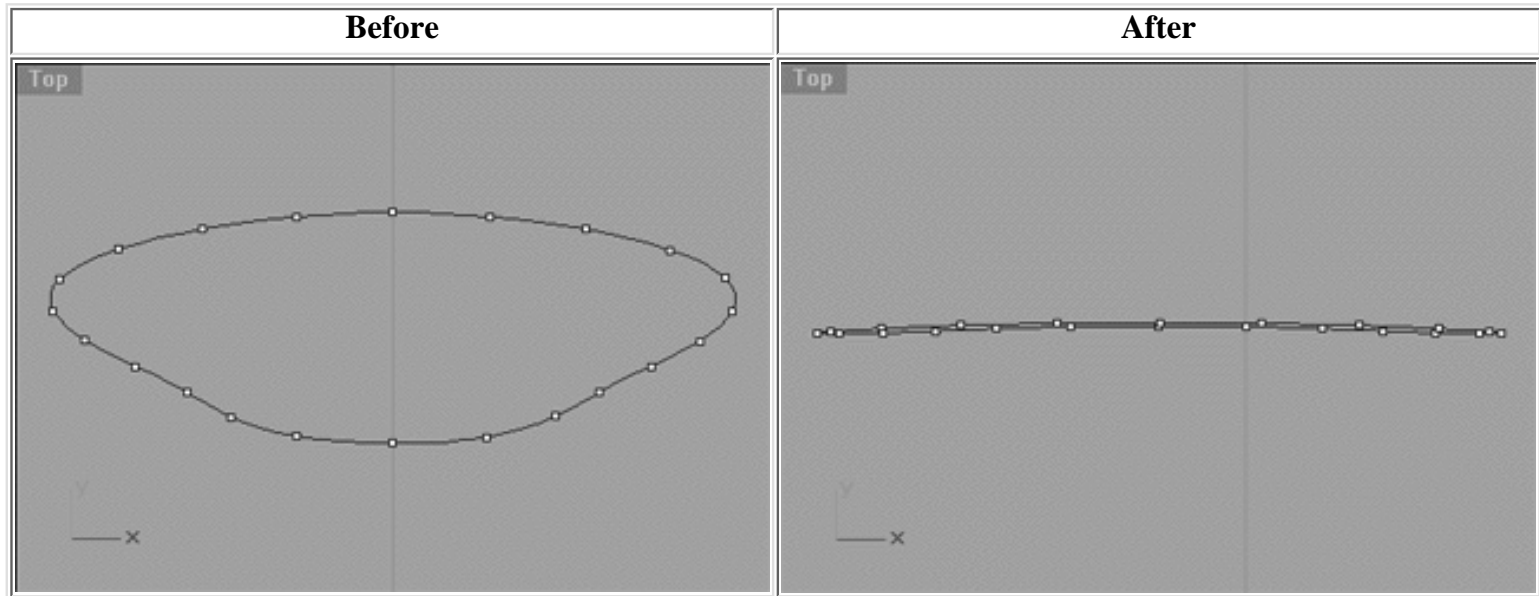
The intrepid British explorer Robert Falcon Scott needed snowshoes and ice axes, all you need is Rhino, some luck and the scale command!



*Working in the front viewport the biggest change that I've made is to make the pole much smaller indeed -- although this is not apparently obvious from the before and after screenshots (just trust me, it's much smaller just compare the size of the pixels). I did this by using the scale command (yes I know, I said it was best to avoid scale because the current version of Rhino does not allow one to pick the centre of an object). So how did I find the centre then? The answer is I didn't I just guessed. Remember if you decided to use the scale command that when you perform the operation that the object will move. So when you've finished scaling, remember to check the Right Viewport, find the object and move it back to where it was. The only other real change that has been made in this view is that I've made the curve more rounded and fuller overall while maintaining a logical and fairly even spacing of the points.*

# The Pole

## A View from the Top

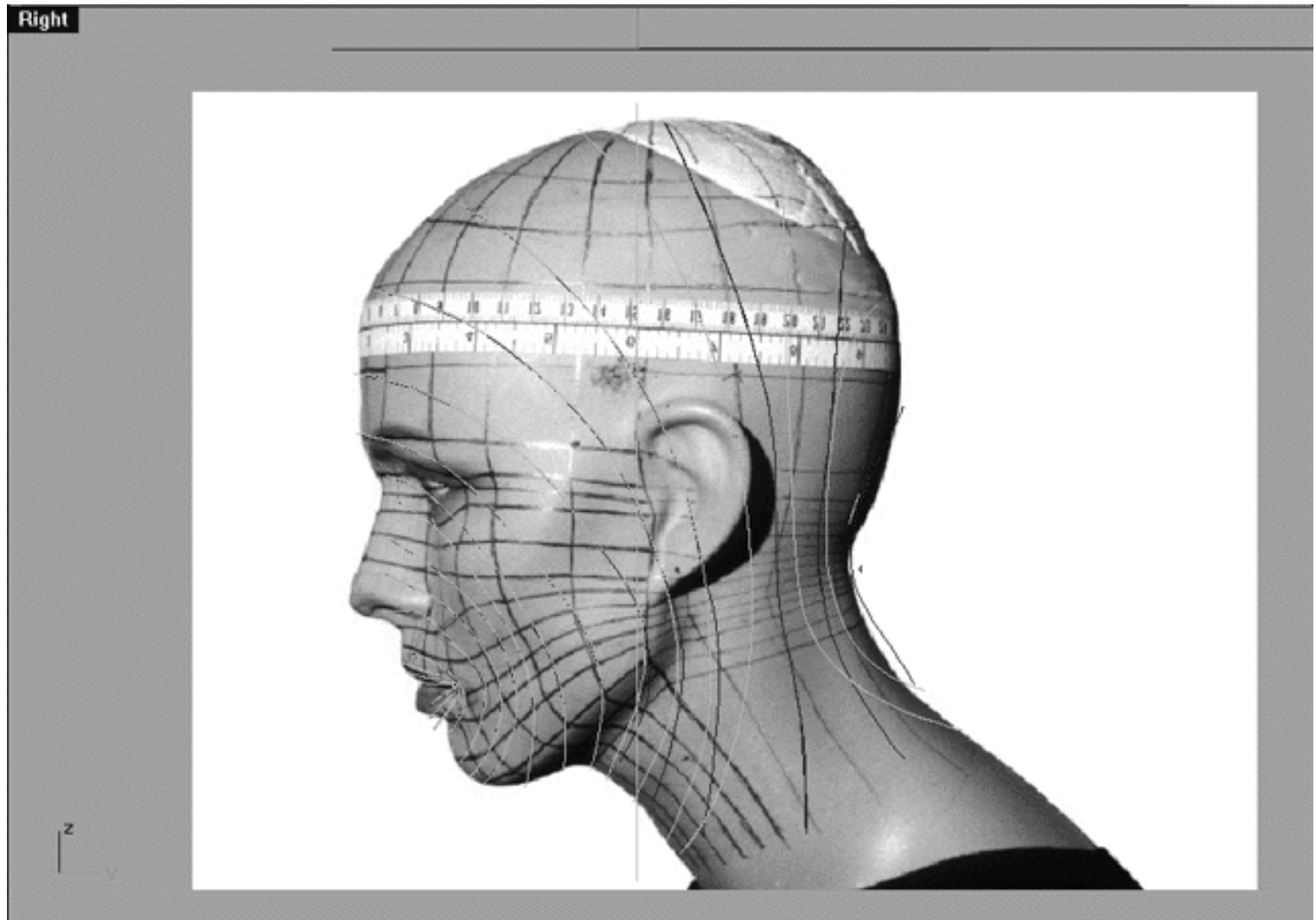


*Observe these screenshots taken from the Top View. Compare the before and after images and you will see that after refinement the isoparm is no longer on an angle. So how did I do that? Easy, just select the isoparm and in the Right Viewport rotate it about its centre. Remember, you'll have to make an educated guess where the centre is, but you needn't be a rocket scientist to figure it out.*

---

# Comparison of Changes

Right then, assuming that you've now finished making all these changes also, allow me to show you an image that will clearly illustrate what effect these changes will have upon our model, have a look at the following screenshot:



This **Right Viewport** screenshot above the following curves on the following layers are visible:  
*Nu\_MouthMerge\_Comp\_OLD* (the "before" curves in cyan colour) and *Nu\_MouthMerge\_Comp\_EX* in (the "after" curves in blue colour).

At this stage if you're confused and feeling a bit lost I strongly suggest that you should carefully compare the differences between the curves on the layers entitled: *Nu\_MouthMerge\_Comp\_OLD* and *Nu\_MouthMerge\_Comp\_EX*. Simply put these are the Before and After layers. Obviously, since I'm not in the same room with you I can't know what you've done in terms of actual editing and how close or far away from the goal you may be (I can't see your work.) With that in mind, I've now created a new layer called *Nu\_MouthMerge\_Comp\_EX* as an example (so you can see my work) which contains the curves that are the **RESULT** of the editing procedure described previously.

Before proceeding to the next phase I recommend that you do the following:

- Save the scene.
- Turn off any edit points that may currently be displayed.

- At the command line type: Show and press Enter.
- At the command line type: Unlock and press Enter.
- Open the Edit Layers dialogue and do the following:
- The layer entitled: Nu\_MouthMerge\_Comp\_OLD should be set to OFF.
- The layer entitled: SCENE START UP should be ON and made the ACTIVE LAYER.
- The layer entitled: Nu\_MouthMerge\_Comp should be OFF.
- Press OK to exit.
- Save the scene again.

---

RETURN to the Top of page -- [Click Here](#)

Go to the [NEXT PART](#)

Written by Joseph R. Saltzman.

Co-produced in association with Steven Ståhlberg  
©1998-1999 Cinemagic Productions Limited. All Rights Reserved.

Duplication of this document including images and text by any means is expressly forbidden without prior written consent of Cinemagic Productions Limited.

Web Site: <http://www.cmagic.co.uk> Telephone: +44 (0)1753 733 190 Fax: +44 (0)1753 736 619 email: [cmagic@cmagic.co.uk](mailto:cmagic@cmagic.co.uk)

**RETURN** to previous page -- [Click Here](#)

**GOTO** the NEXT LESSON



## SCULPTING THE FORM

*(part two of two)*




---

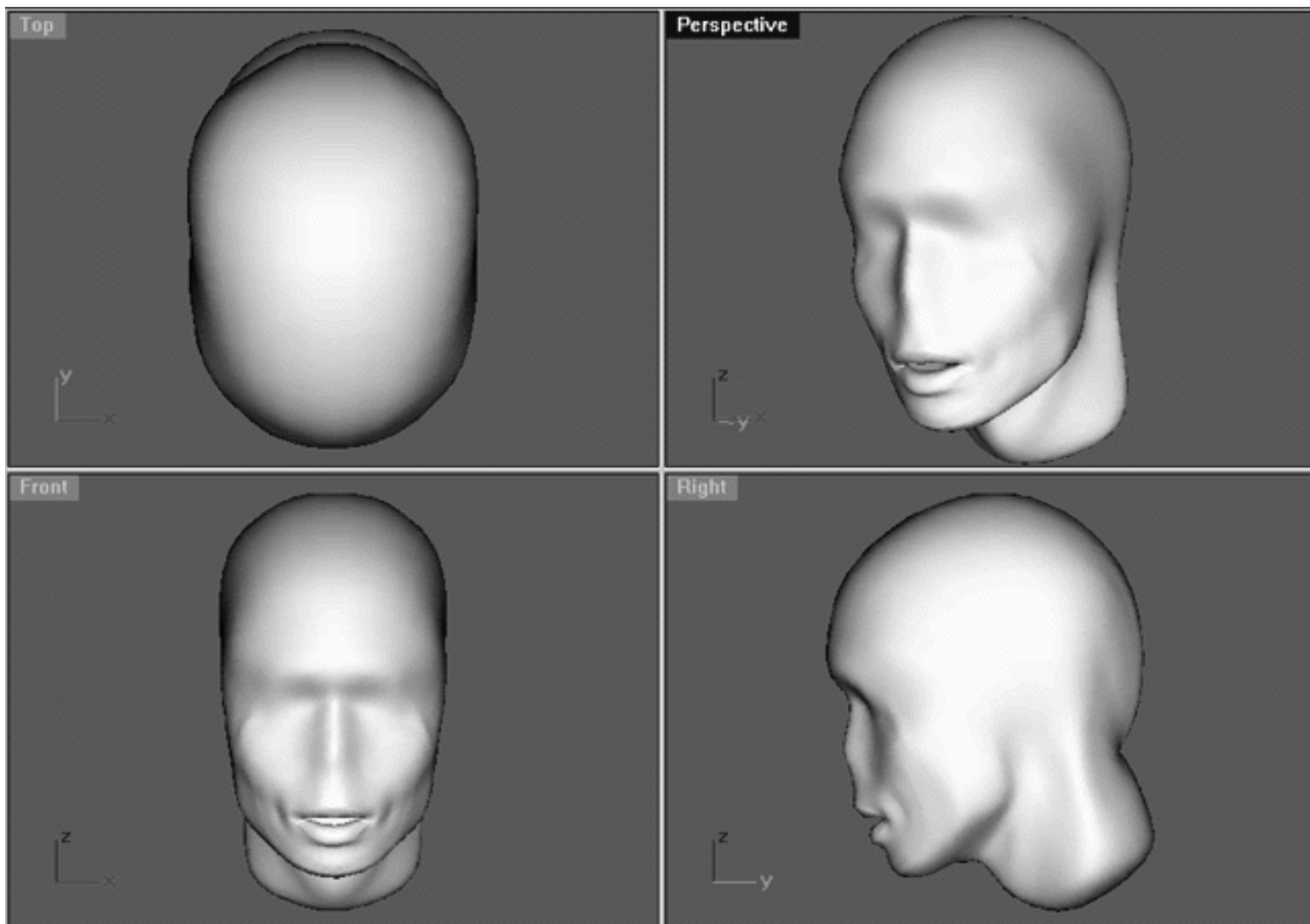
### Contents:

- [Re-Lofting with Normal Option](#)
  - [A Gentle Smoothing Action](#)
  - [Adding Detail -- The Features](#)
  - [Take it to the Bridge](#)
  - [If the Nose Fits -- Use It!](#)
  - [Sorting Sockets](#)
  - [It's Up to You](#)
  - [The Nose -- A Better Basic Fit](#)
  - [Face the Facts](#)
  - [Shutting Down the Scene](#)
-

# Re-Lofting with Normal Option

Now that we've refined and improved the shape of the isoparms (curves) extending from roughly the ear to the pole at the base of the head/neck it's time to loft them up and turn them into a surface we can work with.

- Open up the Edit Layers dialogue box and create a new layer entitled: Nu\_headsurf\_nosmoo, set its colour to a deep purple (no not the rock group!) then make it the currently active layer by placing a check in the check mark column and pressing apply. Confirm that the layer is now listed as currently active in the info box at the lower status bar.
- Next, turn ON the layer entitled: Nu\_MouthMerge\_Comp\_EX, all other layers with the exception of: Nu\_headsurf\_nosmoo should all be set to OFF -- once done, press OK to exit.
- Maximize the Perspective View and zoom in on the mouth area, rotate the view and/or pan as required.
- From the toolbar choose the loft icon  the system will respond with the following prompt: **Select curves to loft (Point):**
- Start by selecting the innermost mouth curve and continue working outward toward the back of the head until you've selected the last curve (the end pole) then press Enter to complete the operation.
- The Loft Options dialogue box should appear, choose the "Normal" option and then press OK.
- Open up the Edit Layers dialogue box and turn OFF the layer entitled: Nu\_MouthMerge\_Comp\_EX. We will do this so that we don't disturb any of these curves when we start to edit the new surface.
- The only thing that should be visible is the new lofted surface you've just created and your monitor should resemble the screenshot below.




This **All Viewport** screenshot shows the result of performing a "normal" loft upon the refined curves on the layer entitled: Nu\_MouthMerge\_Comp\_EX. As you can see lofting with the "normal" option has produced a face that is slightly more drawn and gaunt in overall appearance. You might be wondering why I didn't perform a loft using the "loose" option, after all earlier on in the tutorial I said that it was the preferred option when lofting. Well yes, I still stand by what I said about using the "loose" loft option, I do prefer the look of the surface that it creates. The reason I did not use it in this instance is because by its very nature loose lofting does not adhere exactly to the shape of curves to be lofted -- that's part of the reason why the surfaces produced look so nice and smooth. The problem here is that if I had done a loose loft the whole head would have lost a substantial amount of it's volume, sort of shrinking it and this is something that I'm keen to avoid. Alternatively, we can perform a couple of very minor smoothing operations using the smooth command, this way we can maintain much more control over where and how we smooth the surface.

## A Gentle Smoothing Action

In the Perspective View rotate the head about a bit and observe it from all angles, looking for any flaws in the surface as you do. You should notice that the back of the head has a slight amount of "ribbing" to it, the cheeks are slightly dimpled and the surface contains some imperfections just under the chin. We can reduce many of these types of problems by performing a gentle smoothing action upon the head surface. You may remember that earlier on in the tutorial you were warned to only use very small and carefully applied amounts of smoothing on your model. The same rule still applies, the use of too much smoothing will ruin your model so when you use it apply it carefully and only in small measured amounts.

There is another very important point that I should mention so pay attention. If you are aiming to create near photorealism in your models then be very careful about how you apply smoothing and the amount you use. One mistake that novices often make is to create models that are just far too smooth. Remember real peoples faces are not perfectly smooth, they are not made from marble or plastic and they contain a certain amount of imperfection and to a large extent this is precisely what makes them look real. Smoothing is a fantastic tool, it can work wonders very quickly and help you to create wonderful looking models, smoothing is indeed your friend but should be treated with care and respect.

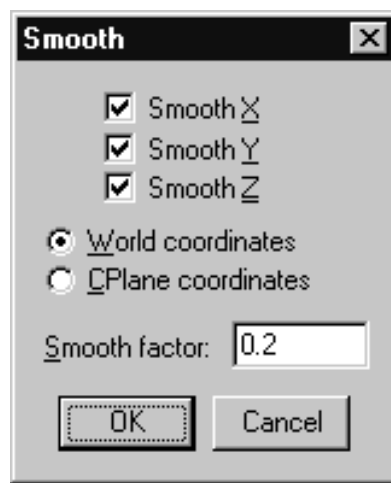
- Open the Edit Layers dialogue box and create a new layer entitled: Nu\_headsurf\_smooth, set its colour to red and then make it the currently active layer by placing a check in the check mark column and pressing apply (Hint -- if you're having trouble, just keep clicking with your mouse in the check mark column until the "Apply" button is no longer greyed-out, then press apply). Confirm that the layer is now listed as currently active in the info box at the lower status bar.
- In Any Viewport carefully click on the head surface, it will highlight.
- At the command line type: Copy and press Enter. The system will respond with the following prompt:  
**Point to copy from (Vertical InPlace):**
- Type IN and press ENTER.

- With the head surface still highlighted from the toolbar choose the Edit Layers icon  and from its flyout select the change layer icon which will open the Layer for Object dialogue box. Locate the layer entitled: Nu\_headsurf\_smooth and double click on it, thus copying all the selected curves on to the appropriate layer. The surface colour should then change to red, if it hasn't it might be because the surface is still selected -- try just clicking in any viewport to deselect it.
- Open up the Edit Layers dialogue box and turn OFF the layer entitled: Nu\_headsurf\_nosmoo, confirm that all other layers with the exception of Nu\_headsurf\_smooth are set to OFF, then press OK to exit.

We have now created a copy of our head surface and put the original away for safekeeping (always a good idea in case disaster strikes). Now that all of the copying and saving to a new layer has been completed we can get on with the business of smoothing the surface just a little bit.

- In Any Viewport carefully click on the head, it will highlight.
- At the command line type: Smooth and press Enter. The Smooth dialogue box will appear as in the screenshot below:

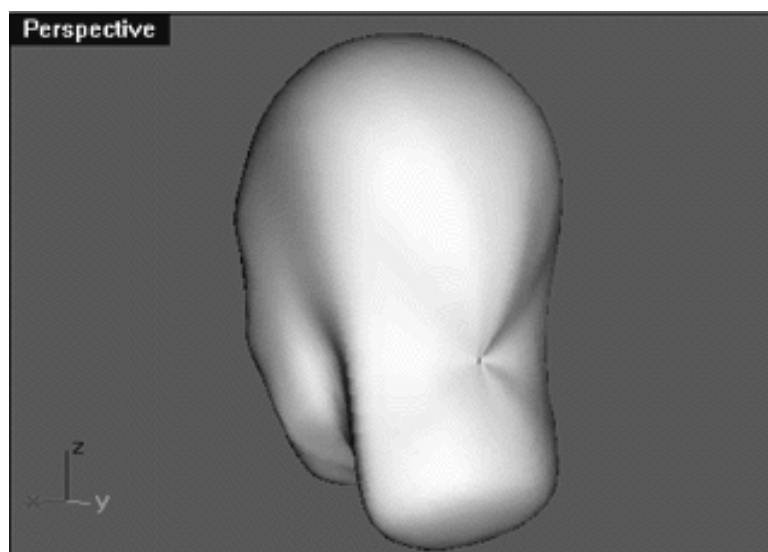




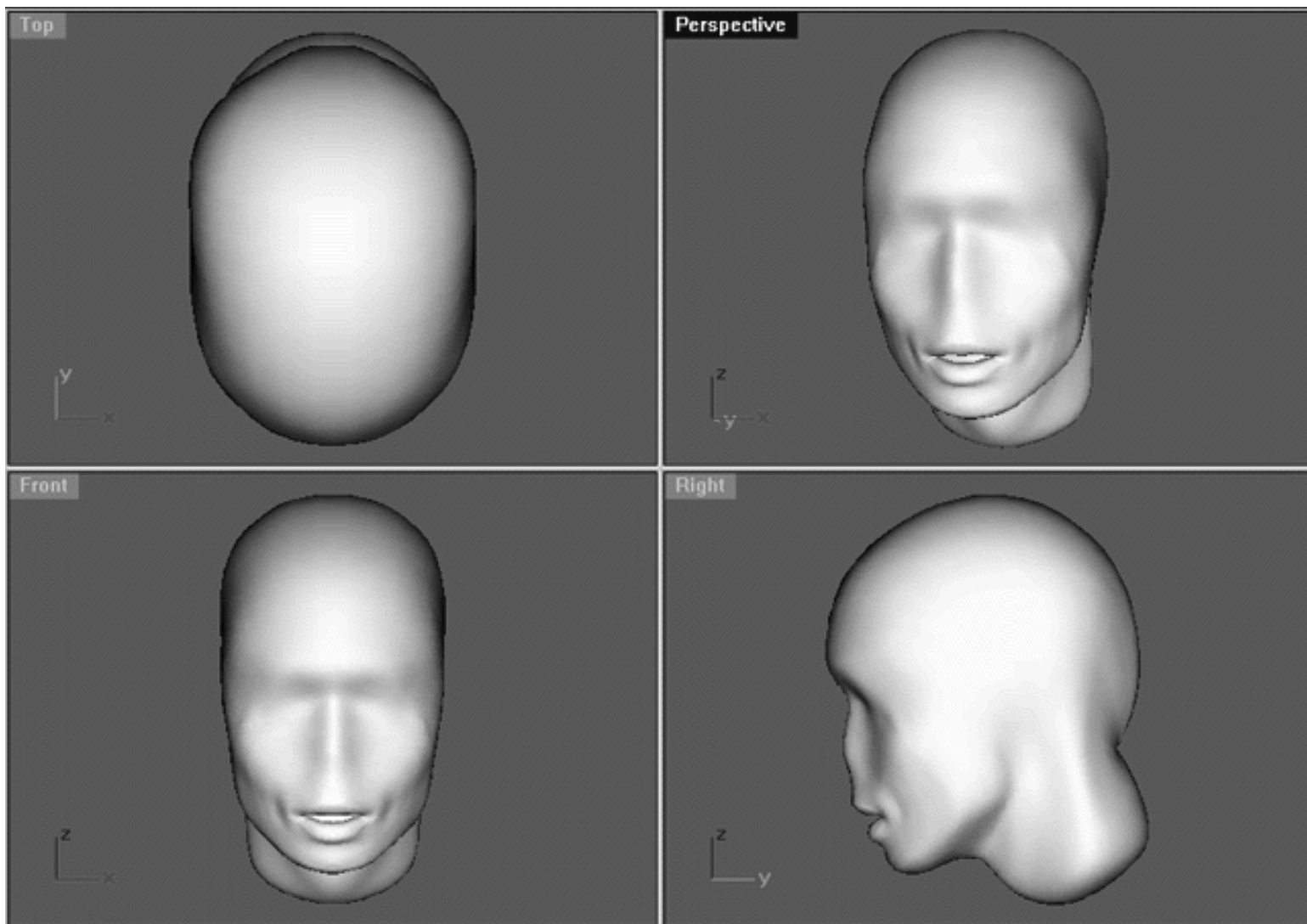
*This screenshot shows the Smooth dialogue box set with its default options.*

- Type in a new value for the Smooth factor, set it to: **0.02** as its default setting is far too radical for our purposes. Once done, press OK to complete the operation.
- Watch the head surface, you will see it "shrink" ever so slightly as Rhino recalculates the position of the control points. Do a quick shaded render and have a look at the surface, spin the perspective view around and examine the results -- it's better but we could still benefit from just a bit more smoothing.
- Once again, select the head surface and repeat the smoothing operation one more time being certain only to apply a smooth factor of **0.02**
- Do another quick shaded render, spin the perspective view and examine the results yet again. This time the surface looks even better than before, now is the time to stop before we get carried away and go to far.

You may have noticed that at the back of the skull there is still a small degree of visible ribbing. This is really nothing to worry about, we can always just smooth that specific area later if we need or feel so inclined to. It's quite likely that will not be necessary because the head will be covered by hair in that area so such minor imperfections will not be seen.



*This screenshot shows the slight ribbing at the back of head -- nothing to worry about!*



This **All Viewport** screenshot shows the overall result of applying two minor smoothing operations to the head surface.

## Adding Detail -- The Features

From this point forward this is where our project starts to become much more interesting and no doubt is what you've been waiting for since this tutorial began. Having now created a quite reasonable and very usable head surface we can now start to think about adding in the finer details of the face such as the nose and eyes. In many respects this is the most difficult and challenging part of the tutorial because you must really look at the shapes that you see and think about what you need to do before jumping in and doing it. Don't just look at the positive shapes, look at the negative space as well, this is very important. Keep doing quick shaded renders and looking at your work in the perspective view. Spin it around, look at it upside down, right side up, from every conceivable angle and concentrate whilst doing so. Your work flow should go something like this. Observe, think about it, apply changes and observe again. Then ask yourself, does it look right? If not, start the whole loop over again until it does. This is why learning to model well takes so much time, it is an iterative process.

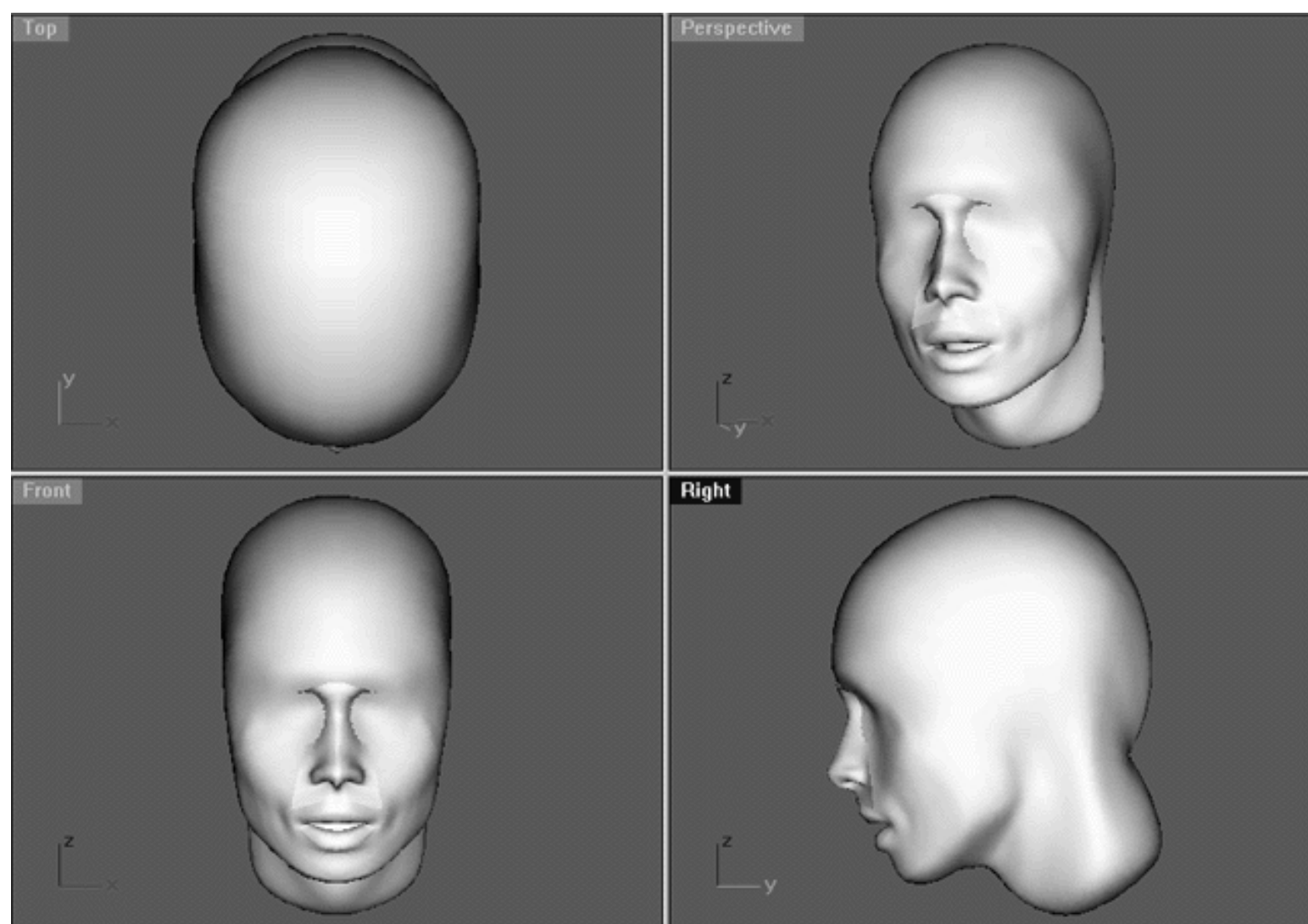
Despite the fact that our head surface is looking much better there are still a few areas that we need to address, do you have any idea what they might be?

Take a few moments to think about that question before reading the next sentence...

When I look at this head surface the first thing that jumps out at me straight away is that there seems to be a lack of definition at the brow bone area, especially at the temples near the outer corner of the eyes. Look at the head in the Front Viewport and notice how the brow bone seems to lose all its definition at either side of the face. In addition it seems to me that some work needs to be done to the eye sockets, they need to be deepened near the bridge of the nose.

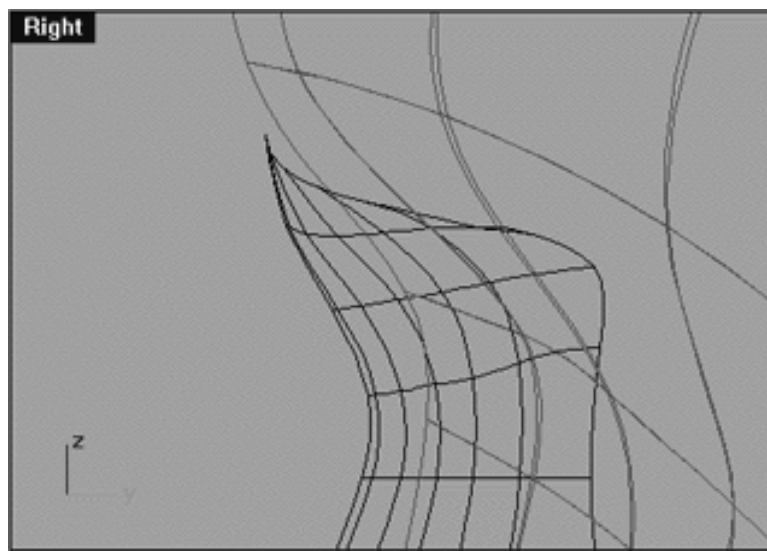
Right then, now that we have some idea of a few of the specific areas that need to be worked on we can now concentrate on improving each of them. Something that will definitely help us better visualize what we are doing will be to start adding in some of the geometry we created earlier, in this particular case the nose.

- Open the Edit Layers dialogue box and turn ON the layer entitled: Noze\_Surface, then press OK to exit.
- Once done, perform a quick shaded render of all the viewports, your monitor should now look something like the screenshot below:




*This **All Viewport** screenshot shows the layer entitled: Noze\_Surface has now been made visible and will aid us in further refining the finer details and features of the face.*

Now that we can see the nose "roughed" into position it's quite clear that something needs to be done at the brow bone area. Take a close look at the screenshot below, you'll see what I mean.

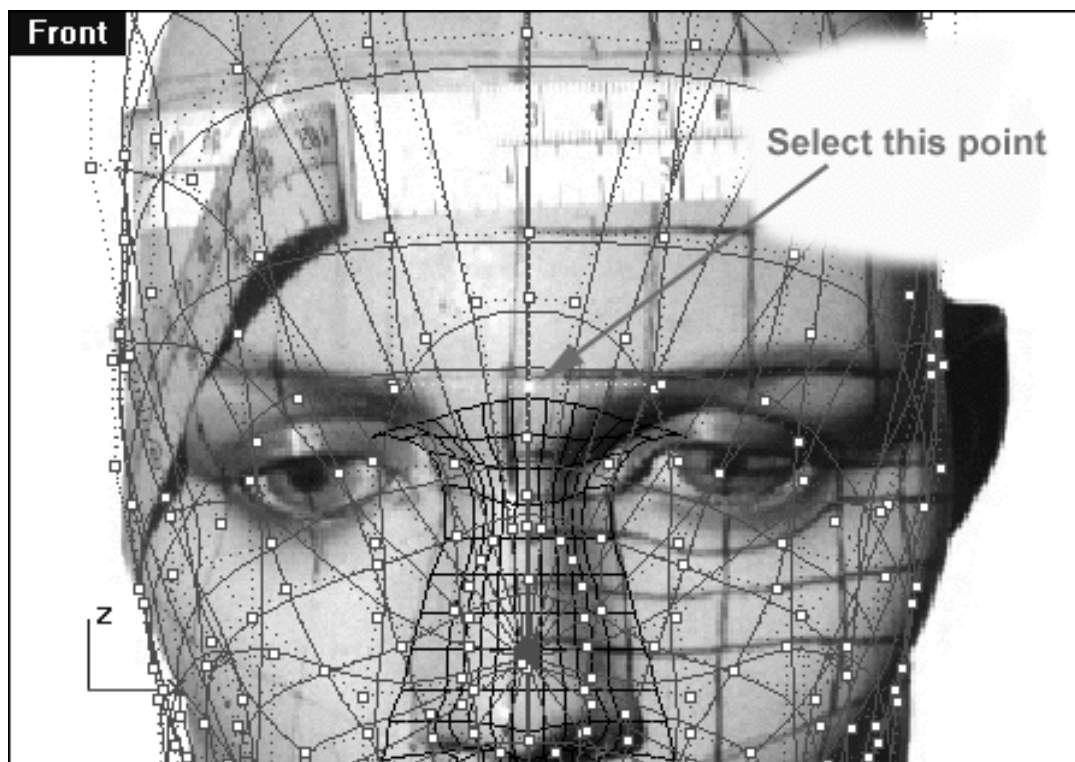


This **Right Viewport** screenshot shows the nose surface (black) and the head surface (red). Observe how the nose surface is sitting forward and that there is a fairly large gap between the brow bone and the nose. Of course we could push the nose backward into the head a bit but we really don't want to do that because the alignment is reasonably good at the base of the nose at the upper lip area. In addition, the general angle of the nose is what it should be so logically our best and most sensible option is to "bump-out" the brow bone a bit and give it some definition.


We will now bring the brow bone forward just a bit to give it the added definition we require.

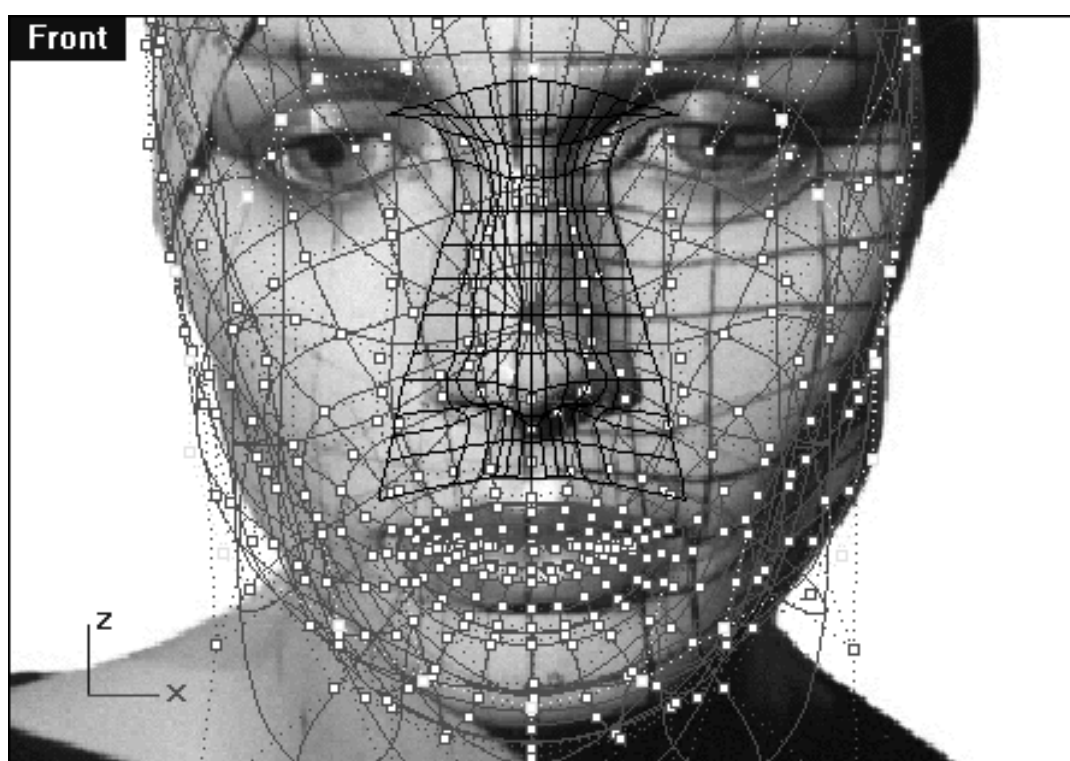
- In Any Viewport click on the head to select it, it will highlight.
- Turn on the control points (not edit points) for the now selected head surface. To do this choose the Control Points On/Off icon  from the toolbar or type: PtOn at the command line and press Enter.
- Now zoom in the Front Viewport so that you can clearly see the edit points that run along the isoparm at the brow bone, then select the point shown in the following screenshot.





This **Front View** screenshot shows the point that you should select on the isoparm running along the brow bone.

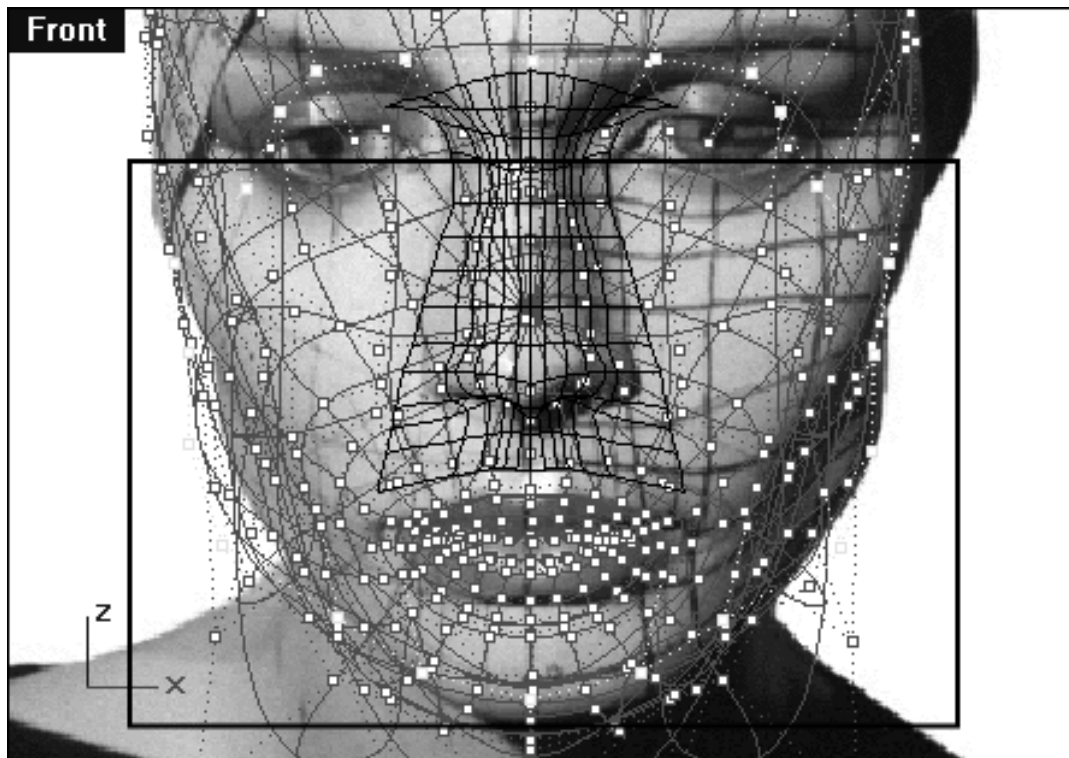
- From the main menu bar select: Tools, Toolbar Layout, Edit -- The Toolbars dialogue box will open. Locate the organic toolset, highlight the organic toolset selection by clicking upon it, then press the Show button and finally press the Close button to complete the operation. The organic toolset should now be visible and you can drag it where you like or dock it along one of the sides of your screen.
- With the point at the brow bone still selected, locate the Sel U icon  within the organic toolset. We actually want to select the points running in the V direction so to do this just right click your mouse on the Sel U icon. Once done, all the points running along the brow bone isoparm in the V direction should now be highlighted as in the following screenshot:



*This **Front Viewport** screenshot shows that all the points running along the brow bone's isoparm in the V direction have now been selected.*

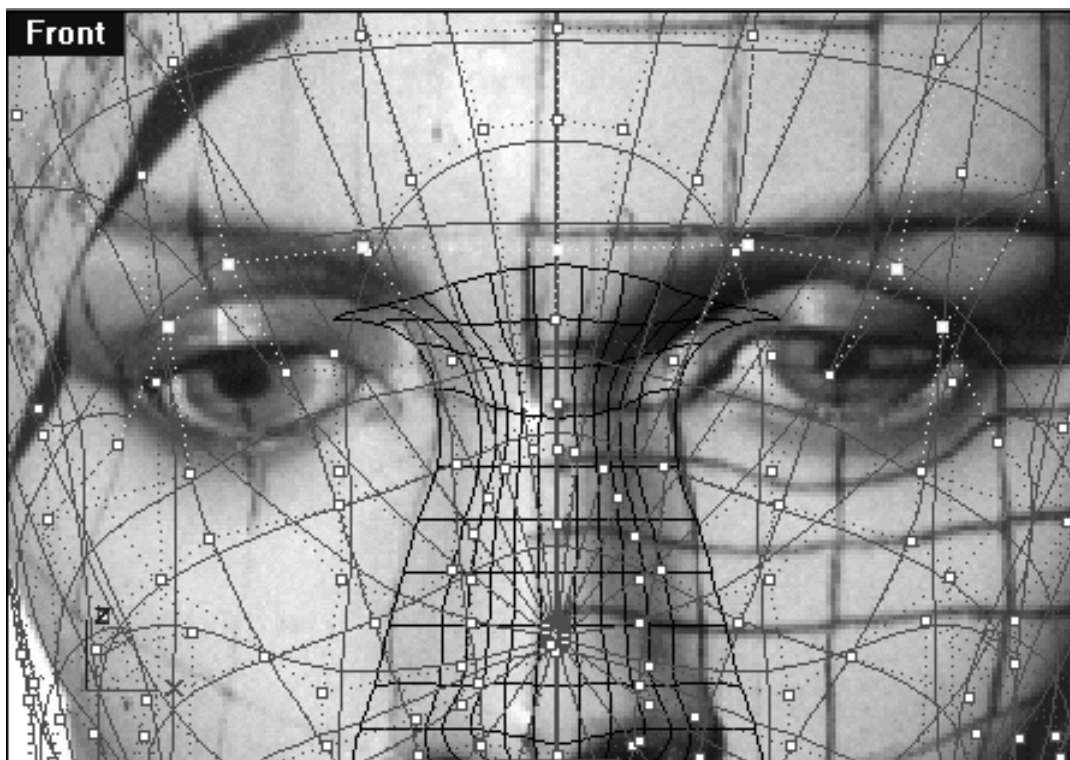
Right then, we now have all the points running along a given isoparm in the V direction selected, however, the problem is that we don't want to move all of these points -- only a few of them.

- Hold down the Ctrl key and frame select **ONLY** the highlighted points as shown in the following screenshot.



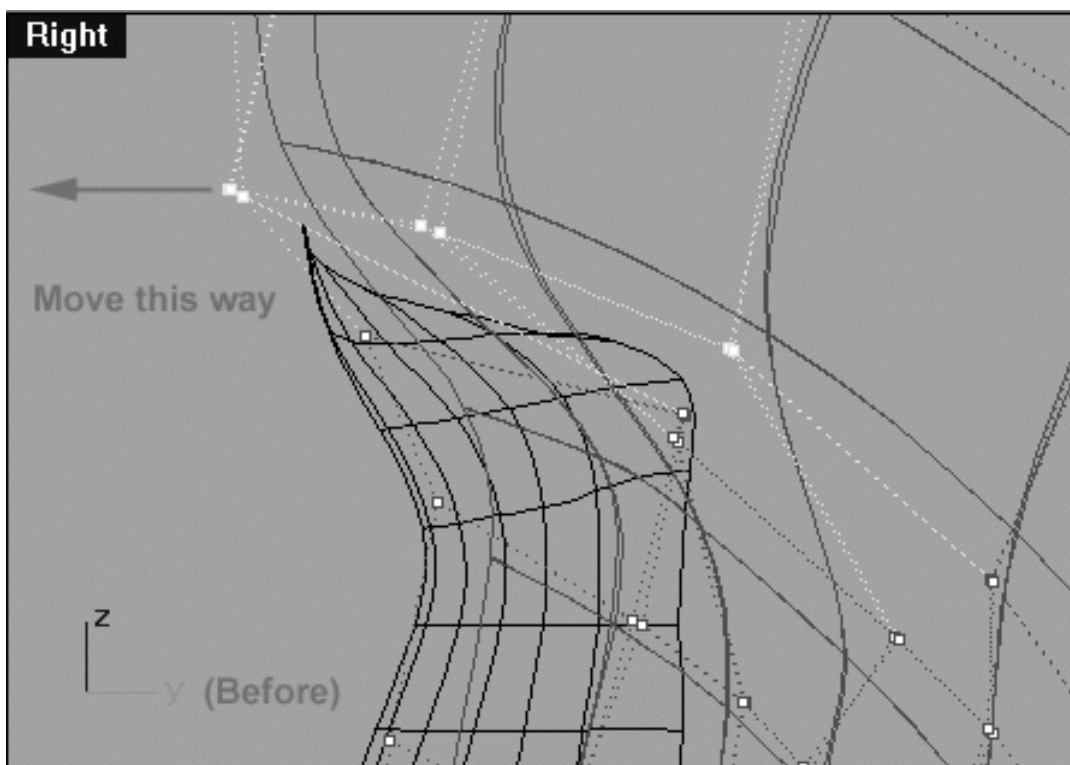
*This screenshot shows only the highlighted points that should be selected.*

- Once you've finished dragging out the selection frame whilst holding down the Ctrl key when you release your mouse button only the following points should now be selected as in the following screenshot:



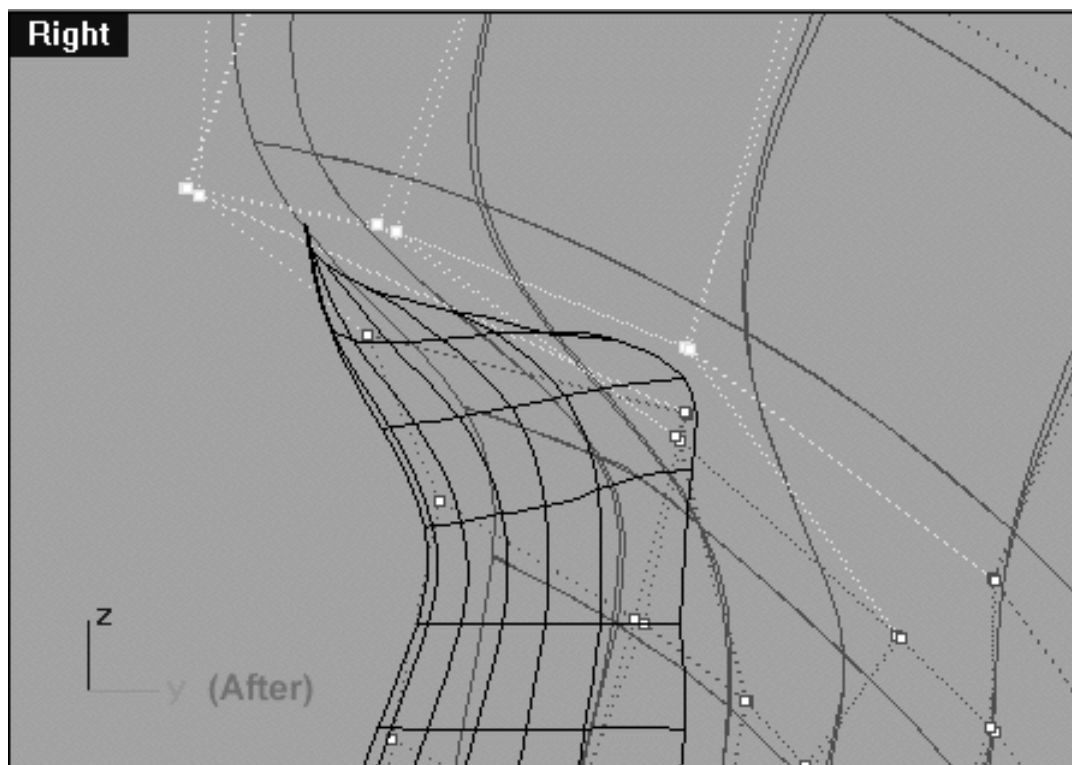
This **Front Viewport** screenshot shows that now only the points that we wish to refine have been selected.

- We will now want to start working in the Right Viewport, so zoom in rather tightly on the brow bone / bridge of nose area of the face.
- Next, hold down the Shift key, then click on an move the selected points along the Y axis. It's important that you don't go wild or let things get too far out of hand when moving these points. You don't need to move them very far, just enough to add definition in this area. If you happen to move the points too much your head will start looking like an ape's as opposed to a humans, so take it easy and see the following before & after screenshots:



In this **Right Viewport** screenshot the proper points have been selected and are ready to be moved along the Y axis.

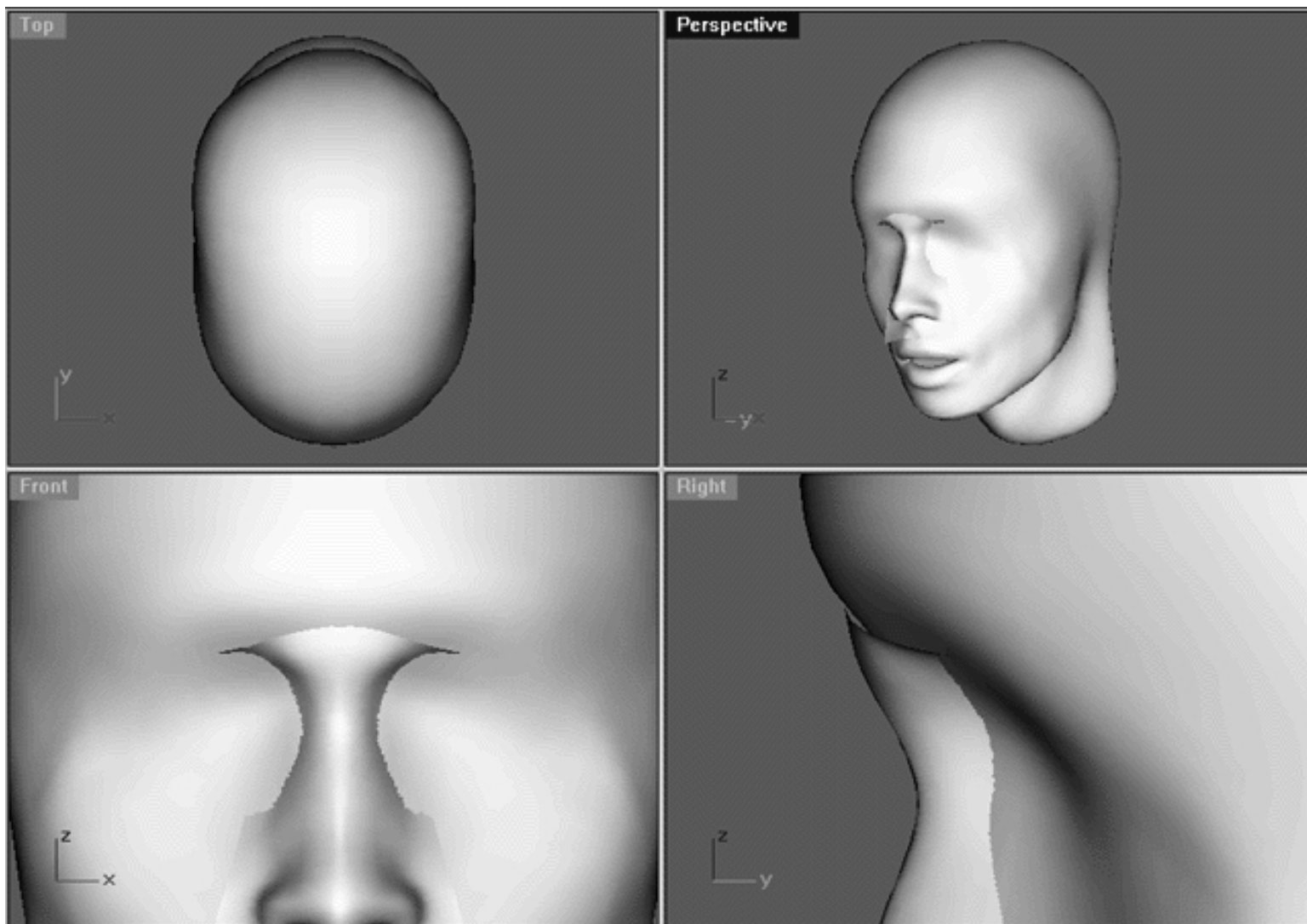




*In this **Right Viewport** screenshot the proper points have been selected and moved along the Y axis. Observe how the profile curve of the head just touches the end of the nose surface now. Remember, don't be too heavy handed with this step, you don't need to move the points very far at all, just enough to add the needed definition.*

From this point forward it's really quite important that you constantly check your work in shaded view after each and every adjustment to the surface. You should spend a lot of time looking at the shaded image in the perspective view and don't forget to spin it round from every possible angle, checking and re-checking your work throughout the entire process.



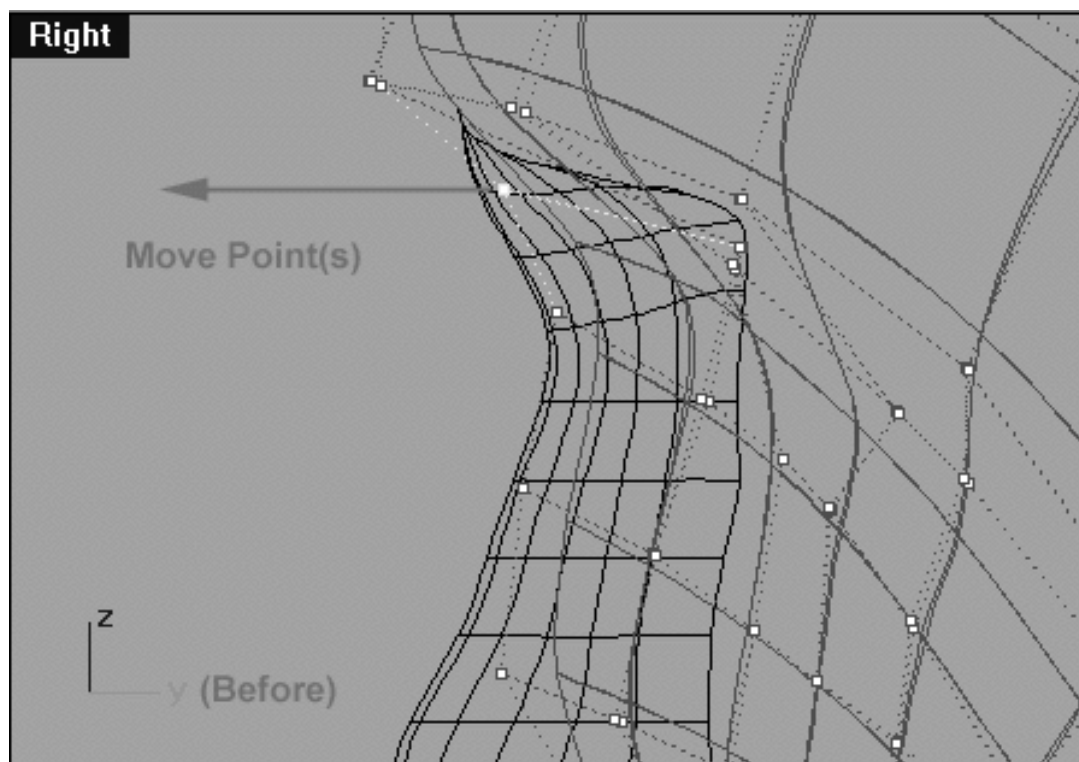


This **All Viewport** screenshot above show the result of the recent refinement to the brow bone area, thus bringing the area forward and creating greater definition.

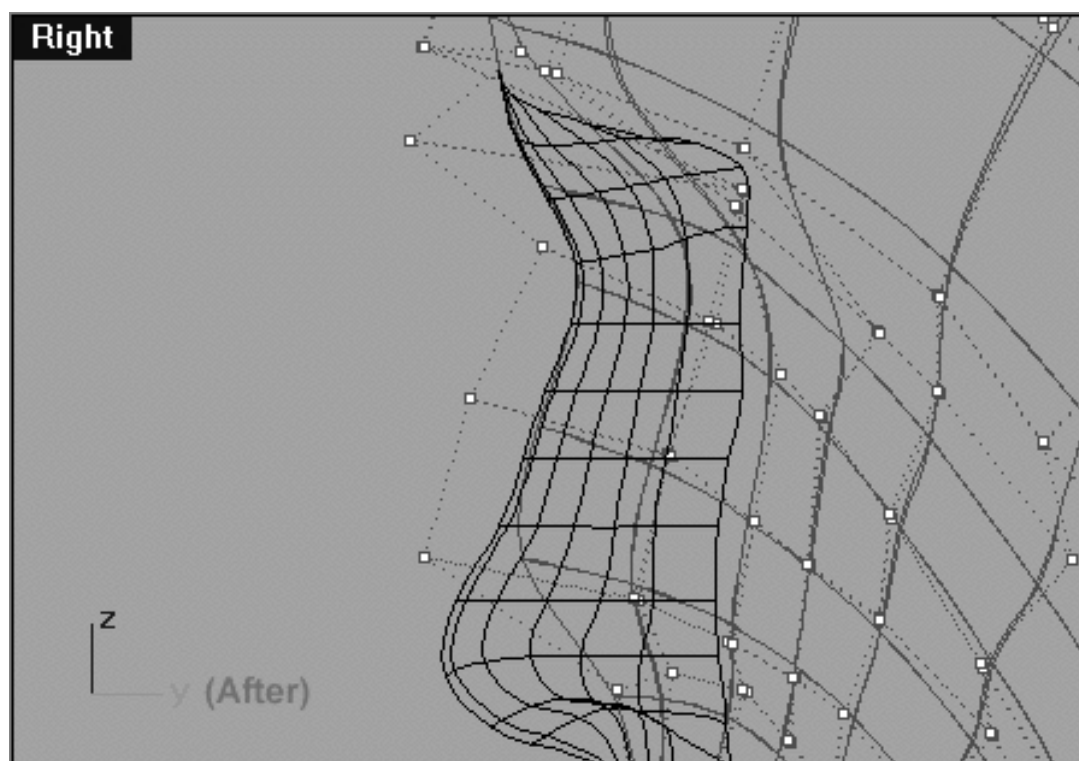
## Take it to the Bridge

Now that we've moved the brow bone forward a bit our next task is to move the head surface's U direction profile isoparm (in the nose area only) forward so that it follows a bit more closely the inner contour of our nose surface when viewed from the Right Viewport. This is quite easy to accomplish -- really!

- For this operation you'll want to be working in the Right Viewport. Zoom in so that you can clearly see the applicable control points, the nose surface and the head surface. Once done, select the point shown in the following screenshot, hold down the Shift key and move it towards the front of the face along the Y axis, see the screenshot entitled: (Before). \*Tip -- As with your editing earlier don't be heavy handed, it's not necessary to move the point very far, just bring it out a bit.
- Once you've finished moving the first point, continue by selecting the next point (just below) and repeat the operation. Your main aim should be to move the U direction isoparm of the head surface forward (in red) so that it sort of follows the profile of the nose surface (in black). Don't worry if you can't get it perfect, it does not have to be - the main thing is that it is close. \*Caution -- what you do want to avoid is pulling the head surface so far out so that it pops through the nose surface which is lying just on top of it. If this happens you've gone too far, move the point back and try again.

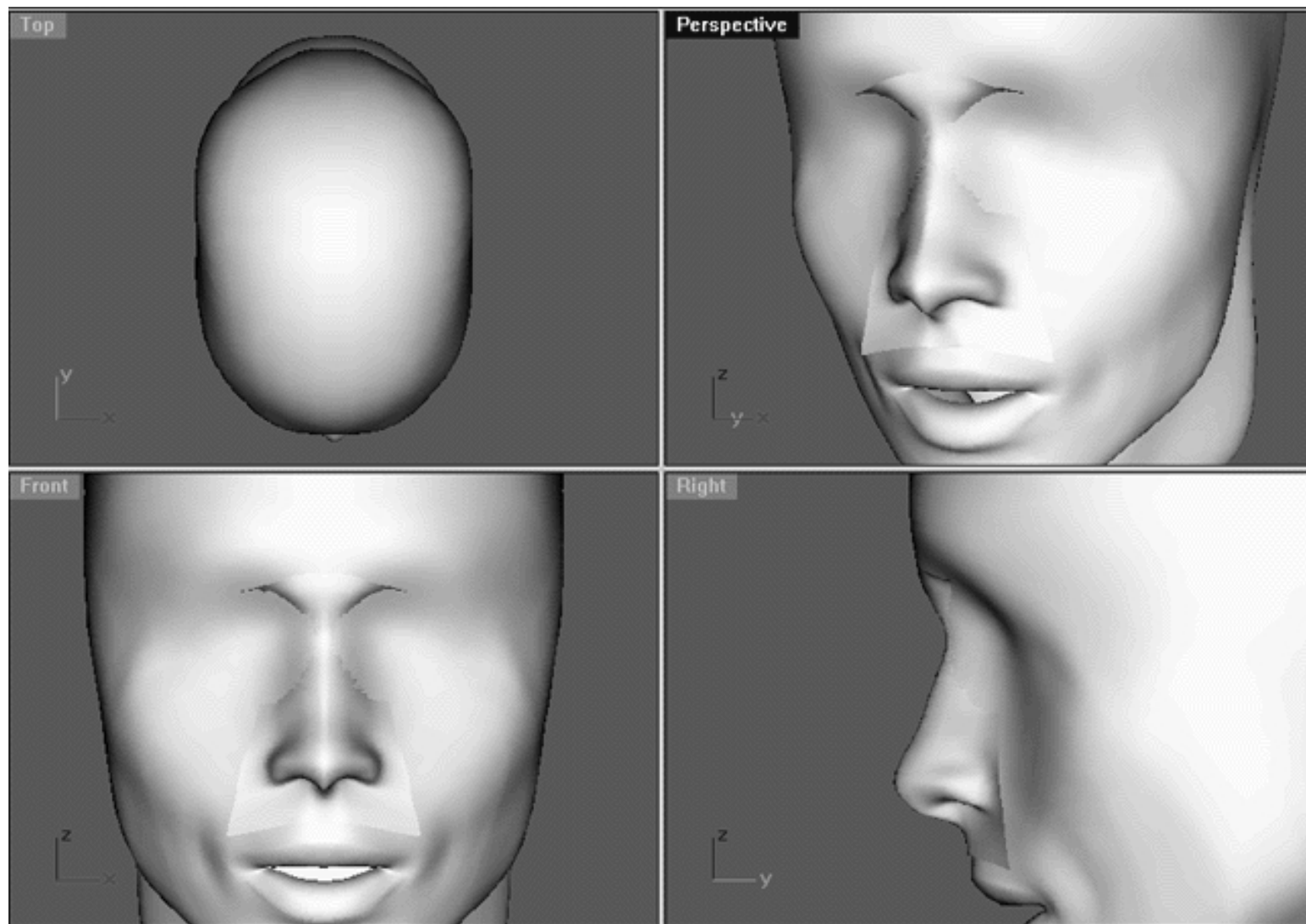


This **Right Viewport** screenshot shows the 1st point you should select prior to moving towards the front of the face along the Y axis.



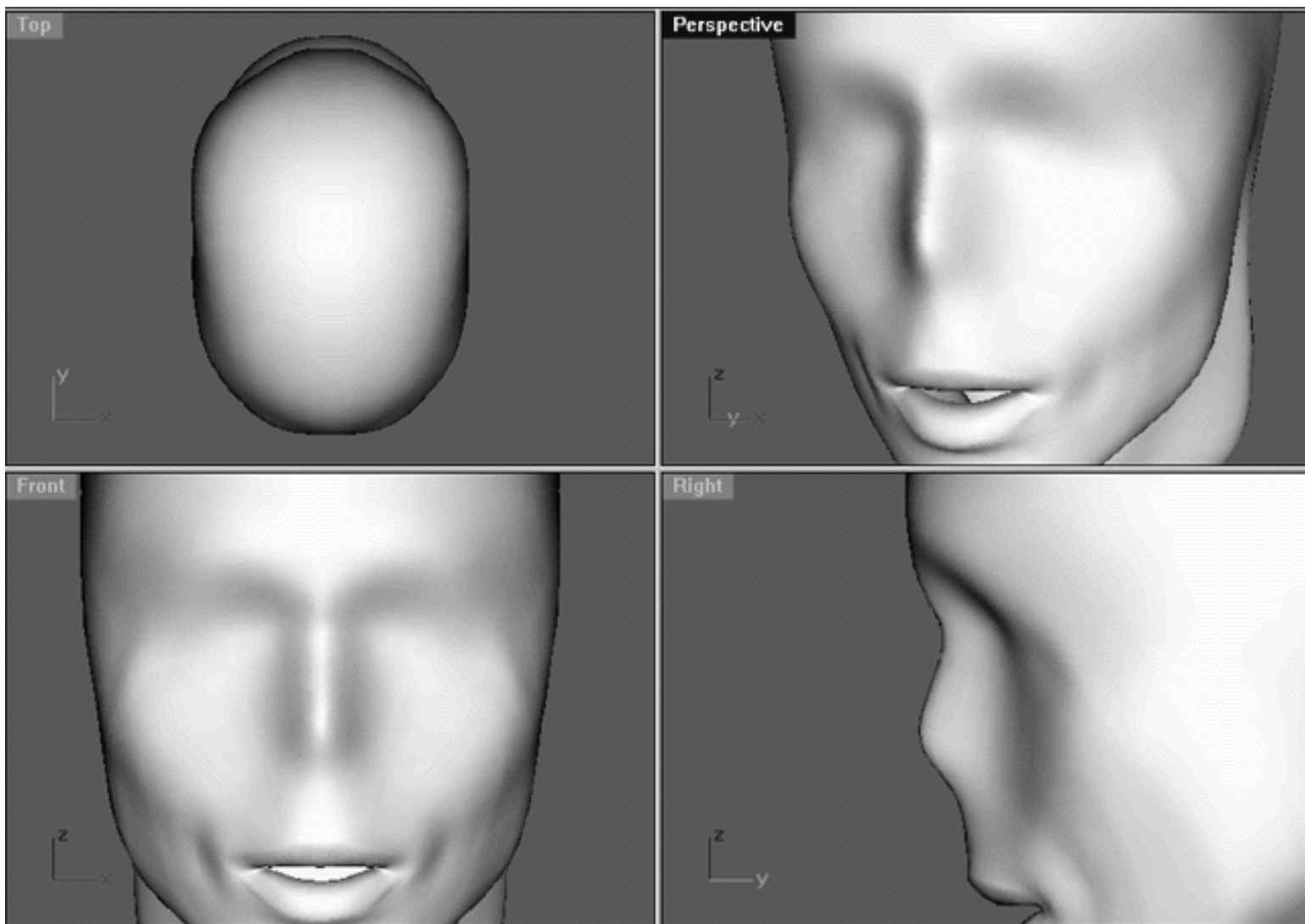
This **Right Viewport** screenshot shows that a total of 5 control points have now been moved towards the front of the face along the Y axis.

The modifications you've just made to the head surface will really become quite apparent when you have a look at it in a shaded view as in the following screenshot:



*This **All Viewport** screenshot observe how the refinement has also improved the area surrounding the sides of the nose and the inner corners of the eye sockets.*

Another worthwhile test to perform at this stage is to temporarily hide the nose surface and just look at the changes that you've made to the head as in the screenshot below:



Here is the same **All Viewport** screenshot as before, however, this time the nose surface has been hidden allowing the changes we've made to the head surface to be revealed. Even without the nose surface in place and visible you can see the improvement to the sides of the nose, bridge of nose, eye sockets and brow bone area.

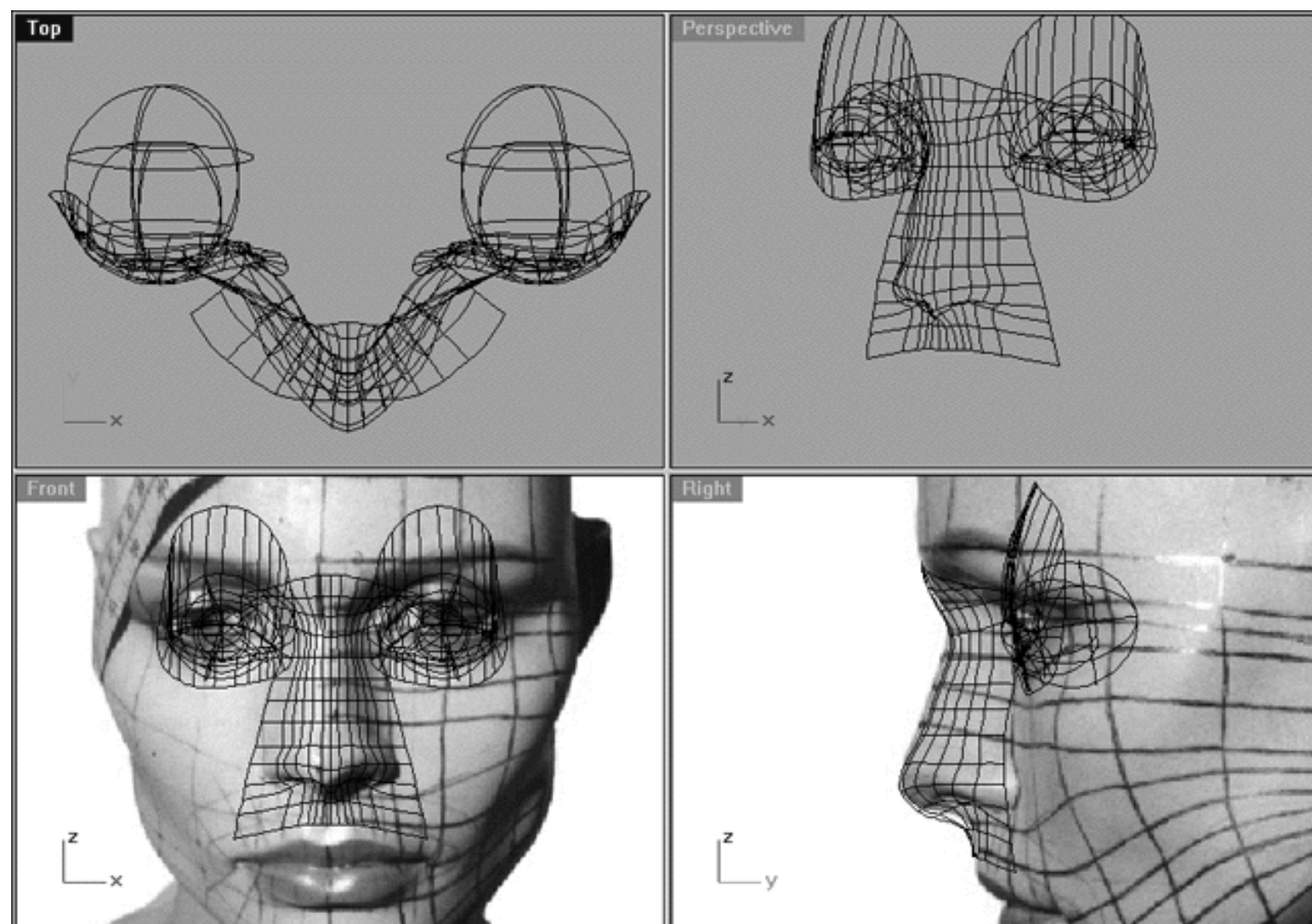
## If The Nose Fits -- Use It!

Things are looking much better and we are now much closer to having a nose that is blended into the head surface, that said, there is still a fair amount of work that needs to be done. Although our main aim is to blend the nose surface into the head surface there is more to consider than just simply that. The area of the face we are working on is in fact quite a complex surface with more than a fair number of hills and valleys to contend with. If that weren't enough to think about we've got a bunch of separate component surfaces, (i.e.. the head, nose and eyelid surfaces) all running into and merging with each other at various locations. Obviously we want the transition areas where each of these surfaces meet to contain a smooth blend and achieving this will require us to think about more than just one surface at a time whilst performing many of our adjustments.

In order to accomplish this we will have to be able to see multiple things in place, this means making our eyelid and eyeball surfaces visible and moving them into their correct locations. I've made your life a whole lot easier by doing this for you and you'll find these surfaces in their correct positions on the layer entitled: Eyes\_Basic\_InPlace. Fine I hear you say, but how does one go about doing this on their own? The answer is that it's easier said than done and essentially requires trial and error on your part. That said, there are some general rules in respect to the proportions of the human face that will make it a bit easier. One key measurement is always remember to check that there should be a distance of about one eye between both of the eyes.



Of course, there are many individual variations to this rule but in general it's correct. This is very important measurement as if the eyes are too close together your character will seem "beady eyed" and too far apart it will seem "wall eyed" either way, something about the face will seem and feel wrong. The dead centre of the eye (the pupil) should fall on a line parallel to that of the sides of the mouth.



This **All Viewport** screenshot shows that the layer entitled: *Eyes\_Basic\_InPlace* has been turned on and in addition to the nose surface the eyelid surface and eyeballs are also now visible. I've temporarily hidden the head surface so that it would be easier to see the placement of the objects and their relationships.

Now that you've had a close look at the screenshot you may be wondering...

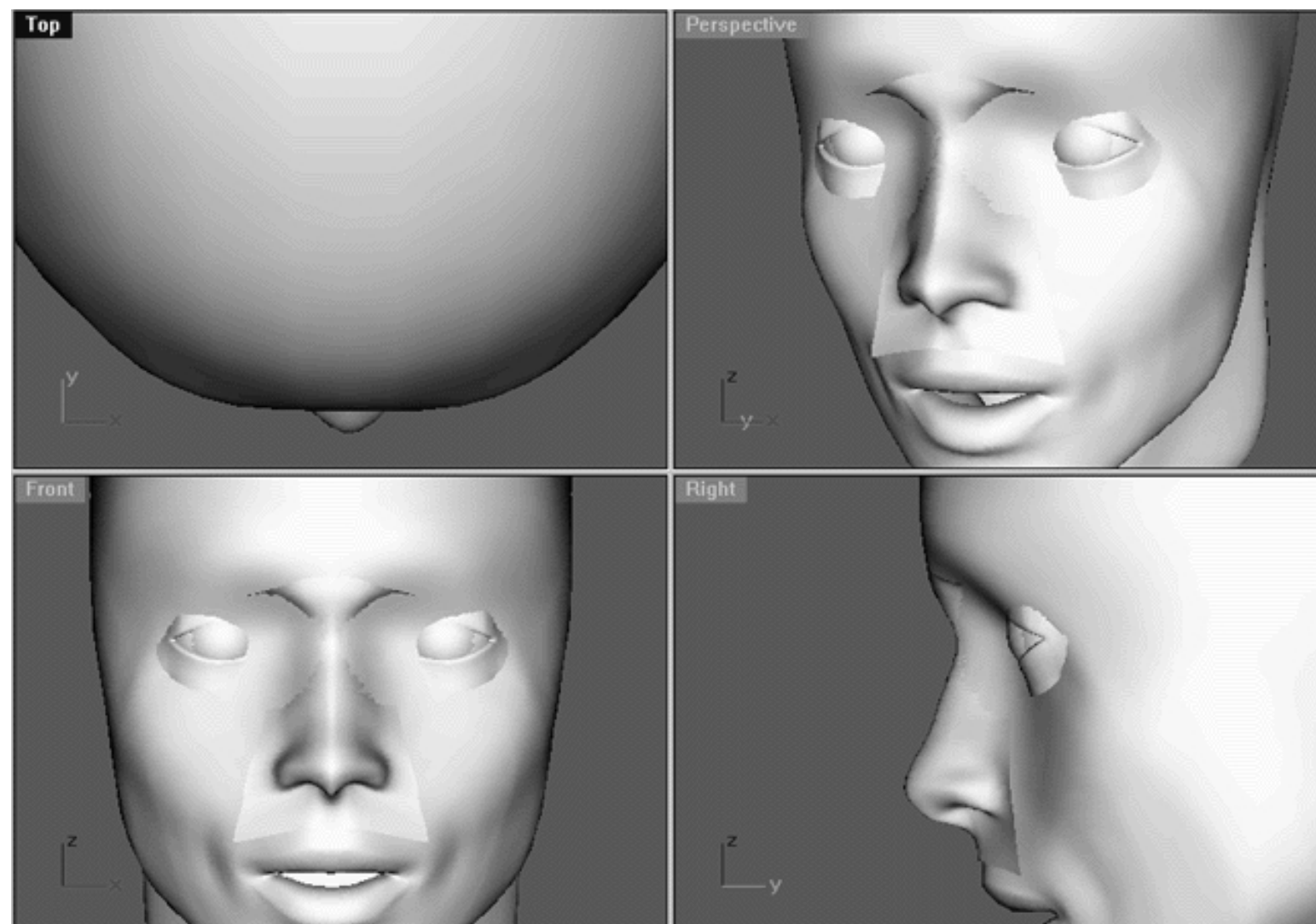
**Q:** Why was the geometry associated with the eyes lower (along the Z axis) in the front view than they appear to be on our model in the background reference image?

**A:** Because the eyes on model in the background image aren't quite in the correct location to begin with! In addition, the head is looking downward and is on an angle. Keep in mind that our background image is not perfect, it's only for basic reference.

**Q:** Looking at the Right View it seems that the eyeball and eyelid surface are on an angle, is that correct?

**A:** Yes. Remember the head is tilting downward so these surfaces must also be placed on an angle.

Right then, we now should take a look at our main surfaces in place, however, this time we will display the head surface and do a shaded view. Hopefully this will reveal much more about nature of our surfaces and point us towards what needs to be done.



*This **All Viewport** screenshot the head surface has now been displayed making it visible. In this shaded view we can see all the major surfaces, namely the eyes/eyelids, the nose and the head surface itself. It's pretty clear from looking at these images that the eye sockets are going to require some additional attention. Obviously because the corners of our eyelid surfaces are currently obscured by the head surface itself the eye sockets will need to be deepened, especially in the area near the tear duct.*

Oh yes, I should point out that most people would have just trimmed out holes for the geometry of the eyes by this stage -- but hey, we are not most people! In some respects doing this makes things a little easier for the artist because you can see the edges created by the trim a bit more clearly and then adjust them accordingly in order to create tangent surfaces for purposes of blending. However, I prefer doing things the hard way and the reason I've not trimmed out the eye sockets is because once again trimming, splitting or creating geometric blends of any kind is it's against the central core of the Cinemagic philosophy, so we shall avoid it like the plague. You will be amazed just how much lighter and more responsive your models will be when animated just by avoiding all that nasty trimming.

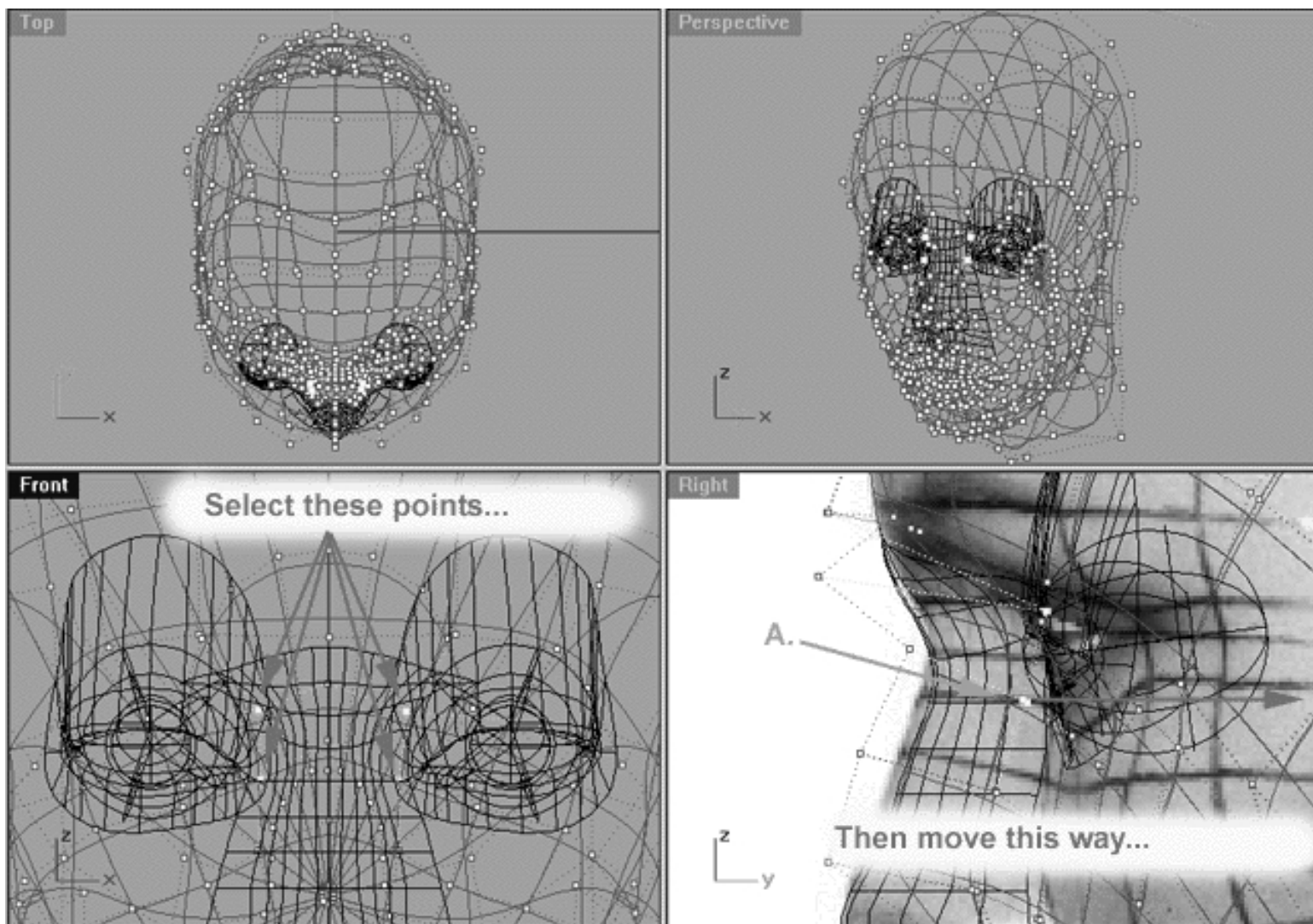
# Sorting Sockets

Now although we are still really working on the nose I'm going to take us on a short detour during which we will concentrate on the eyelids and their sockets. We will temporarily put the work we are doing to the nose on hold for a few moments because it's likely that the adjustments that we make to the eyelids/sockets will also change or distort the surface surrounding the nose as well. It doesn't make much sense to get the nose perfect at this stage only redo it all again later.

In order to save you some more time I've made an exact copy of current head surface and created a new layer entitled: **Nu\_headsurf\_smooth\_2**

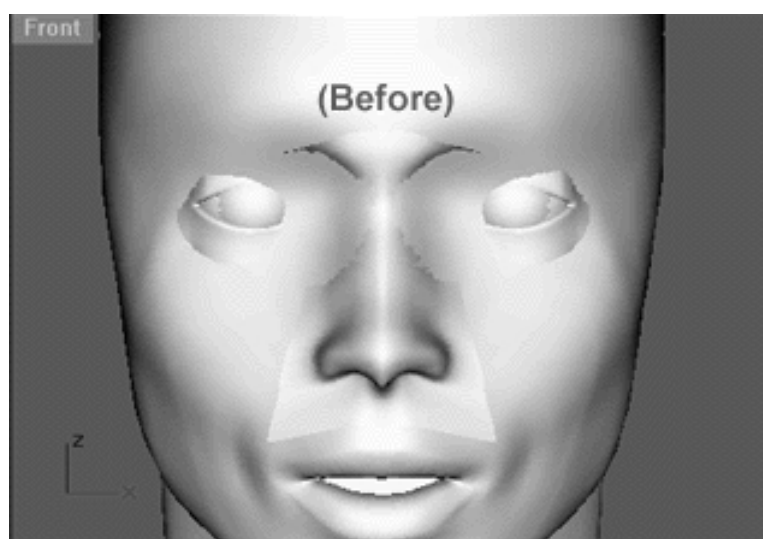
- Open the Edit Layers dialogue box and turn ON the layer entitled: Nu\_headsurf\_smooth\_2 and set it as the currently active layer.
- Turn OFF the layer entitled: Nu\_headsurf\_smooth and press OK to exit.
- In any viewport select the head surface and turn on its control points.
- Zoom in the Front and Right viewports so that the area surrounding the eye sockets is clearly visible then in the Front Viewport select the 4 points shown in the following screenshot. \*Tip -- to select multiple points be sure to hold down the Ctrl key whilst picking.
- Once you've selected the points shown, hold down the Shift key and in the Right Viewport click on the point labelled (A.) in the screenshot and move the points roughly 10.088 units along the Y axis.





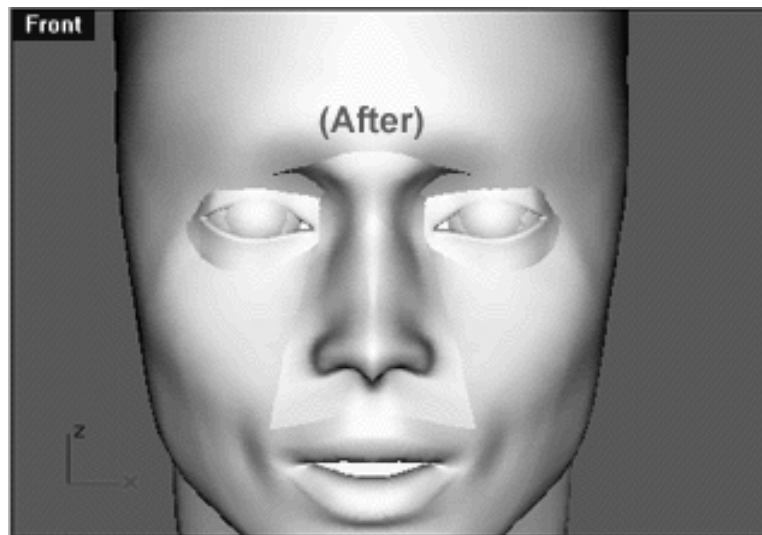
This **All Viewport** screenshot shows the 4 points that you should select in the Front Viewport. Remember in order to select multiple control points hold down the Ctrl key whilst picking. Once the 4 points have been selected, move your cursor into the Right Viewport, hold down the Shift key and click on the point labelled (A.) (and continue to hold the mouse key down!) while moving the 4 selected points roughly 10.088 units along the Y axis.

Right then, let's have a look at the result as a shaded view and compare the before and after surfaces...



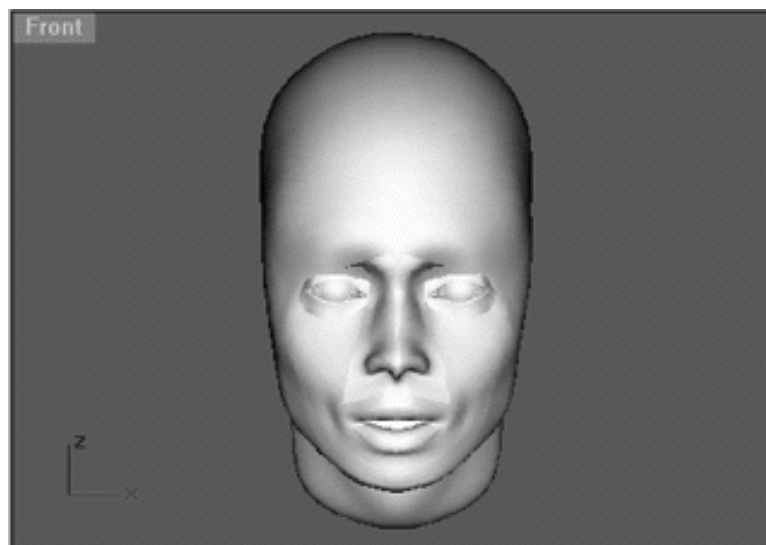
This is the **Before** surface prior to moving the 4 points, notice how the corners of the eyes have been obscured by the head surface.

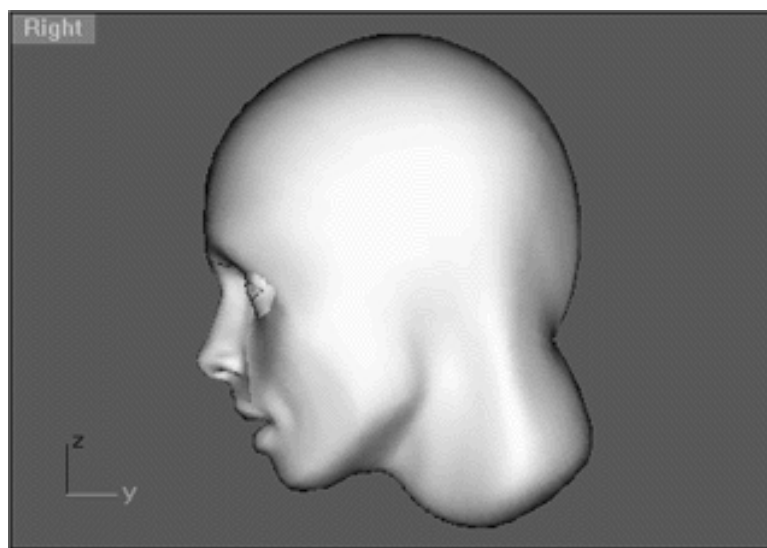




*This is the **After** surface and shows the result of moving the 4 points we selected along the Y axis in the Right Viewport. Observe how the corners of the eyes are no longer obscured and the eye sockets are much deeper -- just what we want at this stage.*

Hopefully you were paying enough attention to notice that although now the depth of the eye sockets is much better overall the brow bone / bridge of nose area also was moved back slightly by the operation. Just look at the Right Viewport, do you see how the profile isoparm is no longer where it was? Of course this is something that we don't want, so you'll have to select a few points and move them so it's back out to where it was previously. Little things like this are simple to fix but easily missed -- remain vigilant!

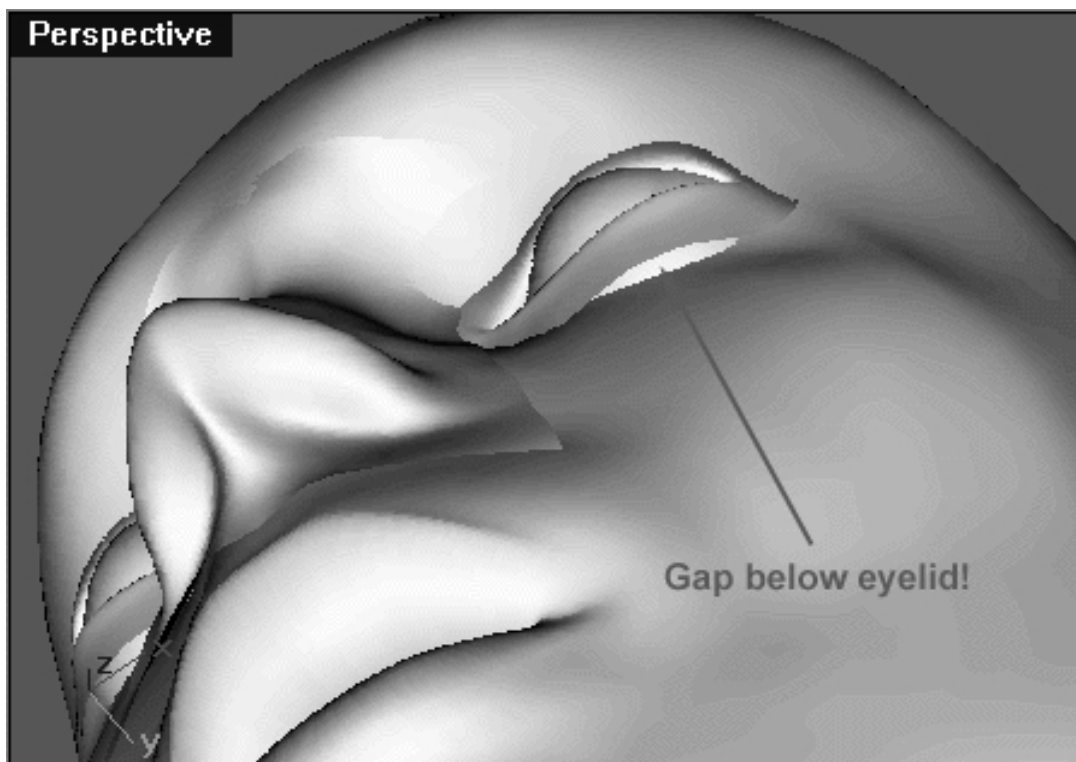




The above **Front** and **Right Viewport** screenshots show that the brow bone / bridge of nose has now been correctly repositioned.

Well it would be fair to say that those last few refinements have made a world of difference and we are steadily moving closer to actually being able to blend in the eyelid surfaces to the head. Still, we are not quite there yet as some problems still exist, let's examine what the problems are at this stage.

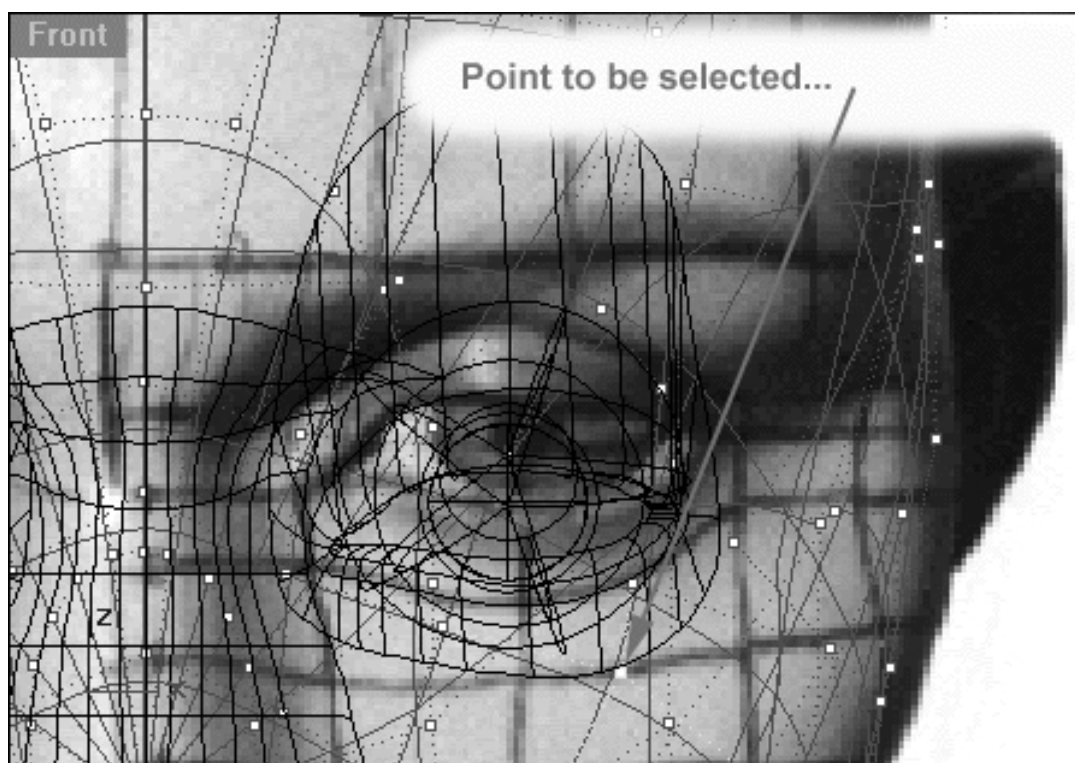
The main problem with our head at the moment is that a whacking great gap exists between the eyelid surface and the head. This gap is located just below the lower eyelid surface with its greatest gap to be found in the area where it meets with the cheek bone. This gap is not very obvious until you rotate the head about in a shaded perspective viewport, then it can be seen quite clearly as in the screenshot below:



The above **Perspective View** screenshot shows the large gap between the lower eyelid surface and the cheek bone.

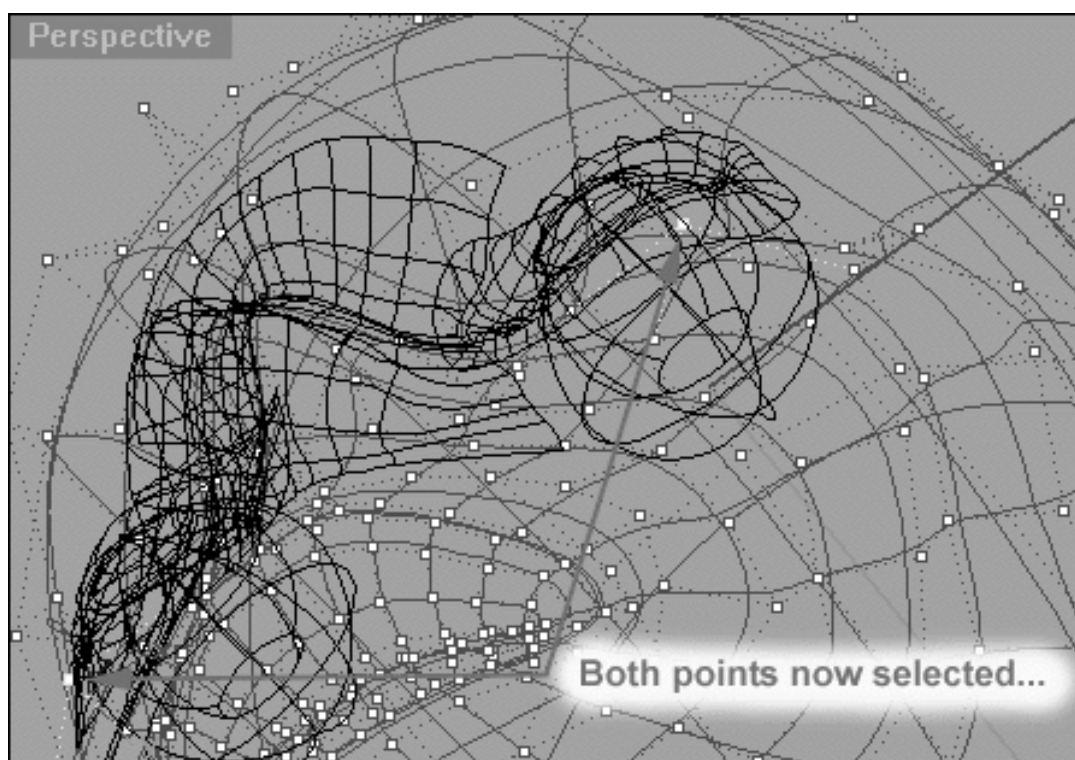
Now that we've identified the problem we can set about fixing it, let's crack on...

- In the Front Viewport zoom in tightly so that the head's left eyelid surface and neighbouring control points are clearly visible. Once done, select the point shown in the following screenshot:




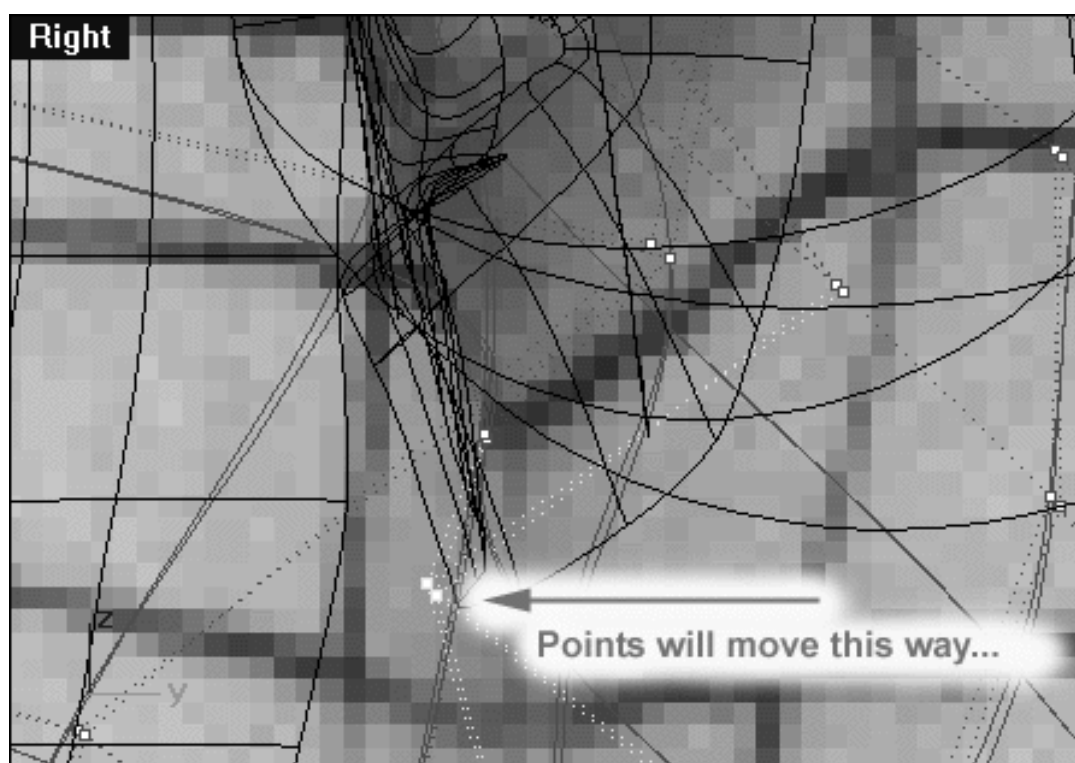
*This **Front Viewport** screenshot show the control point that you should select.*

- Once the point shown has been selected find the same highlighted point in the Right Viewport and zoom in tightly on it. You should see that this point will have a twin sister either next to it or very nearby. Now that you've found the points you need select them BOTH by dragging a frame around them in the Right Viewport. Once you've done this confirm that you've selected the correct points by checking the Top or Perspective views as in the following screenshot:



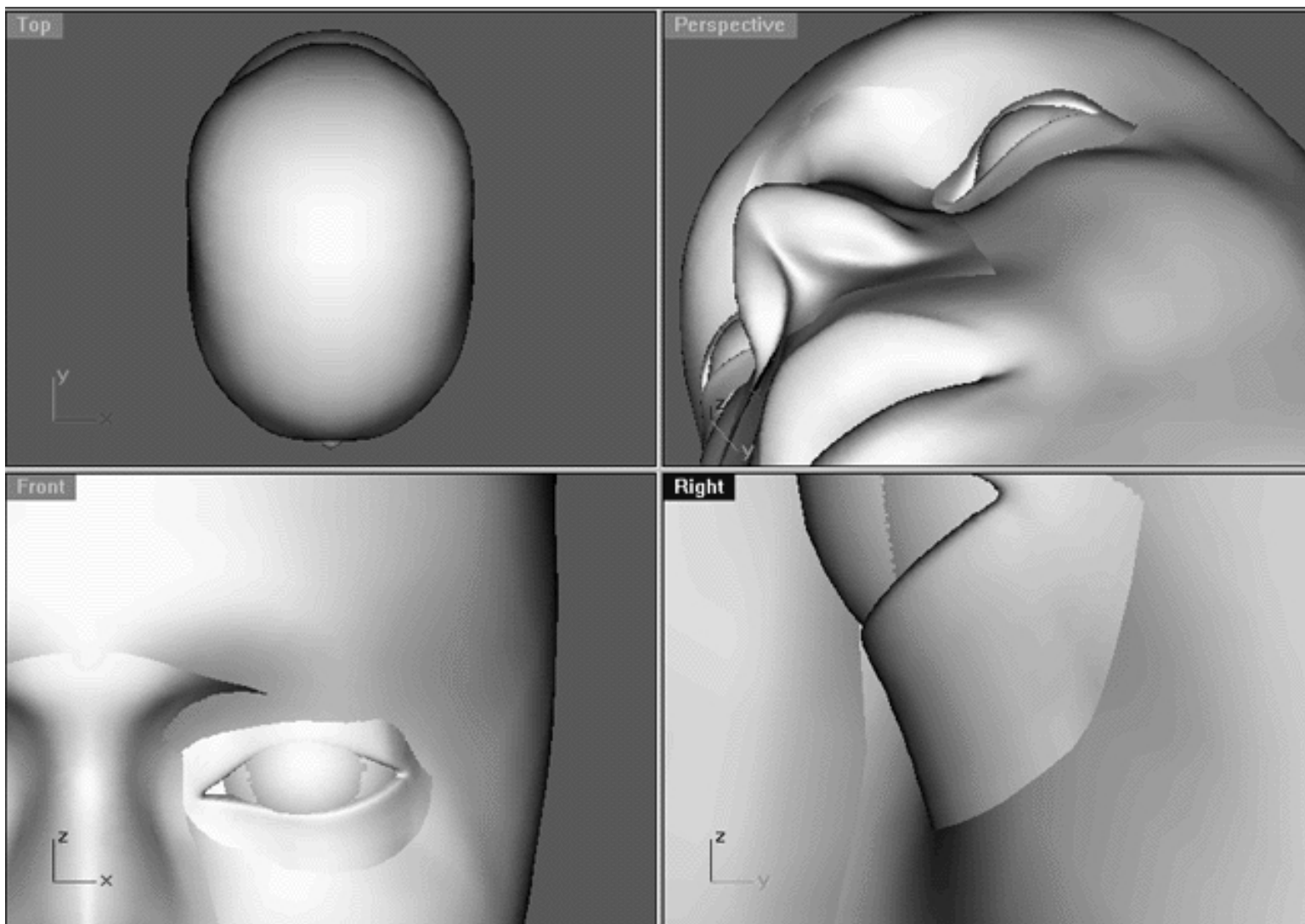
*This **Perspective View** screenshot shows the result of selecting the 2 correct points in the Right Viewport.*

- Now make certain that you are working in the Right Viewport and that it is active (the viewport name label should be dark blue in colour).
- With both points still selected (they should be highlighted) from the **organic tool box** locate the single green downward pointing arrow icon  and with your mouse RIGHT click on it roughly 60 times -- yes I did say 60! Doing this will move the points along the World's -Y axis by very small increments (this is known in Rhino speak as nudging) thus moving the head surface closer to that of the lower eyelid, little by little. Take a look at the following screenshot to see the effect of nudging the points in the right view:




*This **Right Viewport** screenshot shows the effect of nudging the points along the -Y World Axis in the Right View.*





This shaded **All Viewport** screenshot shows the result of nudging the points along the -Y World Axis in the Right View. Observe that in the perspective view the gap between the lower eyelid surface and the head has closed considerably, although it still needs to be moved even further still.

- The surface alignment is much better, however, the head surface still is not quite position where it should be so we will need to continue nudging along the -Y World Axis in the Right Viewport.
- Once again, make sure that both of the points you were moving previously are still selected (highlighted) confirm that you are working in the Right Viewport and that it is active.
- In the organic tool box locate the single green downward pointing arrow icon  and with your mouse RIGHT click on it another 30 times (roughly).

## It's Up To You

By now the gap between the lower eyelid surface and the head should be closed up and it's now time to think again about the brow bone, eye sockets, and cheek bone areas of the face. You've just witnessed how by carefully selecting only a couple of control points at a time and then using the nudge feature of the organic tool box you can move the points in or out, up or down thereby altering the contour of the surface quite dramatically.

Of course the key to all of this facial sculpting is in firstly deciding which control points to select and then which way to move them and just how much. You'd face the same situation and dilemmas if you were working with clay, only in many respects with clay the job is easier because you can "feel" your way around the subject matter in 3 dimensions pushing or pulling the material as required. As ever, be it clay or pixels this is something that is easier said than done but if you are systematic in your approach it needn't be all that difficult.

I would suggest that your work flow should go something like this. First do a quick shaded render of all the viewports and really look closely at the surfaces of your head. Next, focus on the perspective viewport and rotate the view checking the model from all possible angles. Don't just only rotate the view of the head horizontally but also vertically and look at it from above and below, this is very important if you want to be sure that your proportions are correct. From your observations it will become clear which areas are in need of the most initial adjustment. Don't be too ambitious, just choose a small area to work with and concentrate on making it look correct before moving on to the next area. Resist the temptation to skip ahead and avoid doing that at all costs as it can really be just the thing to lead you down a blind alley.

You will need to choose a few control point(s) and then move them and again, it's very important only to select a few point(s) at a time. The question I'm asked most by artists at all levels is: "how do you choose which point to move in the first place?" The answer is by trial and error mostly and this is precisely the reason why you should only move a few points at a time. Remember, when sculpting the undo key is your best friend! If you move a couple of points and look at the shaded view and realize that what you've done looks clearly wrong then just undo the move, no harm has been done. Through trial and error and practice you will get a feel for which points to select and when until this almost becomes second nature to you. Again, this is not that difficult just make an educated guess and 8 times out of 10 you will be right. Look at your model, ask yourself does that bit need to go in or out? Then choose the point(s) that lie directly under that particular area of surface contour and try moving them one way or another, then examine and judge the results. Does it look right? If so, what you've done is correct.

Now that I've pointed you in the right direction and you've some idea of what remains to be done the rest is very much up to you. You've now dug well into the phase of sculpting the head/face where there is really no one single right or wrong way doing things, what is important is that you get the job done not so much how you got there. Much of what you will do during this particular phase of work is more a matter of taste and personal preference than purely a question of what is right or wrong. That said, you must still pay attention to the proportions of each facial feature, look for subtle changes and proceed slowly, carefully and systematically. The truth of the matter is that it would be impossible for me to show you exactly which points you should move at this stage in the tutorial and in what order as there are just too many possible permutations. Besides, the control points I may choose to move and the order I may work in may not be the same as what you would choose to do.

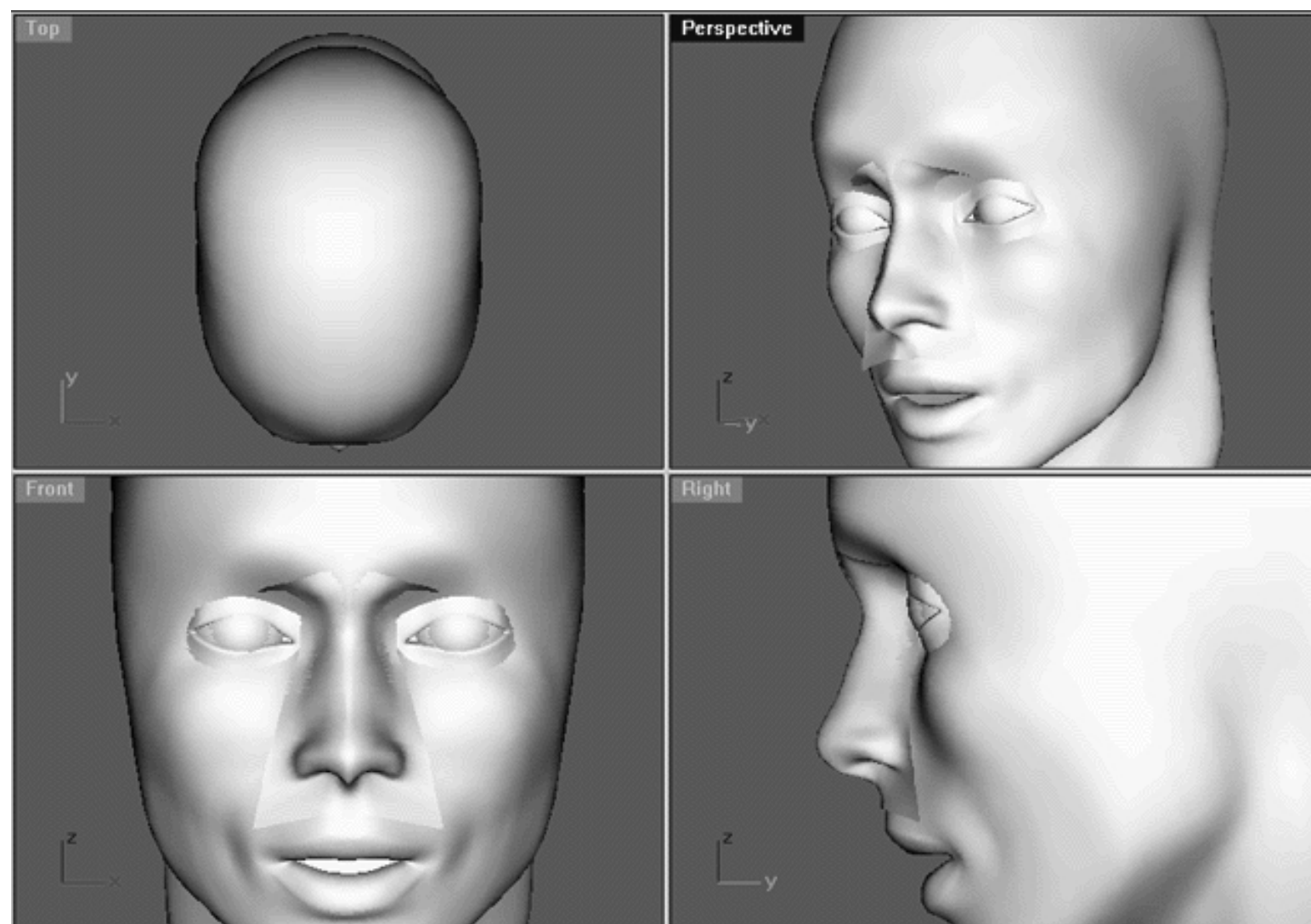
So that you don't feel as if you're being left stranded allow me to give you some specific ideas of what still needs to be done.

- The area directly behind the eyeball needs to be deepened.
- Control points on the head surface near either corner of the lower eyelid surface need to be moved forward along the Y axis (as seen from the Right Viewport).
- The brow bone needs a small amount of refinement near the area where it meets with the nose.
- The cheek bones need to be moved forward along the Y axis (as seen from the Right Viewport).

You can accomplish 99% of these things by first selecting the applicable control point in the Front Viewport, then switching into the Right Viewport, locating the highlighted point and also selecting its twin sister (hold the Ctrl key to select multiple points). Once done and still working in the Right Viewport, move the point either forward or backward by nudging. Examine and judge your results in shaded view, then undo or repeat as required.

How long should you spend on this? As long as it takes, I've spent hours, days, even weeks doing just this type of thing so DO NOT RUSH.

Once you've worked on these areas and feel satisfied your monitor should resemble the following screenshot:



*This **All Viewport** screenshot shows improvements to the brow bone, eye sockets and cheek bones.*



# The Nose -- A Better Basic Fit

Now that most of the facial contours are close to being finalized, we can now return to working on the nose and set about making a better basic fit. Essentially what needs to be done is to remove the excess, unwanted surface bits whilst making sure that all the appropriate edges are as tangent and neat fitting as possible.

We will use Rhino's trimming function in order to remove the bits of the nose surface that we don't need. To do this we will first have to create some "cutting" curves that will act as a path for our cut. As a real world example, imagine that you had a piece of cloth that you wanted to cut into a specific shape. You'd first draw a line on the fabric with a marker so that you can follow it with a scissors. So basically speaking our "cutting" curves are meant to act as a line or pathway for our software scissors "the trim" to cut out -- simple!

But wait a minute, I can almost hear you saying: "I thought trimming a surface was against the Cinemagic modelling philosophy, you're contradicting yourself, aren't you?" Not quite, Yes, it might seem that way but allow me to explain. Using powerful commands such as trim or split is not a bad thing in itself. The fact is that trimming or splitting a surface can be essential tool when modelling and I've got no problems with using it in that way. That said, now let me point out exactly how our method will differ, so pay attention because this is a useful technique that you should become acquainted with.

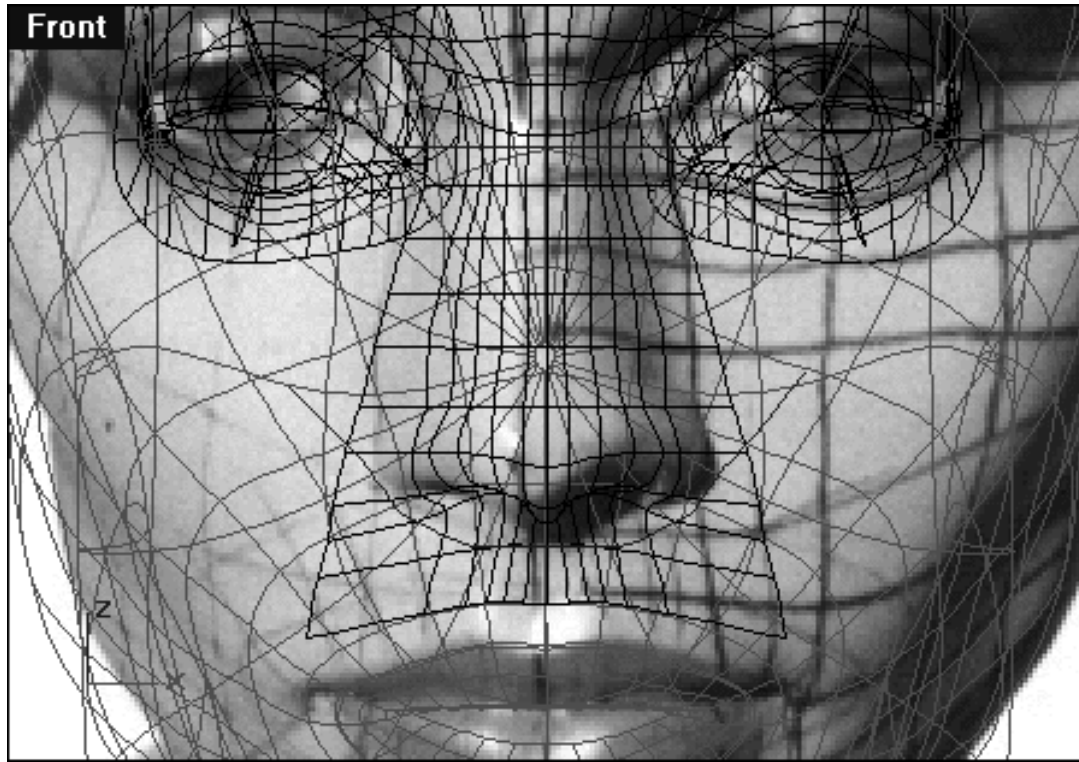
The upshot is, we will not use the actual trimmed nose surface within our model, rather we will rebuild a new surface from the trimmed surface -- got that? By doing this we will create a surface that is very close to the shape we want without the all the drawbacks of it being an actual trimmed surface.

How will we do that then? It's easy, once we've trimmed the bits off the surface that we don't need we can use Rhino's command: ExtractIsoparm to remove the curves from the trimmed surface. Once the curves have been removed we can loft them up which will produce a shape that's pretty close to what we require which is not trimmed!

Of course, the surface will change a bit and will never be exactly the same what we had prior to the extraction and re-lofting, but really all that is required is a bit of refinement to the new surface which we would have do in any event, so we've got nothing to loose and everything to gain!

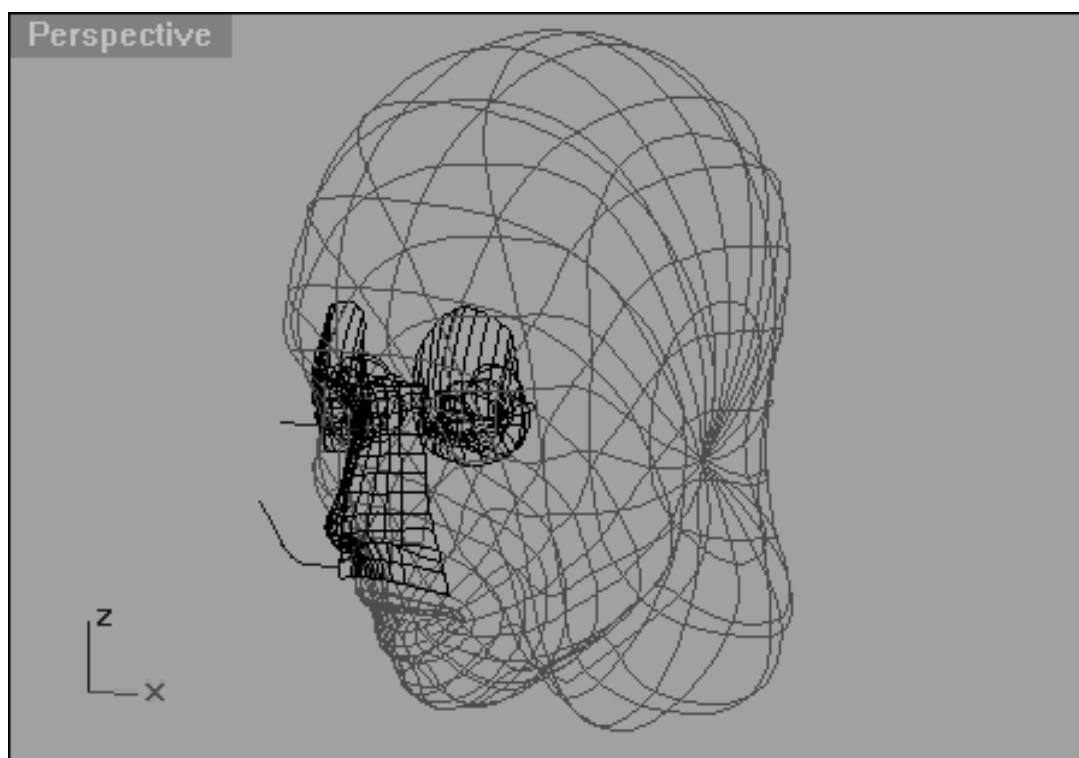
Right then, now that you've got some idea of what we are about to do, let's crack on with it...

- Open the Edit Layers dialogue and create a new layer entitled: Nose Cutters and set its colour to blue. Once done, make sure that Nose Cutters has been set as the currently active layer by placing a tick in the check column, then press Apply to exit.
- Next, In the Front Viewport zoom in so that the area surrounding the nose is clearly visible.
- Now draw an interpolated curve near the base of the nose close but still some distance away from where you'd expect it to attach. This curve should be drawn in sort of a Salvador Dali moustache shape with the ends pointing up sort of toward the corners of eyes (see the following screenshot for help with positioning). Keep in mind that the ends of this curve must extend past the edge of the nose surface, otherwise the trim will not work properly.
- At the top of the nose (near the bridge) draw either an interpolated curve or a line (either is fine) and again be sure that it extends past the edge of the nose surface as in the following screenshot.






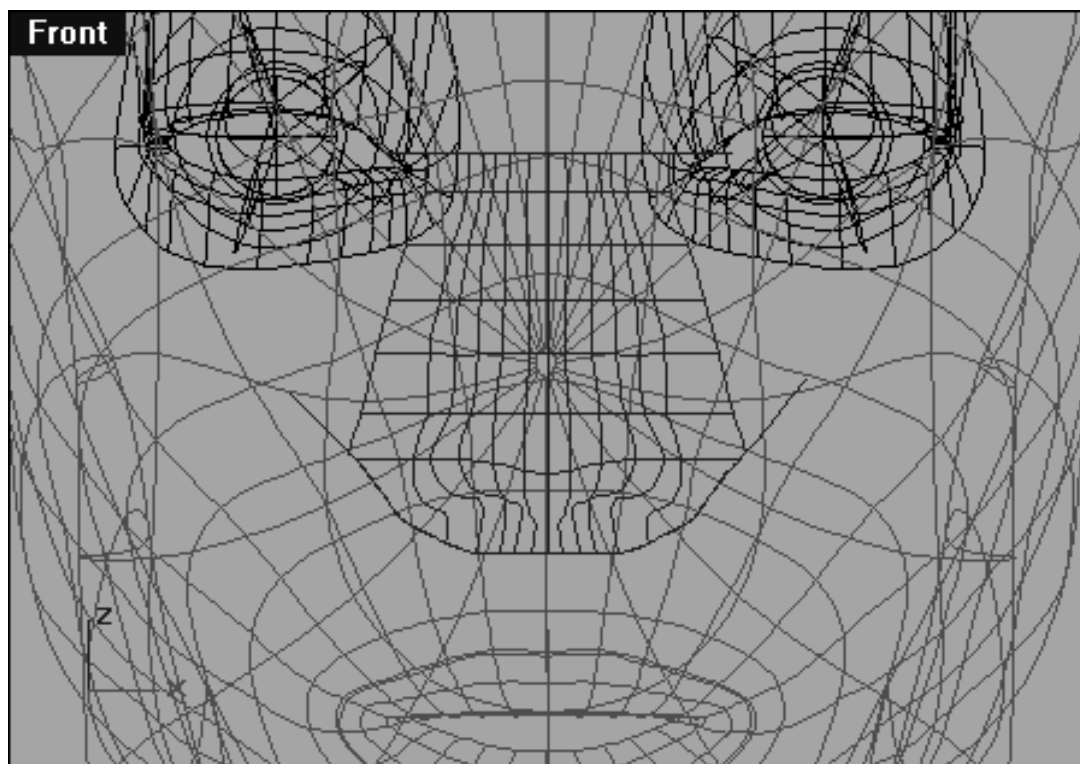
*This **Front Viewport** screenshot shows the correct shape and positioning for the curves to be used as "cutters" to trim the nose surface.*

- Once you've created the "cutting" curves they will appear at the origin at the centre of the head. As a rule I like to move them out so they are located "in front" of whatever I plan on trimming. In other words, I like to have the cutting curves in the direct line of sight with the current view, which in this case is the Front Viewport. Carefully select the 2 new cutter curves, hold down the shift key and then in the Right Viewport move them along the Y axis so that they are placed in front of the head. \*Note -- It doesn't matter exactly where in front of the head you place them, just so long as they are in front, have a look at the following screenshot:




The above *Perspective View* screenshot shows the 2 cutter curves have been moved in front of the face.

- Open the Edit Layers dialogue box and create a new layer entitled: Nose Surface Chop, set its colour to a dark green and assign it as the currently active layer.
- Select the nose surface object (i.e. Noze\_Surface) and copy it using the InPlace option.
- With the nose surface still highlighted choose the Edit Layers icon  and from its flyout select the change layer icon  which will open the Layer for Object dialogue box. Locate the layer entitled: Nose Surface Chop and double click on it, thus copying the selected surface on to the appropriate layer. The surface colour should then change to dark green, if it hasn't it might be because the surface is still selected -- try just clicking in any viewport to deselect it.
- Open the Edit Layers dialogue box and turn OFF the layer entitled: Noze\_Surface, press OK to exit.
- From the toolbar choose the trim icon  or type the command: Trim at the command line and press Enter.
- The system will respond with the following prompt at the command line: **Select cutting edges (options):**
- In the Front Viewport, select the cutting curve near the base of the nose then press Enter.
- The system will respond with the following prompt at the command line: **Select object to trim (options):**
- Now select the bit of nose surface below the cutting curve (not above it) in a second or two the unwanted bit of nose surface should disappear once it has press the Esc key to complete the operation.
- Repeat the procedure this time with the upper cutting curve.
- Once done your monitor should resemble the following screenshot.

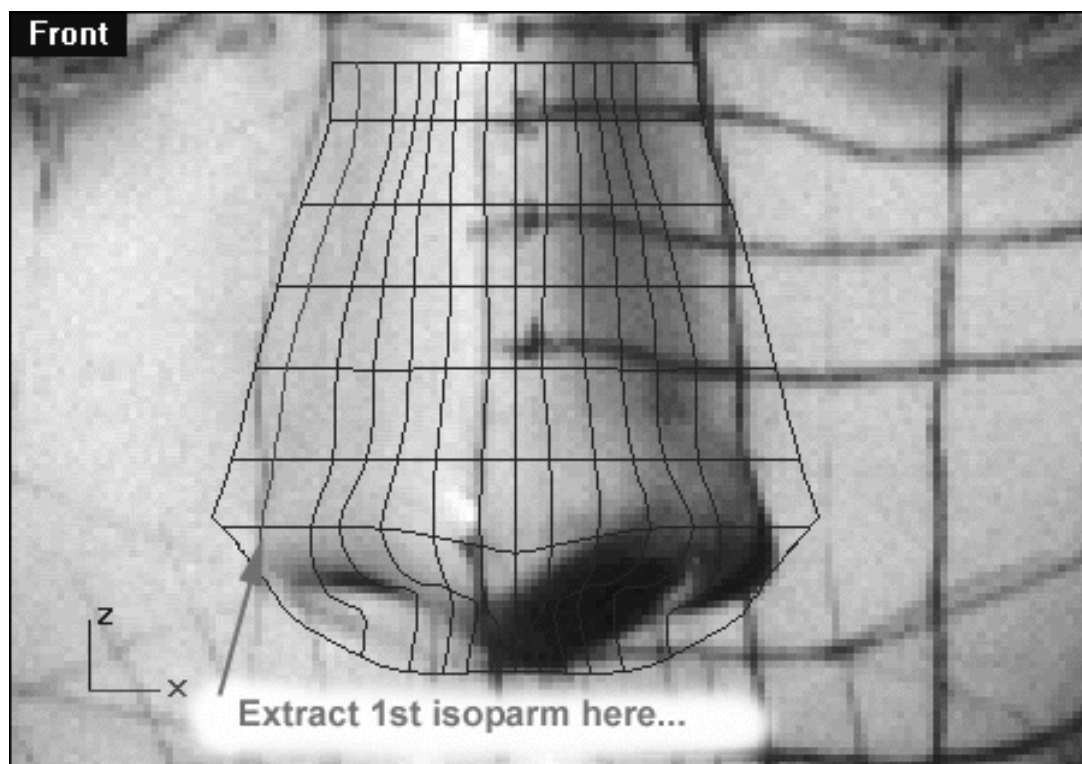


This **Front Viewport** screenshot shows the result of using the cutter curves to trim off the unwanted bits of nose surface.

- Open the Edit Layers dialogue box and create a new layer entitled: Nose Chop Extractions, set its colour to magenta and assign it as the currently active layer.
- Turn OFF the layer entitled: Nose Cutters and also temporarily turn OFF the following layers: Nu\_headsurf\_smooth\_2 and Eyes\_Basic\_InPlace, then press OK to exit.
- Maximize the Front Viewport and zoom in tightly upon the nose surface.
- From the toolbar choose the Extract isoparm icon  or type the command: ExtractIsoparm at the command line and press Enter.
- The system will respond with the following prompt at the command line: Select surface for isoparm extraction (Direction = Both)
- Click on the trimmed nose surface and then type V at the command line and press Enter. (Typing V tells Rhino to only extract isoparm running in the V direction along the surface).

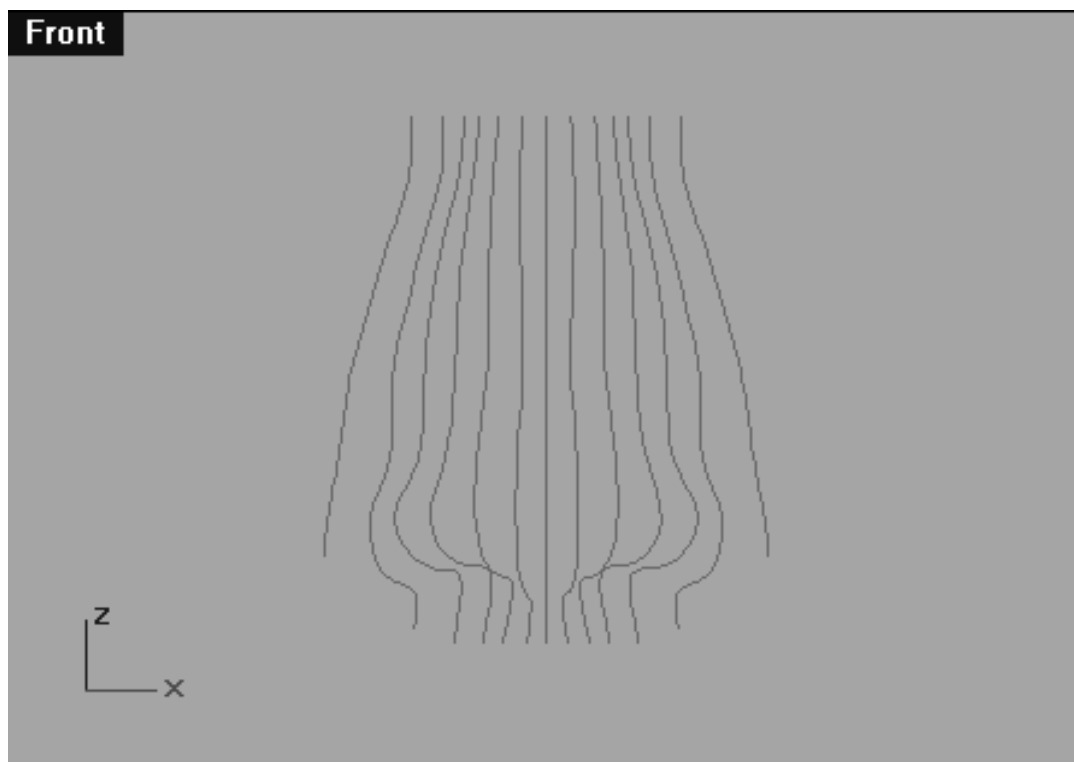
You should now have a line that runs from north to south along the nose surface as you move your mouse. The idea behind this is where ever you place you mouse and click an isoparm will be extracted from that location on the surface -- it's that easy!

- At the moment our nose surface on the layer entitled: Nose Surface Chop has a bit more material than is actually required at either side (west and east). Since we don't need this material we can avoid creating it in the first place when we extract the isoparms from this surface. With this in mind, position your mouse (now in isoparm pick mode) about 1/2 between the edge and the 1st isoparm and click to remove your first isoparm. See the screenshot below:





This **Front Viewport** screenshot shows the approximate location where you should click to extract the 1st isoparm from the surface

- Continue working, moving your mouse horizontally along the X axis to the next isoparm. Try to position the mouse (now in isoparm pick mode) as perfectly and exactly on top of the surface isoparm to extract as possible and only click when you've done so. It is very important that you try and be as accurate as possible when selecting isoparms for extraction so take your time and pick accurately!
- Once you've extracted the last isoparm, press Enter to complete the operation.
- Open the Edit Layers dialogue box and turn OFF the layer entitled: Nose Surface Chop.
- Create a new layer entitled: Nose Nu Sides, set its colour to black and assign it as the currently active layer, press OK to exit.
- Your monitor should now resemble the following screenshot:




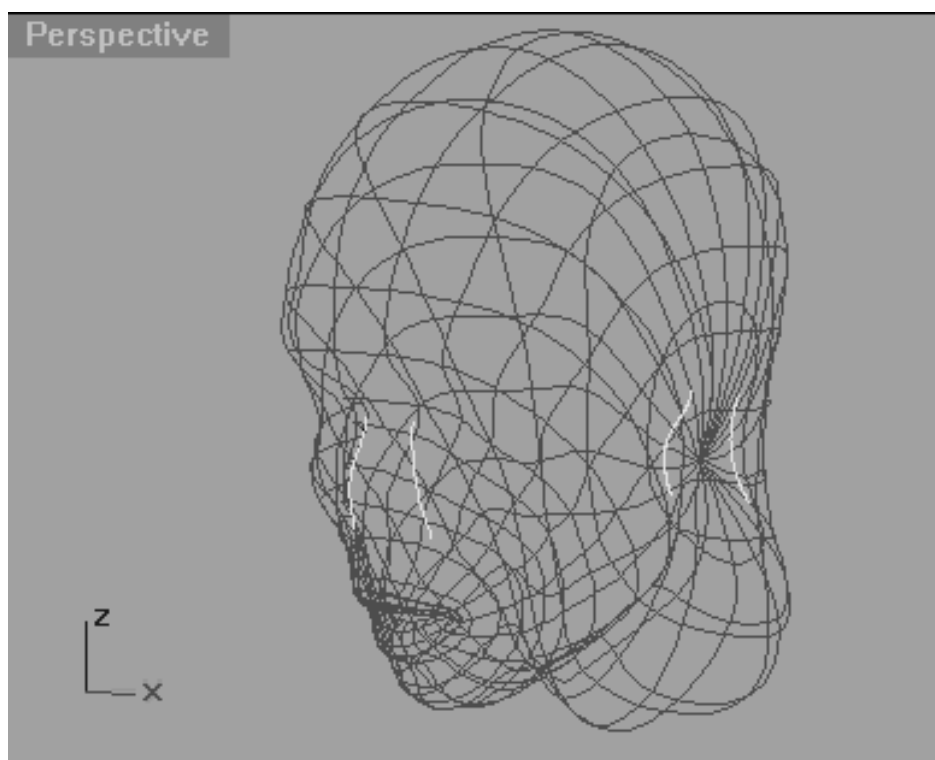
This *Front Viewport* screenshot shows the result of extracting isoparms from the former surface.

Before we proceed with lofting up these extracted isoparms into an all new nose surface there is something else we should still do. Because we've effectively reduced the amount of material at either side of the nose (west & east) it is unlikely that it will fit as tightly against the head as it did previously. Of course, we want the nose to fit as snugly against the head surface as possible so this is an issue we need to address. So how do we make sure that the side edges of the nose fit to the contour of the head surface as accurately as possible? The solution is simple, by projecting the side edge curves against the head surface -- easy!

- Select all the extracted nose curves with the exception of the two side edge curves, then temporarily hide all the curves you've selected.
- Open the Edit Layers dialogue box and create a new layer entitled: Nose Nu Sides set the colour to black and assign it as the currently active layer, press OK to exit.
- Only the two side edge curves should now be visible. Select both curves and Copy them by typing the command: Copy, using the InPlace option and then pressing Enter.
- Next, with the curves still highlighted assign them to the layer entitled: Nose Nu Sides. Do this by choosing the Edit Layers icon  and from its flyout select the change layer icon  which will open the Layer for Object dialogue box. Locate the layer entitled: Nose Nu Sides and double click on it, thus copying the selected surface on to the appropriate layer. The surface colour should then change to black, if it hasn't it might be because the surface is still selected -- try just clicking in any viewport to deselect it.
- Now unhide anything that might be currently hidden by choosing the Hide Objects/Show objects icon from your toolbar or by typing the command: Show at the command line and pressing Enter.
- Open up the Edit Layers dialogue box and turn OFF the layer entitled: Nose Chop Extractions. It would also be a good idea to set everything else with the exception of the layer entitled: Nu\_headsurf\_smooth\_2 to OFF, press OK to exit.



- From the toolbar select the Project Curve to Surface icon  or type the command: Project at the command line and press Enter.
- The system will respond with the following prompt at the command line: Select curves to project:
- In the Front Viewport select both curves by clicking on them and press Enter.
- The system will respond with the following prompt at the command line: Select surfaces or polysurfaces to project onto:
- In the Front Viewport click on the head surface and press Enter. A few seconds later you should see a few new curves have been created and projected upon the head surface.



*This **Perspective Viewport** screenshot shows the result of projecting the two side edge nose curves upon the surface of the head. Observe how two curves have also been projected onto the back surface of the head as well -- these will have to be deleted.*

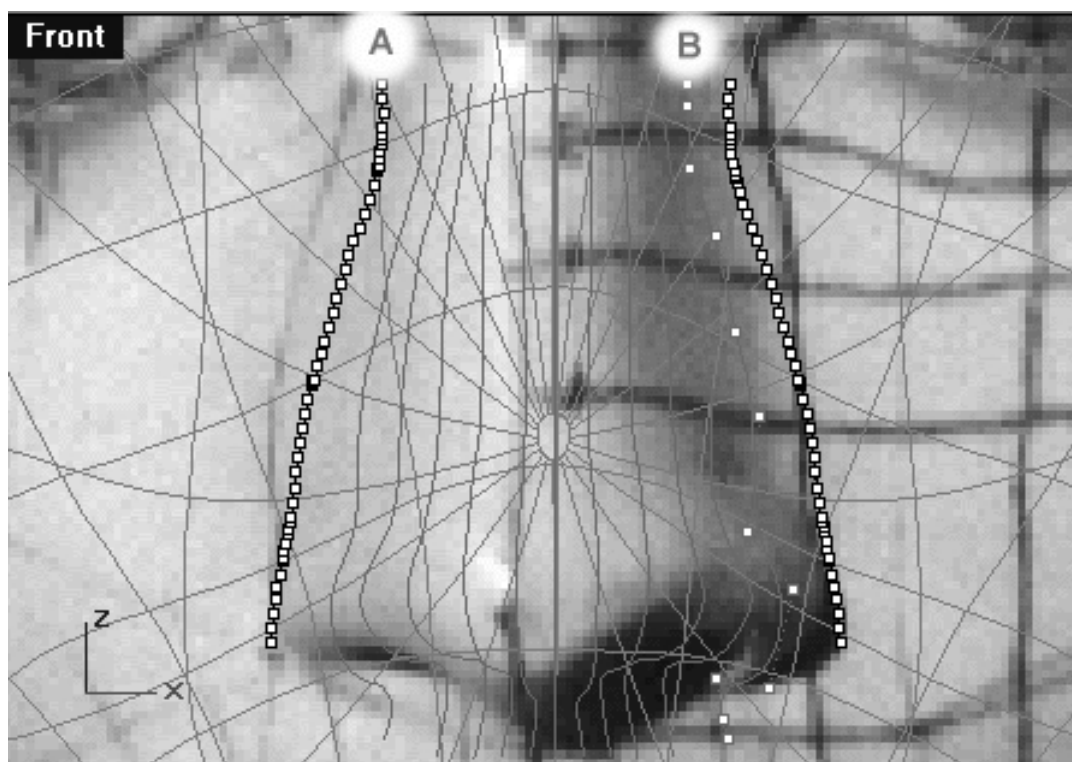
- Select the head surface and type the command: Lock at the command line and then press Enter.
- Hold down the Ctrl key and select the 2 curves that were projected onto the rear head surface, then press the Delete key and their gone.

Okay now we just turn on the layer entitled: Nose Chop Extractions.

Don't break out the champagne yet because we still have a slight problem. You will remember that one of the side effects of projecting curves is that the resulting curve has about a million points. Obviously now with the exception of the two projected side curves all our other nose curves are evenly parameterised so lofting is clean surface is going to be difficult -- or is it?

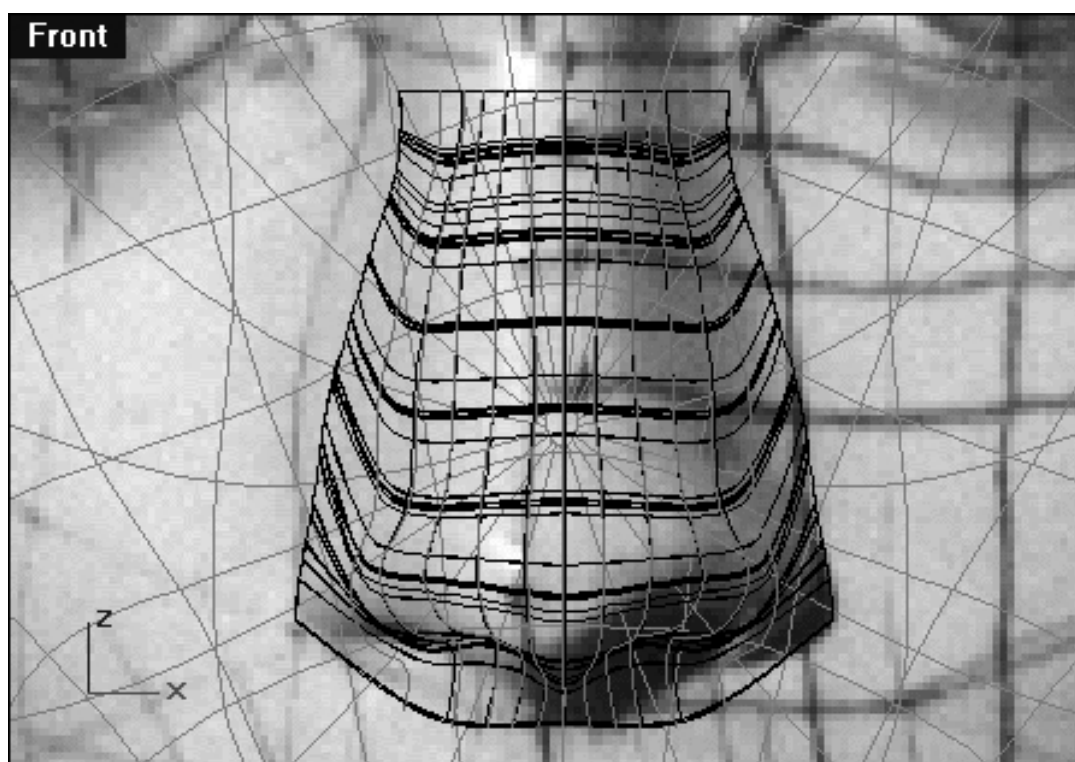


Have a look at the next screenshot:




This **Front Viewport** screenshot shows the nature of our problem. Here the control points have been displayed, observe the side curve (A) it's been projected and has about a million points. Now look at curve (B) it was carefully constructed and only has a few points (about 12).

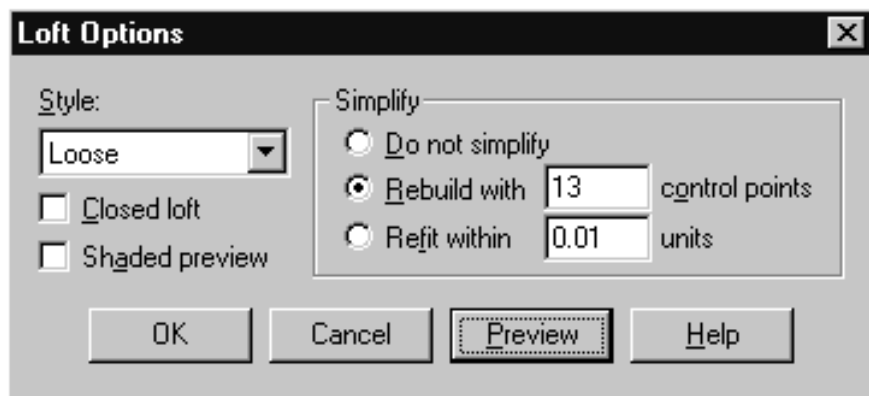
And of course if you try to loft surfaces with uneven point counts the result will look something like this...



This **Front Viewport** screenshot shows the result of lofting curves with uneven point counts -- yuck!

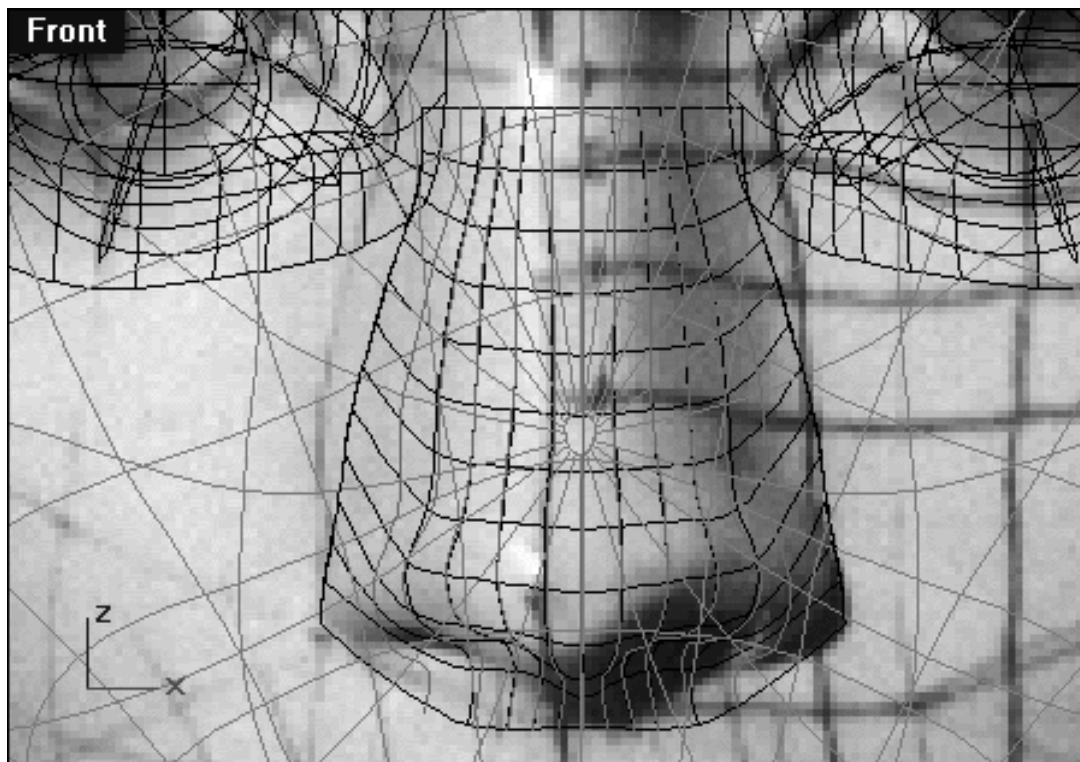
The solution is to use the rebuild option within the loft command and specify the number of points to use, since all the others had between 12 to 13 points after trimming let's tell Rhino to rebuild our surface as if all the curves had 13 points (besides it's a good "lucky" number!).

- Open the Edit Layers dialogue box and create a new layer entitled: Nose Surface Final, set its colour to black and assign it as the currently active layer.
- If you've not done so already, now would be a good time to select the head surface and lock it. This will make it easy to pick the nose curves for lofting and will prevent you from inadvertently moving or messing anything up.
- From the toolbar select the loft icon  or type the command: Loft at the command line and press Enter.
- The system will respond with the following prompt at the command line: Select curves to loft ( Point ):
- In the Front Viewport, start by picking the base (near upper lip) of the leftmost curve -- it will highlight. Then, continue working towards your right picking all the remaining nose curves, once done press Enter.
- The loft options dialogue box should appear as in the following screenshot. As in the screenshot, set the style option to Loose, the Simplify option to Rebuild with 13 control points and press OK to exit.



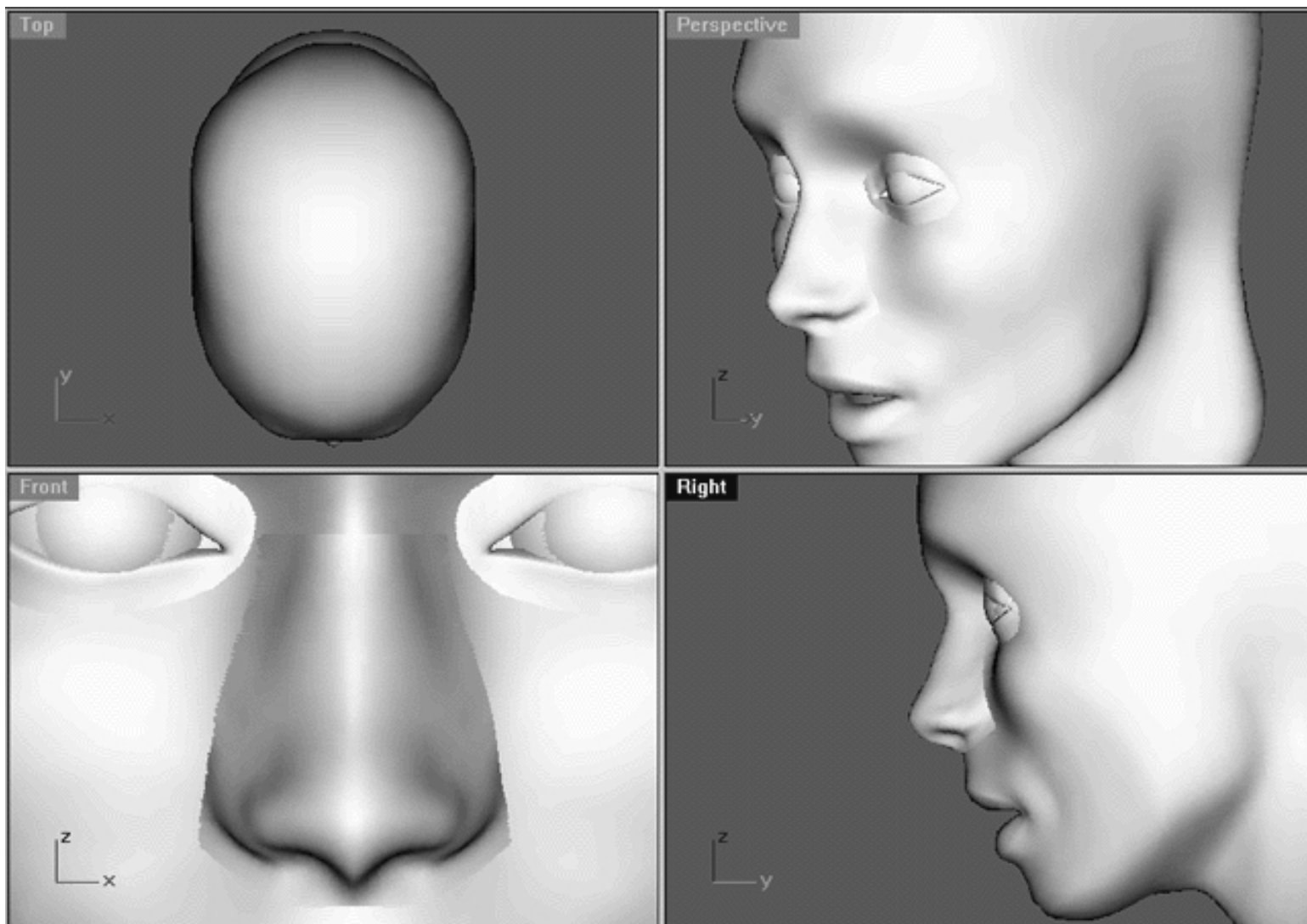
*The Loft Options dialogue, set all options as shown.*

Once complete your monitor should resemble the screenshot below:



*This **Front Viewport** screenshot shows that a new surface has now been created on the layer entitled: **Nose Surface Final**.*

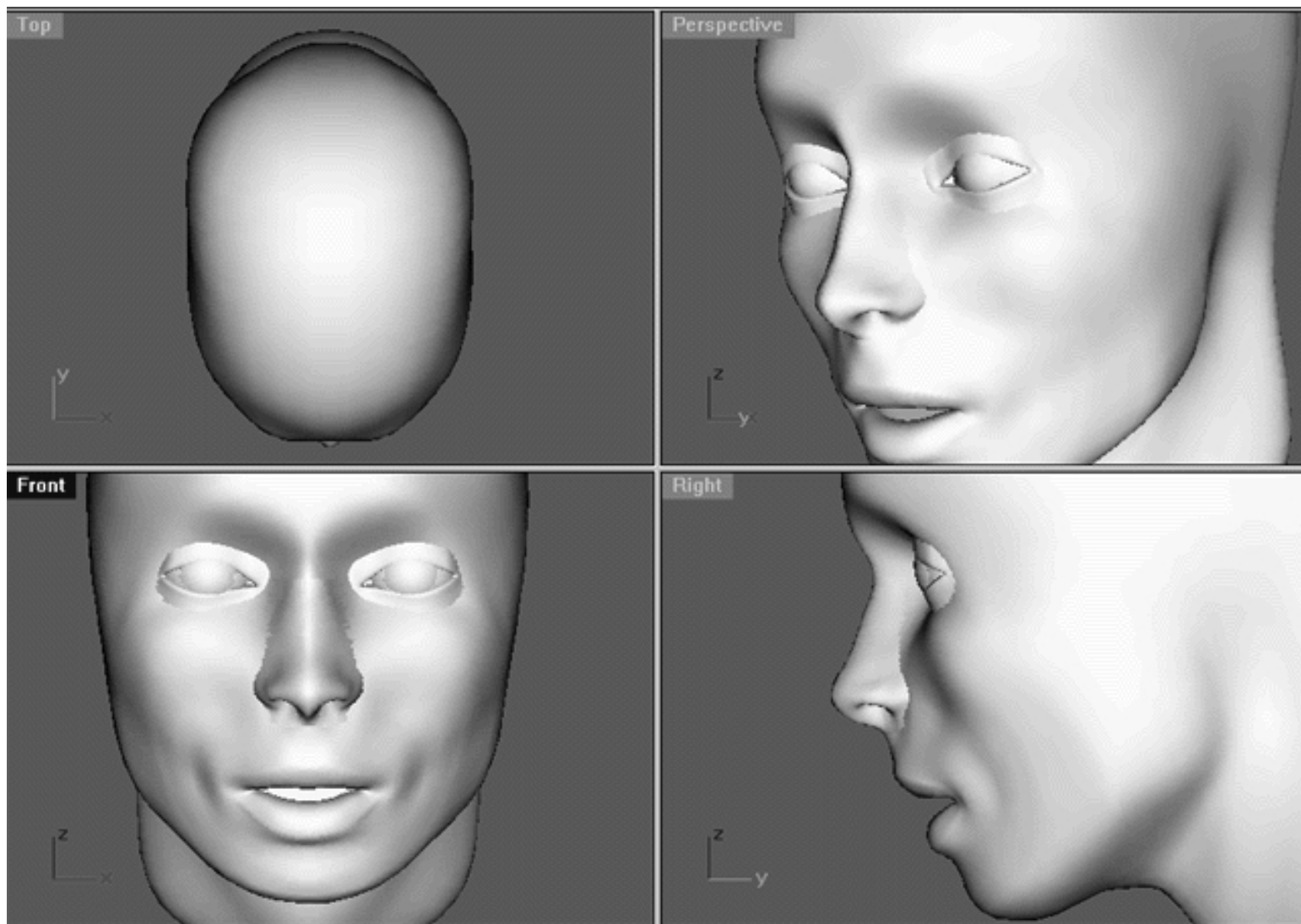
- Open the Edit Layers dialogue box and turn OFF the layers entitled: Nose Chop Extractions and Nose Nu Sides and then press OK to Exit.
- Perform a quick shaded viewport render and observe the results. Your monitor should now resemble the following screenshot:



*This **All Viewport** screenshot show the result of lofting -- which is a whole lot better than what we had before!*

The nose now has a far better fit to the face, all the superfluous surface material has now been removed and we don't have any trimmed surfaces to deal with -- perfect! Despite the recent improvements just mentioned there is still other work that needs to be done before we can think about performing the final blending magic. Very minor and systematic adjustments now need to be performed on both the head and nose surface. This consists of moving a few control points at a time on selected areas, the ones requiring specific attention are:

- The head surface at either side where the nose mates with the cheek. Here, the head surface needs to be moved forward, along the Y axis when viewed from the Right Viewport. Once done, the nose should appear far less fat when seen from the front view.
- The nostril flare. There are a few things going on here. Firstly the area of the head surface at each corner of the nose flare meets the head needs to be moved forward slightly, again along the Y axis when viewed from the Right Viewport.
- The nostril. This needs to be deepened on the nose surface and can be done by moving a single point upward along the Z axis.
- The upper lip nasal filtrum (the grooved area down the middle of the upper lip) under which in life can be found the Orbicularis Oris muscle. Here, once again the head surface needs to be moved forward.



This **All Viewport** screenshot shows the result of performing the previously mentioned changes upon the head.

## Face the Facts

Although we are now light years ahead of where we first began and in general the head is looking good the truth is that the model could still use a lot of improvement still. At the moment this model is by no means perfect and I would recommend that you spend some time refining it even beyond this point.

What needs to be done?

A better and more important question is what do **YOU** think needs to be done?

Take some time to observe the previous screenshot and think about it.

The specific areas that I would address in my spare time would be as follows:



1. The brow bone is now too far forward, I'd move it back a bit.
2. The eye sockets now appear too deep, especially right below the brow bone. Most of this will be corrected when you adjust the brow bone.
3. The mouth could be moved upward along the Z axis, there is a bit too much distance between the base of nose and upper lip.
4. The jaw could be thinned and made a bit more pointed to give the chin more definition.
5. The shape of the nose could be even better, more refined.
6. The neck could be improved, more roundness is needed.

With any head modelling project this is almost always the case, you can work on a model nearly ad infinitum. The reason that modelling can take such a long time is that you often don't or can't spot various issues until all or some of the components have also been placed within and refined. This is a cyclical process from which there is little escape, however, it is completely natural. For your models to be the best that they can be you need to learn how to be hard on yourself and accept that even after putting hours or even months of work into a project it is likely that there will still be things that need to be fixed. Sometimes this will mean ripping your model to bits and doing some major alterations, probably the last thing you feel like doing. Still, if you want your model to be the best it can be you must swallow your pride, accept that there are some problems and get on with fixing them.

As an artist it is difficult to separate yourself from what create and become dispassionate so that you are able to make unbiased judgements. Don't allow yourself to become too emotionally attached to your work and certainly don't feel bad if you didn't get things quite right the first time round, chances are you will next time. Remember this is only computer graphics, not brain surgery and at the end of the day it just is not that important in the larger scheme of things. What is important is that you learn a bit more with every model that you create so that you continue to grow and improve upon what you've already done as an artist, it is a life long journey of learning so relax and enjoy it.

On the other side of the coin it is possible to take perfectionism beyond all reasonable limits and become far too particular. Many people become obsessive, so much so that they never manage to finish anything -- that's no good either. You can overwork your models, so it is every bit as important to know when to stop working, put the mouse down and move on. In every project you will hit a wall, the point of diminishing returns where no matter how much to pick apart, tweak and refine it makes very little difference to anyone other than yourself.

The point I'm getting at is that rarely is a model ever perfect (least of all one of mine). Find a point of balance with your work and let it guide you. Remember that everything is a trade-off between what is correct and what is not proportionally speaking, the amount of perfection you desire to achieve within your work and the time (and money) you have available for doing so.

# Shutting Down the Scene

- Save the scene.
- Confirm that no Osnaps are currently active, disable any that are.
- Hide any edit points that are currently displayed.
- Unlock any currently locked objects -- type **UNLOCK** at the command line and press **Enter**.
- Open the Edit Layers Dialogue box and locate the layer entitled **SCENE START UP**. Make it the currently active layer by clicking in the "check" field -- a check mark should appear in the column, when it has press **APPLY**. Once done, the layer entitled **SCENE START UP** should now have become the active layer and should be **ON**.
- Turn OFF the layer entitled: Eyes\_Basic\_InPlace.
- Turn OFF the layer entitled: Nose Surface Final.
- Turn OFF the layer entitled: Nu\_headsurf\_smooth\_2
- The Layer entitled: Photopoints should be ON.
- All other layers should be **OFF** -- press **OK** to Exit.
- Perform a ZoomExtentsAll.
- **S A V E Y O U R W O R K...!**

---

RETURN to the Top of page -- [Click Here](#).

Go to the NEXT LESSON

Written by Joseph R. Saltzman.

Co-produced in association with Steven Ståhlberg

©1998-1999 Cinemagic Productions Limited. All Rights Reserved.

Duplication of this document including images and text by any means is expressly forbidden without prior written consent of Cinemagic Productions Limited.

Web Site: <http://www.cmagic.co.uk> Telephone: +44 (0)1753 733 190 Fax: +44 (0)1753 736 619 email: [cmagic@cmagic.co.uk](mailto:cmagic@cmagic.co.uk)

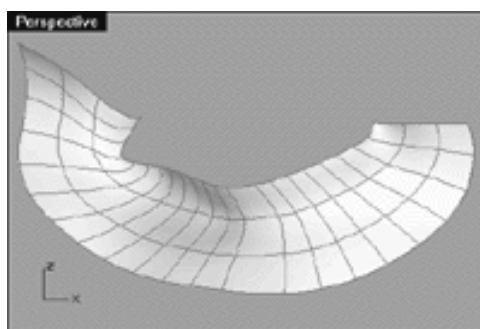


**RETURN** to previous page -- Click Here

**GOTO** the NEXT LESSON



## BLENDING SURFACES FOR THE EYELIDS





---

### Contents:

- [Scene Setup](#)
  - [Magic Surfaces](#)
  - [Creating the Blending Surfaces](#)
  - [Projecting a Proper Image](#)
  - [Extraction Action](#)
  - [Just a Trim](#)
  - [Example Movie -- Trimming Off the Tails](#)
  - [Lofting the Blending Fillets](#)
  - [Time to Refine](#)
  - [Eye Spy: Something Beginning with M](#)
  - [Summary](#)
  - [Shutting Down the Scene](#)
-

# Scene Setup



- If you've not done so already start a Rhinoceros session by **double clicking** on the desktop icon  the application will begin.
  - Choose File, Open from the menu bar and double click on **START\_B.3DM** in the file list, it will load and open.
  - Confirm at the Lower Status Bar the currently active layer is entitled SCENE START UP. If it is active proceed to the next step, if it's not then make it active by left clicking on the layer box, highlighting the correct layer and clicking on it.
  - Again, at the Layers Box on the Lower Status Bar this time right click on the box, the Edit Layers Dialogue box will open. Confirm the following switches have been enabled or disabled:
    - The Layer entitled: Nu\_headsurf\_smooth\_2 should be ON.
    - The Layer entitled: Eyes\_Basic\_InPlace should be ON.
    - The Layer entitled: Nose Surface Final should be ON.
    - The Layer entitled: Photopoints should be OFF.
    - The Layer entitled SCENE START UP should be ON.
    - All other layers should be set to OFF.
  - When you've finished making your changes ( if any ) click on OK.
  - Confirm that the grid display in the viewports has been disabled, if not turn it off now.
  - Confirm that no Osnaps are currently enabled, if any are disable them.
  - Confirm that no edit points are currently displayed, if any are hide them.
  - Zoom out all the viewports by selecting the Zoom Extents/Zoom Extents All Views icon  or by typing **ZoomExtentsAll** at the command line and pressing ENTER.
-

# Magic Surfaces

At long last, we've nearly reached the stage where we can begin to actually create a seamless blend between all of the multiple component surfaces, thus producing the appearance of a single surface unified head. The key to doing this and making it actually work is through the use of surface "fillets" and transparency mapping. Okay, now we can reveal the whole secret to this technique-- ready? Okay, it's a trick, a cheat and nothing more than an optical illusion and it's as simple as that! The fact is our head will never be a single unified head, it will always be made up of multiple component surfaces, it is not now nor will ever be a seamless geometric object -- IT WILL JUST LOOK AS IF IT IS WHEN RENDERED!

This knowledge is at the very core of the technique first taught to me by Steven Stahlberg and method we now use on a daily basis during production and fully endorse here at Cinemagic Productions Limited. The use of transparency mapping to hide surface seams is actually nothing new, it's been around a long time but strangely it's not been used much in connection with the head or face. In the past, this type of mapping has been used by character animators mostly used to cover up other problematic blending areas mainly in the body such as the attachment points of arms, legs, hands and so on.

Prior to using Steven's simple yet amazingly effective techniques we used to spend many weeks even months trying to build in high levels of facial detail into actual whole seamless heads built with radial parameterisation. Looking back now this was just crazy, a fruitless effort and nothing more than a complete waste of valuable time. Yes, it can be done, many people do it but the fact is that it's more difficult than need be, so really what is the point?

The notion that one must create a single piece of geometry in order for it to be any good and to render and animate correctly is just simply a myth, it is not true at all -- so forget about it! Anyone who thinks that because they've created a single piece model and because of that it is somehow superior to one that has been created from multiple components is seriously deluding themselves.

The fact is that there is no major advantage to creating a single surface organic models considering that they almost always:

Take far longer to create, contain trims or other types of geometric blending that will impact system speeds and slow down animation interactivity.

On the other hand multiple component models with blending surfaces should have none of these problems and have the advantage that:

They are almost always quicker to build, lighter and overall easier to adjust, control and animate.

So what are the disadvantages? Well the first is that at the moment the renderer in Rhinoceros does not support this type of transparency mapping. What this means is that if you do all your rendering **only** in Rhinoceros then this method is not ideal and you're pretty much out of luck. In this case you are going to have to resort to trimming and the surface blends found within Rhino.

Don't get me wrong, there is nothing wrong with the trimming or blending functions found within Rhinoceros at all, in fact they work very well indeed. The problem is simply that using trims and geometric blending solutions just will create more computational overhead, which for purposes of animation is not ideal. I should point out that the overhead created by blends and trimming would be problem in ANY modelling or animation package supporting NURBS, this is not a something unique to Rhino.

So, If you're not planning to animate your model, export or render it within another application then by all means use the blending and trimming found within Rhinoceros as it does work extremely well indeed. In our view, it would be fair to say at the current time the "look" of the renderer found within Rhino is not exactly spectacular anyway but it does give you a more than adequate visual "idea" of what's going on which I think is the point. The vast majority of artists will model in Rhino and render and animate their creations elsewhere in another software application suited specifically for the purpose -- after all Rhino is really modelling package, first and foremost -- and a mighty good one at that!

You don't have look far to find a good software application for rendering and animation. The fact is that almost any 3D application that supports NURBS animation and rendering should be able to perform the type of transparency mapping.

---

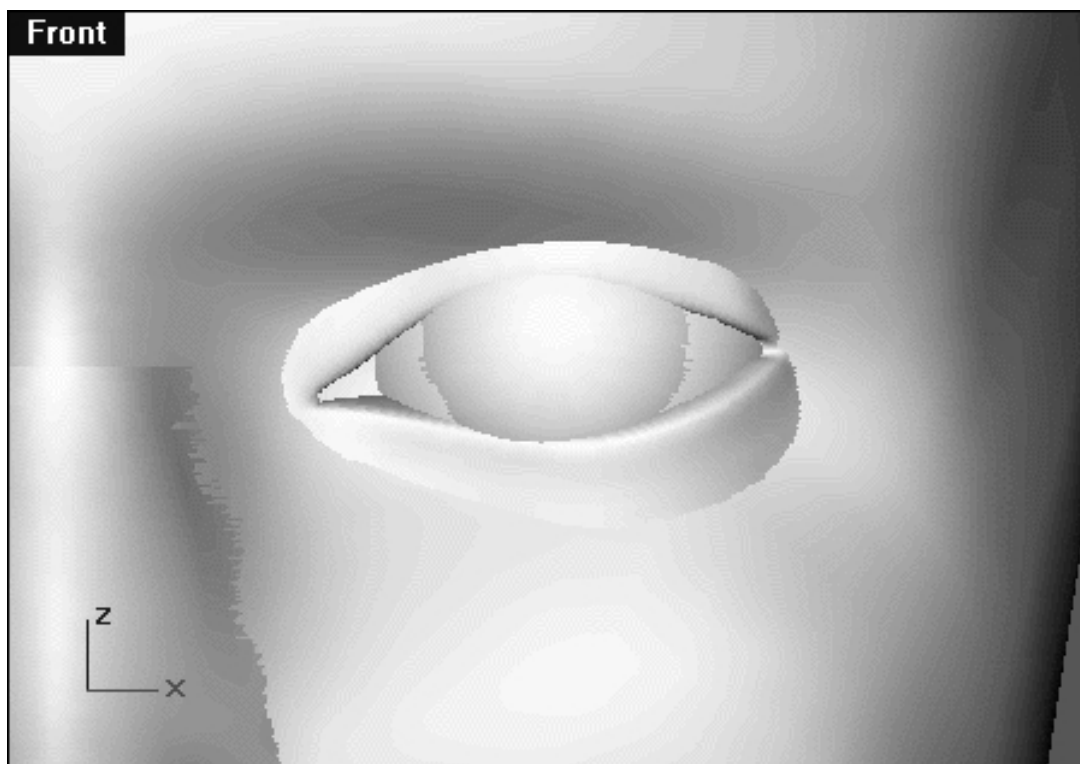
## Creating the Blending Surfaces

So how do these "blending" surfaces work then? Well the idea is a very simple one and can be explained quite easily by the following example. Suppose you wanted to build a new room inside of your house. The first thing that you'd have to do is to create a wood frame (the studs) in order to define the size and shape of the room and create a structure on which to attach the plasterboard walls. You can think of this wood frame as analogous to the curves that make up your head and the plasterboard that create the walls at the head surface itself.

Obviously, plasterboard is a finite size so you are going to have to place a few sheets side by side in order to cover the wooden studs, and where these two separate pieces meet is going to create a seam. For our purposes you can think of these two separate plasterboard pieces as the head surface and the eyelid surface and where they meet you've got a seam. Of course, we are going to paint our room and general idea is not to have a whacking great seam running down the walls -- what would the neighbours think?

The same idea applies to our head, instead of using paint we are going to want to apply a material "shader" to our model in order to simulate real skin and we don't want nasty seams to show where we've placed the nose, eyelids, etc. So how would a house builder fix the problem? Chances are a builder would tape over the seam, cover it with a thin coating of plaster and then sand down edges so they feather into the surface of each wall. Once this was done, paint can be applied and if the job was done well the seam should not show. We are going to do almost the exact same thing only rather than using actual tape and plaster we are going to create a third surface in Rhino (a blending fillet) that we will use as digital tape & plaster to cover up and hide the seam from view.

Have a look at the following screenshot. In this image you can see that there is clearly a seam between the eyelid and head surface. Of course you can also see a similar type of seam where the nose is placed against the head surface and we will deal with it in the same way a bit later on in the tutorial.

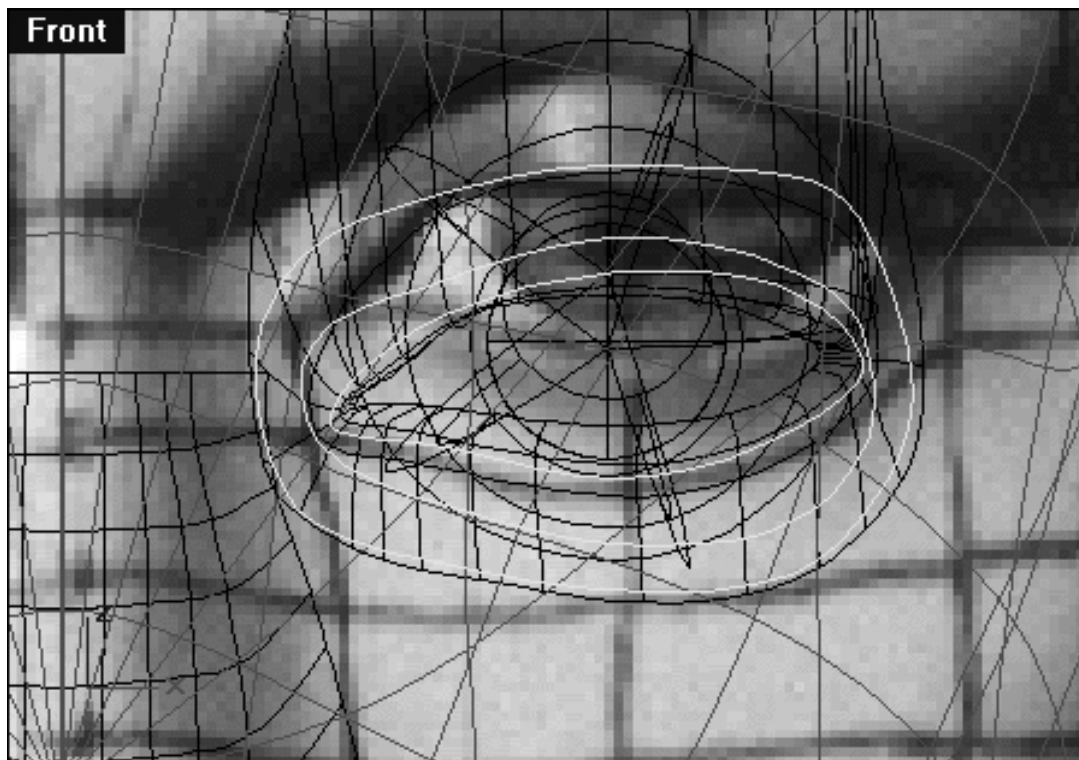


This **Front Viewport** screenshot shows the visible seams between the multi-component surfaces.

Okay, now that we know visually just where the seams are located on the model our problem becomes how to create the new third surface (a.k.a. the blending fillet) to cover it up? Logically it's important that each of the edges of our new surface lie as close and as tangent to each of the original surfaces as possible, which in this case is the head and eyelid. So what we really need to accomplish in this case is to create some curves that will mimic the contours of each of those individual surfaces closely. These new curves can be lofted up to create a third surface (a.k.a. the blending fillet) which will then "blend" between the two surfaces.

Although there are several methods to creating new curves that follow the exact contours of a surface in Rhino we will do it by simply projecting the curves onto the surface. Seriously, I use the Project command often during the course of my day to day work, it has easily become one of my very favourites as it's very simple to use, extremely powerful and you can do so much with it.

Right then, now we know that we will create a blending fillet by creating some curves and projecting them onto the surface. I can almost hear you saying "But wait just a minute, we've got two separate surfaces how can we project across them?" Good point, you're quite right and the answer is you can't! The good news is that you don't have to. Your strategy should be to create a few circular curves in the Front Viewport as in the following screenshot.



This **Front Viewport** screenshot shows the 3 new circular curves I've created that will be used for projection purposes.

So how did I determine where to place these circular curves and more importantly just why did I place them in this manner?

First off, I should stress that the final surface that we create does not have to be fully circular as it is not necessary to cover the seam on the upper eyelid, only the seam along the lower eyelid needs to be covered. Why? Because the eye naturally creates a sharp crease along the upper eyelid anyway so there is no point in trying to hide it! The only reason I've drawn fully closed circular shapes as a basis for our blending fillets is just to get us started, I will trim the excess upper portion away later in the procedure.


Okay, let's start by discussing the innermost curve I've drawn (near the Iris of the eye) here the most important things for you to keep in mind are that:

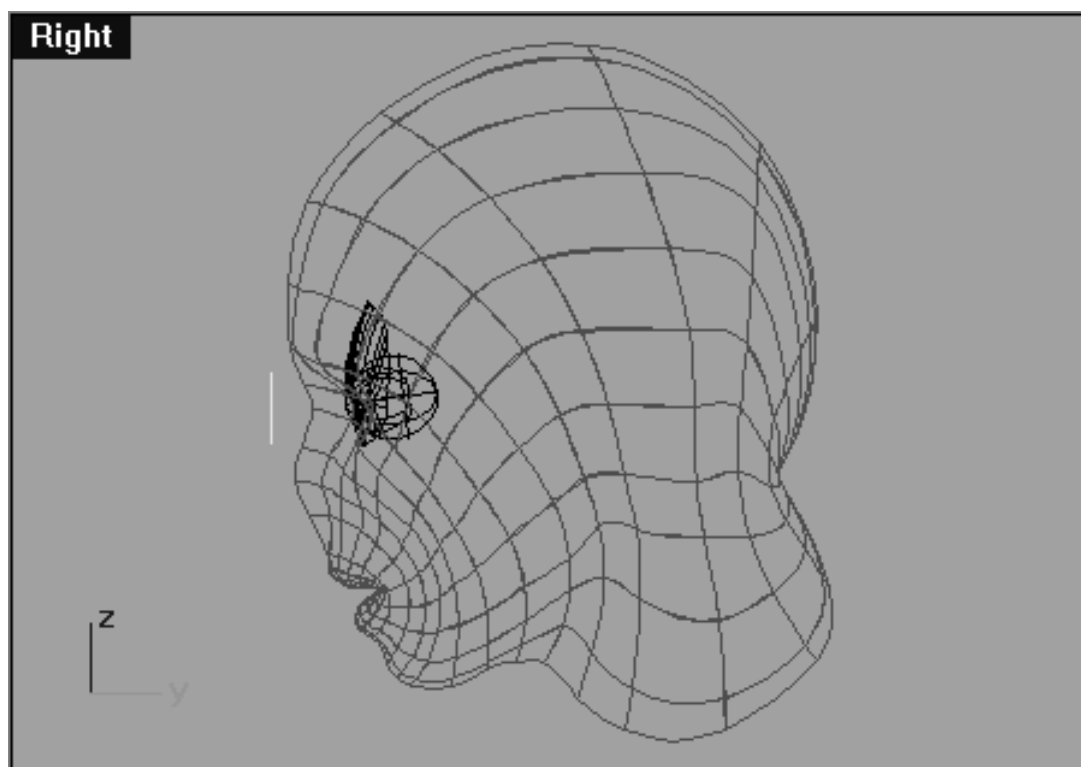
This curve should run just slightly below the rim of the lower eyelid.

The next curve (the middle one) should run very close to the actual seam (i.e. the area where the two surfaces intersect). But how can you tell where this is? Easy, do a quick shaded view and then mark where the seam shows up on your monitor using an O.H.P. marker pen then once done, draw the curve by tracing along the mark -- it's that easy!

Lastly, the outermost curve should be drawn near the lower edge of the eyelid surface and maintain a fairly even distance from that of the previous curve.

Right then, now that we've devised a strategy for the placement of our curves and have an idea of what needs to be done we can now set about the actual task at hand.

- Open up the Edit Layers dialogue box and create a new layer entitled: EYE\_BLEND\_FILL\_CURVS, assign the colour to blue and set it as the active layer.
- Maximise the Front Viewport and zoom tightly on the eye area.
- From your toolbar choose the Curve, Interpolate Points icon  and draw 3 closed circular curves as in the previous screenshot. You needn't worry about how many points you use, it's not important -- just pay attention to the shape of the curve and its placement.
- Once all the curves have been created they will be located at the world origin. In any viewport, locate and then select them -- they will highlight.
- Next in the Right Viewport whilst holding down the shift key and move all 3 selected curves along the Y axis so that they are in front of the face. *\*Note -- Strictly speaking this is not necessary but somehow I feel better about things when I do this!* Your monitor should now resemble the following screenshot.



*This **Right Viewport** screenshot shows that the 3 new interpolated curves we've just drawn have now been moved from their point of creation at the world origin along the Y axis and are now located in front of the face.*

## Projecting a Proper Image


Now let's project the 3 curves onto the eyelid surface...

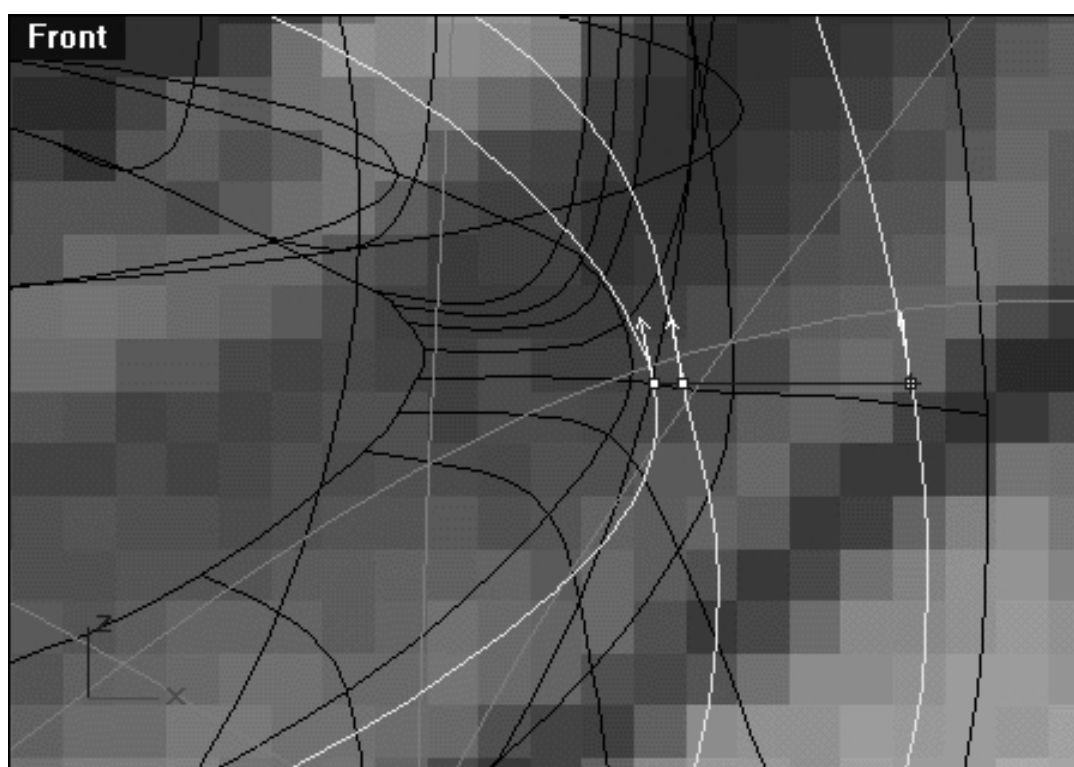
- From the toolbar choose the project curve to surface icon  the system will respond with the following prompt at the command line: **Select curves to project:**



- Select the innermost curve, the middle curve and the outer curve and then press Enter. The system will respond with the following prompt at the **command line: Select surfaces or Polysurfaces to project onto:**
- In the Front Viewport select the eyelid surface -- it will highlight, then press Enter. In a moment or two you should see 3 new curves have now been projected upon the surface.
- Press the Esc key deselect any currently highlighted curves.
- In the Right Viewport select the 3 curves that are floating just in front of the head (not the ones you've just projected) and temporarily hide them by typing the command: Hide at the command line.

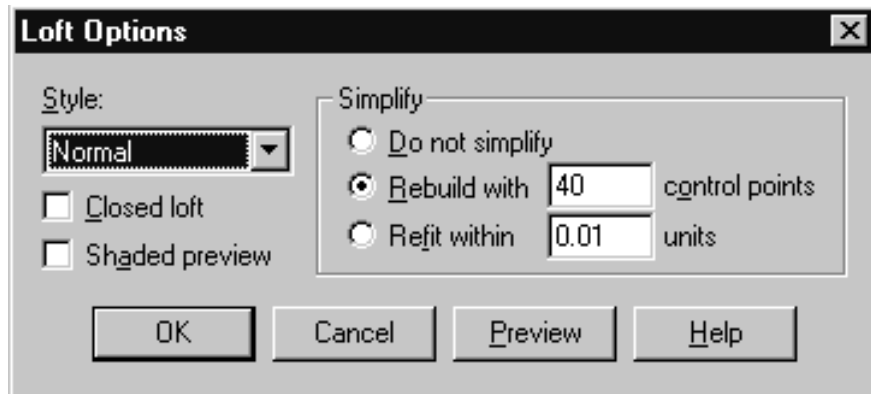
Now that we've projected the curves, next we will create an interim surface from them.

- From the toolbar choose the loft icon .
- In the Front Viewport, Zoom in tightly and begin by selecting the innermost curve at about the 3 o'clock position, then select the middle and outer curve each at approximately the same general location. When all the curves have been selected and are highlighted press Enter.
- The system will respond with the following prompt at the command line: Select seam point to adjust. Press Enter when done (**FlipDirection Automatic Natural**):
- You should now see line connecting all 3 curves with arrows indicating the direction of each of the curves. It is very important that this line connecting all 3 curves is in alignment and that all the arrows are heading in the same direction. If you drew all the curves the same way then chances are all the curves will be headed in the same direction. In the event that they are not heading as expected use the FlipDirection option to fix the problem. Once you've done this your monitor should resemble the following screenshot:



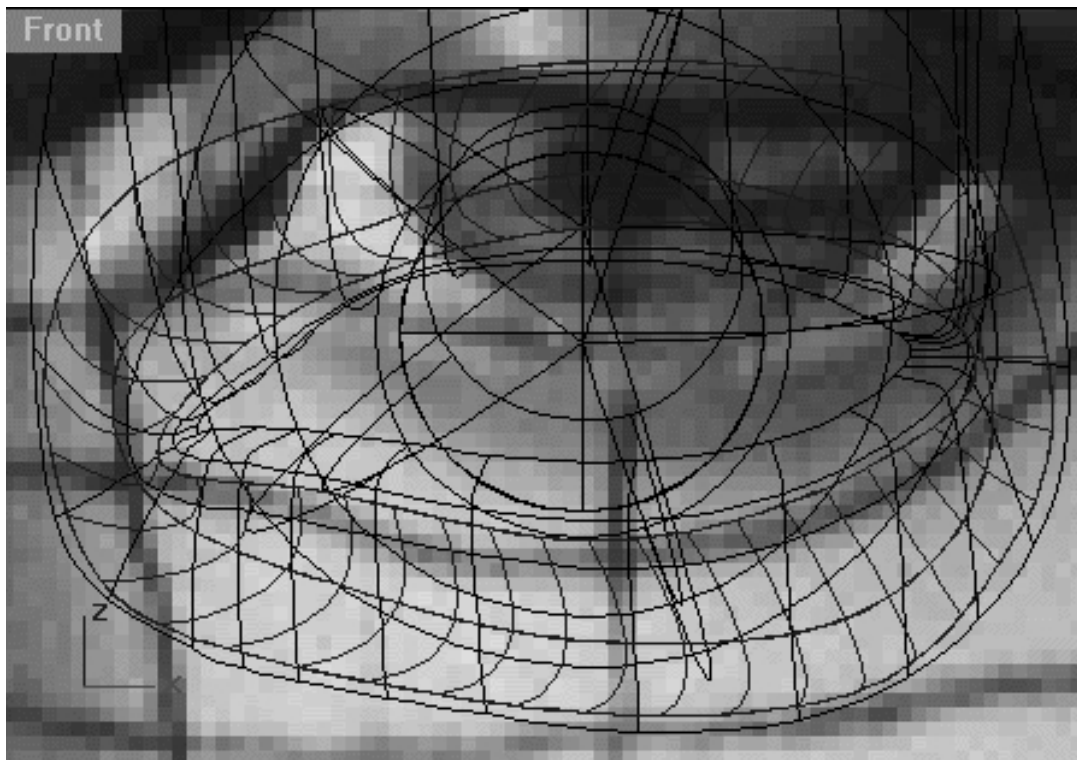
This **Front Viewport** screenshot shows the seam point properly aligned and the curves all heading in the same direction.

- The curves are now ready to be lofted, press Enter.
- The Loft Options dialogue box will appear as in the following screenshot:



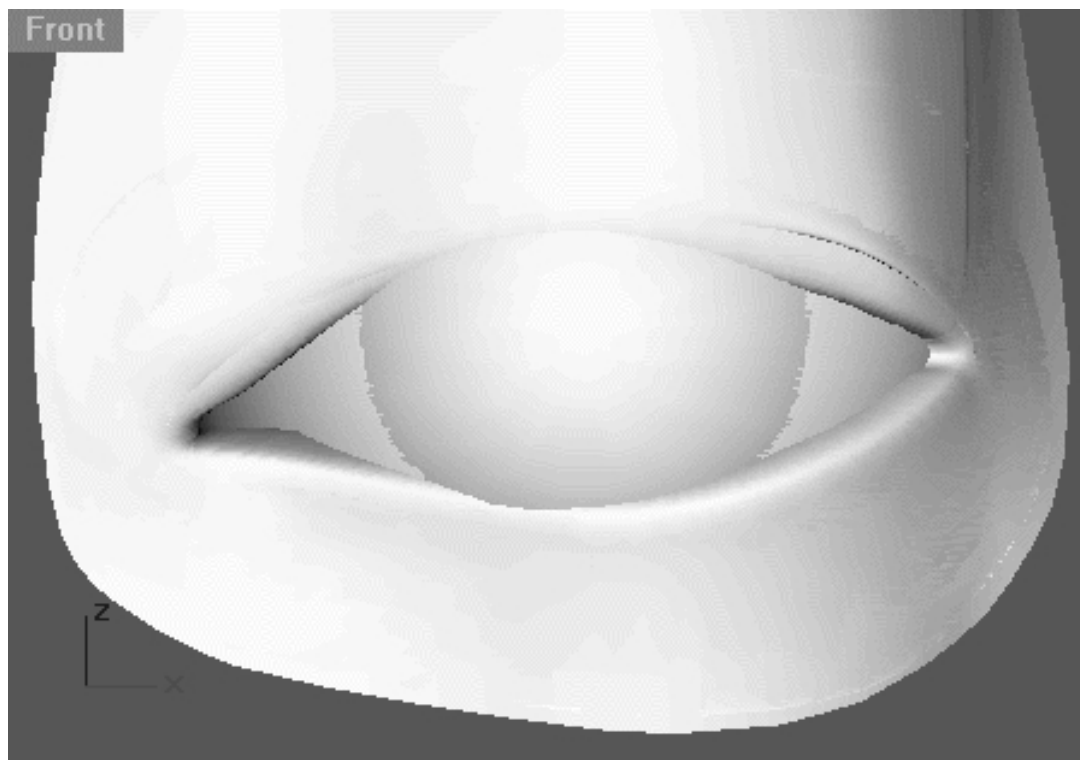
*The Loft Options dialogue box.*

- Set the Style to Normal and Simplify to Rebuild with 40 control points. Why 40 points? It's an arbitrary figure, however, by experience we know that it should provide a sufficient amount of points to allow for an accurate representation of the underlying surface.
- When all the parameters have been set in the Loft Options dialogue, press OK.
- A new surface will appear, your monitor should now resemble the following screenshot:



This **Front Viewport** screenshot shows the result of performing a normal style loft and simplifying by rebuilding the 3 projected curves using 40 control points.

Right then, now let's look at the same thing again only this time in a quick shaded view.



*This **Front Viewport** screenshot shows the result of performing a normal style loft and simplifying by rebuilding the 3 projected curves using 40 control points.*

So what does this image tell us then? Well, as you can see the new surface conforms fairly well to the underlying eyelid surface, like a decal would. We know this because with the exception of some minor distortions to the surface (along the upper lid) you really can't see the new surface we've created at all -- which is just what we want!


Right then, we now have created an interim decal like surface that mimics the contour of our eyelid surface. Well that's nice, but what good is it? At the moment, not much! We now need to create another surface following the same principal and procedures as we've just done only in this instance the next surface we create will be projected onto the head. Once we've done that we can create a third hybrid surface from these which after some minor tweaking will become our final blending fillet.

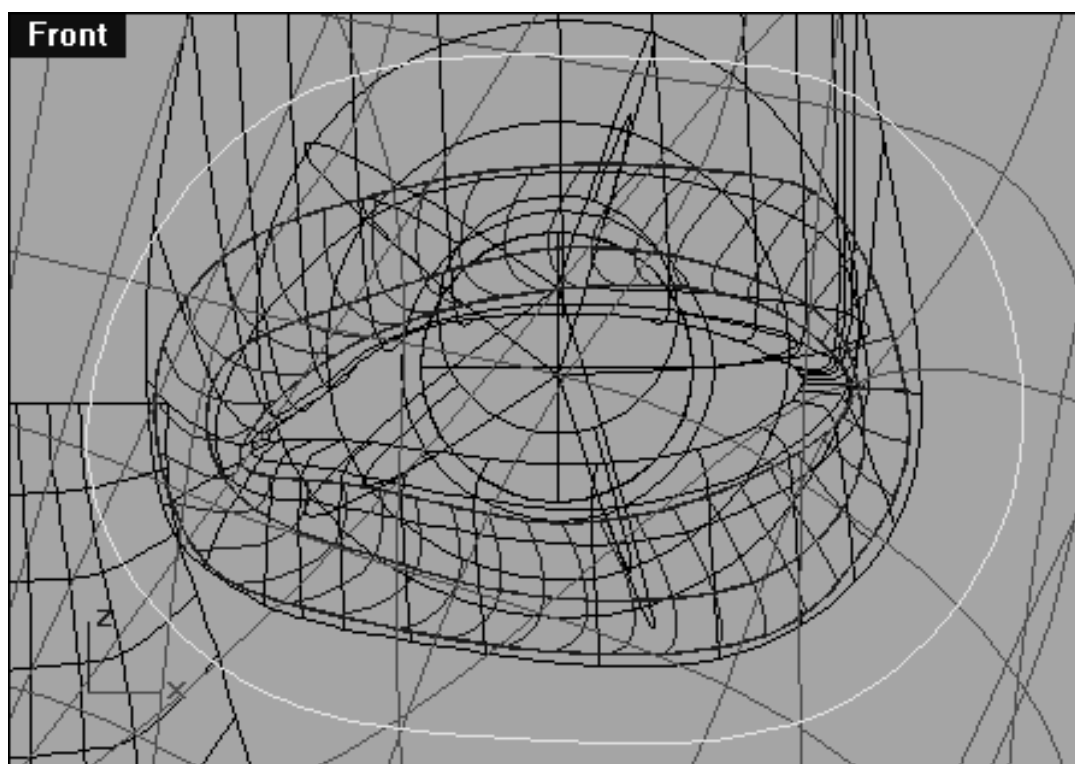
Before we go much further let's create a new layer for this first interim surface so that it will be easier to manage all the bits later on.

- Open the Edit Layers dialogue box, create a new layer called: Blend\_Interim\_Surface\_01 and the layer colour to blue, once done press OK to exit.
- In any Viewport, select the lofted surface we've just created -- it will highlight, then using the Edit Layers icon and the Change Layer flyout assign it to the new layer entitled: Blend\_Interim\_Surface\_01.

In order to create this next new surface we will have to create yet another curve and project it, let's do that now.

- Maximise the Front Viewport and zoom tightly.


- From your toolbar choose the Curve, Interpolate Points icon  and draw a single closed circular curve as in the following screenshot. Once again, you needn't worry about how many points you use, it's not important -- just pay attention to the shape of the curve and its general placement.



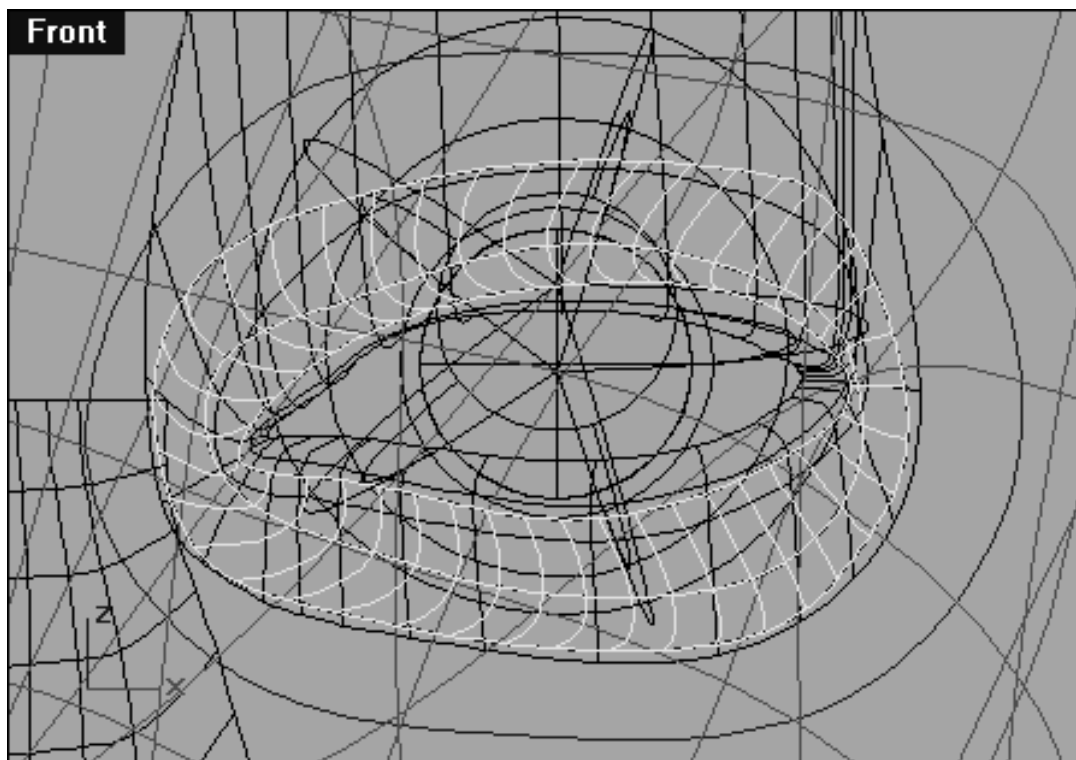
*This **Front Viewport** screenshot shows the approximate location you should draw this interpolated curve. Observe its relationship to the previous circular curves you drew and its location in respect to the face.*

- Once the curve has been created it will be located at the world origin. In any viewport, locate and then select it -- it will highlight.
- Next in the Right Viewport whilst holding down the shift key and move the selected curves along the Y axis so that they are in front of the face.
- Once done, press the Esc key to deselect any currently highlighted curves.

Good, now that you've created the new curve and have positioned it it can now be projected upon the head surface.

- From the toolbar choose the project curve to surface icon  the system will respond with the following prompt at the command line: **Select curves to project:**
- Select the new outer curve and press Enter. The system will respond with the following prompt at the command line: **Select surfaces or Polysurfaces to project onto:**
- In the Front Viewport select the head surface -- it will highlight, then press Enter. In a moment or two you should see that a new curve has now been projected upon the surface.

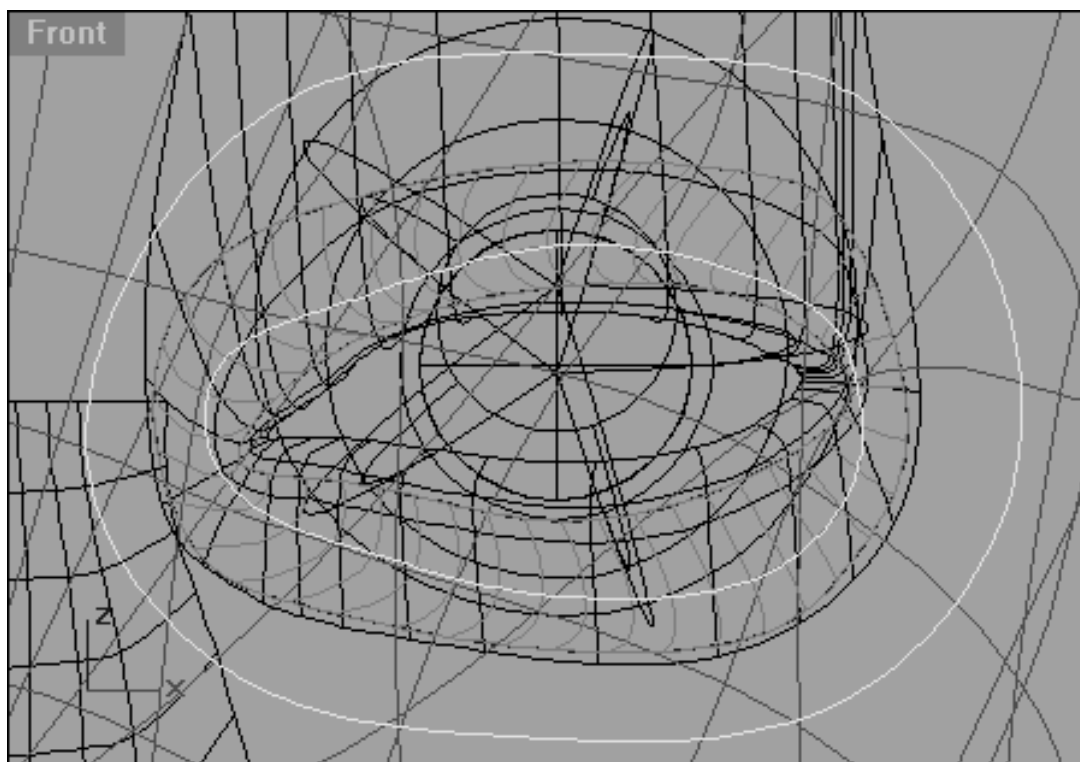
- Now in the Top, Right or Perspective Viewports take a moment to inspect the back of the head surface, you will notice that a circular curve has also been projected there as well. Select the curve that has been projected upon the back surface and get rid of it by pressing the Delete key as it is not required.
- In the Right Viewport find and select all the curves that located in front of the head that you've used for projecting and either hide them or lock them. The idea being that you should get them out of your way as having them hanging about can only cause confusion now. I don't suggest that you delete them however, not yet anyway as you never know when and if you might need them again.
- In the Front Viewport select the first interim blending surface and lock it -- see the following screenshot.



*This **Front Viewport** screenshot shows that the first interim surface has been selected and is ready to be locked.*

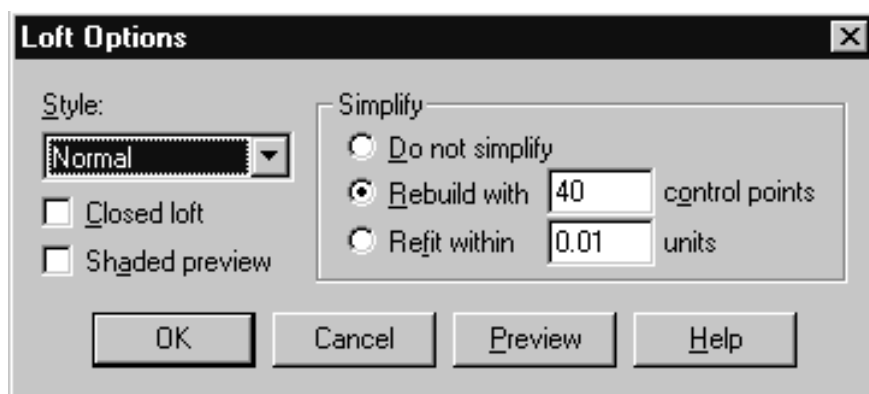
With the first interim surface now safely locked we can now set about lofting up our second interim surface, let's get cracking...

- In the Front Viewport select the outermost curve, then working inward toward the centre of the eye skip a curve and then pick the next one, once done your monitor should resemble the following screenshot:



This **Front Viewport** screenshot shows the curves that will create the second interim surface have now been selected and are ready for lofting.

- With the curves still selected, from the toolbar select the loft icon the system will respond with the following prompt at the command line: Matching seams and directions...**Select seam point to adjust. Press Enter when done** (FlipDirection Automatic Natural):
- Once again as you did earlier adjust the seams so that they line up and make sure that the direction arrows are both pointing in the same direction. In the event that they are not, use the FlipDirection option.
- When everything is lined up you are ready to go, press Enter.
- A new surface should appear along with the Loft Options dialogue box as in the following screenshot.

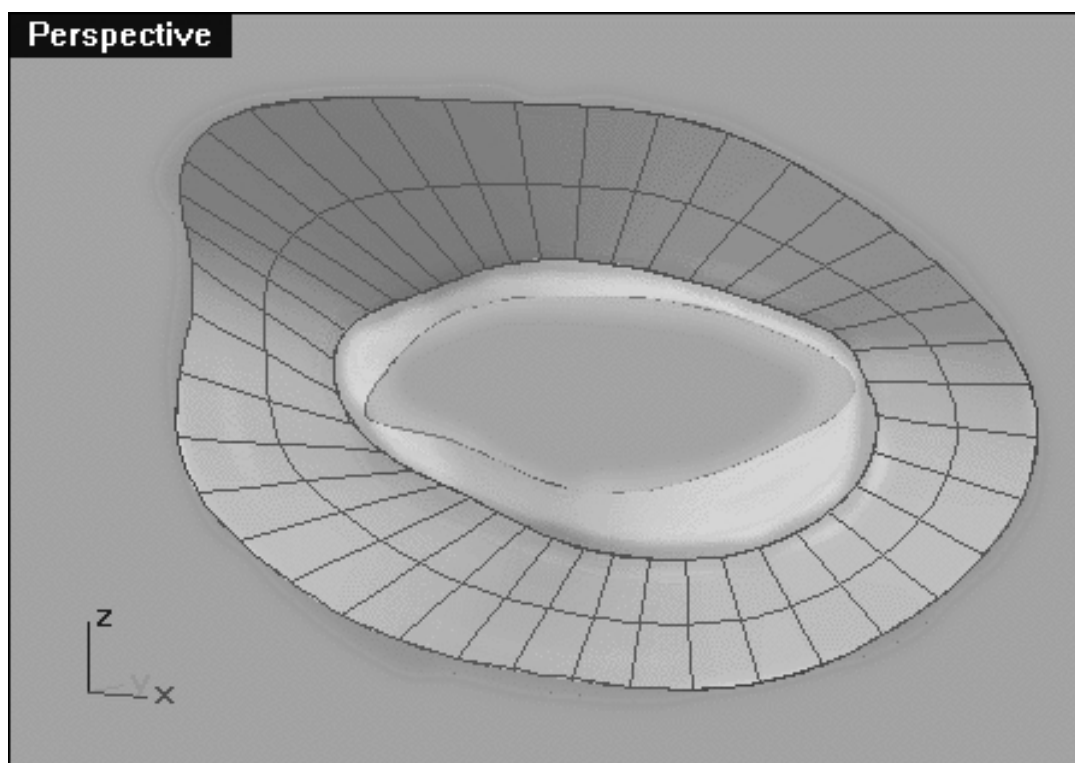


*The Loft Options dialogue box*

- Set the Style to Normal and Simplify to Rebuild with 40 control points, press OK to complete the operation.



So let's take a moment to review what we now have. We have now produced two interim surfaces. The first interim surface adheres to the eyelid surface and the second interim surface adheres to the head surface. Because of their placement each of these interim surfaces run into each other and merge more or less halfway down the middle. Have a look at the following screenshot:



*This **Perspective Viewport** screenshot shows the first interim surface (highlighted in yellow) the second interim surface (highlighted in green) and the area where they run into each other and merge (highlighted in orange).*


Right then, our task is now to create a third hybrid surface from these two interim surfaces. This will be accomplished by extracting the isoparms heading in the U direction (i.e. North to South in this case) of each interim surface. We will then join the end points of each of these extracted U direction isoparms from which we can loft a new hybrid surface. Once this has been done, we can then perform some minor refinements to what will then become our final blending fillets.

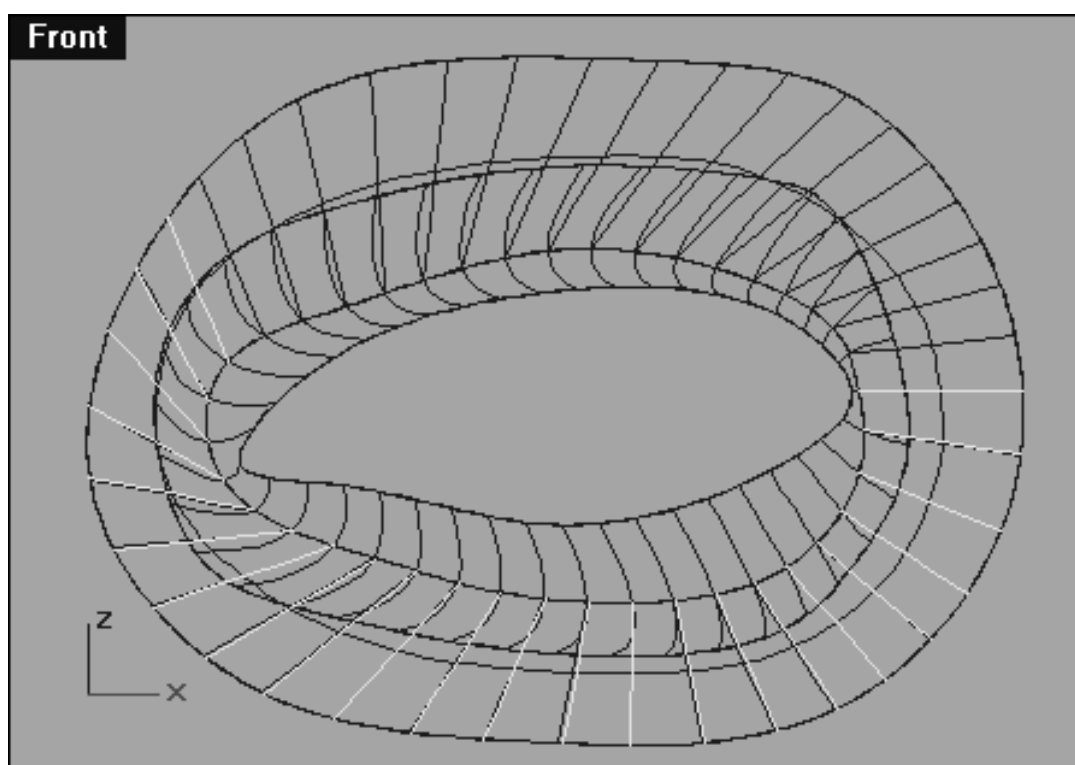
Once again, let's try and keep things as tidy as possible, create a new layer for this second interim surface so that it will be easier to manage all the bits later on.

- Open the Edit Layers dialogue box, create a new layer called: Blend\_Interim\_Surface\_02 and the layer colour to blue, once done press OK to exit.
- In any Viewport, select the lofted surface we've just created -- it will highlight, then using the Edit Layers icon and the Change Layer flyout assign it to the new layer entitled: Blend\_Interim\_Surface\_02.



# Extraction Action

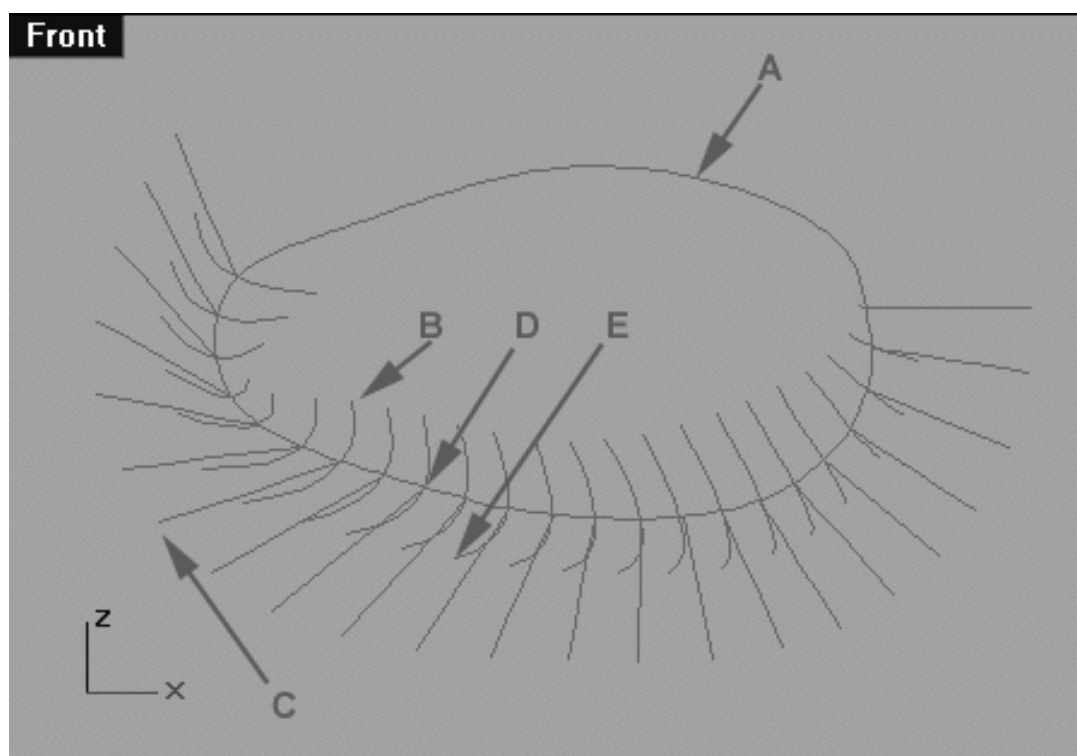
- Open the Edit Layers dialogue box, create a new layer entitled: surfacemaker, assign its colour to magenta and set it as the currently active layer.
- In the Front Viewport begin by selecting the second interim surface and then choose the Extract Isoparm icon  the system will respond with the following prompt at the command line: Select isoparm to extract (Direction = Both):
- At the command line type in U and press Enter, then begin extracting the isoparms starting at roughly the 3 o'clock position and working your way clockwise until you reach roughly the 10 o'clock position as shown in the following screenshot.



*This **Front Viewport** screenshot shows the starting and ending locations of the isoparms that should be extracted from the second interim surface (roughly about 23 in all).*

- Check to see if the first interim surface object is locked (ghosted) if so, type the command: Unlock at the command line and press Enter.
- Now select the first interim surface and repeat the procedure of extracting the isoparms along the U (North / South) direction. \*Tip--When you actually select each of the isoparms for extraction try and remove them as close as you can to the location where its sister isoparm on the second interim surface is located.
- When you finished extracting all the isoparms go back and also extract the isoparm that runs in the V direction at the point where isoparms on the first and second join.
- Once done, press Esc to complete the operation. When you've finished no curves should be highlighted, if any are, press Esc once again.

Confused? Don't be, have a look at the following screenshot, it will help you to understand what we are trying to do.




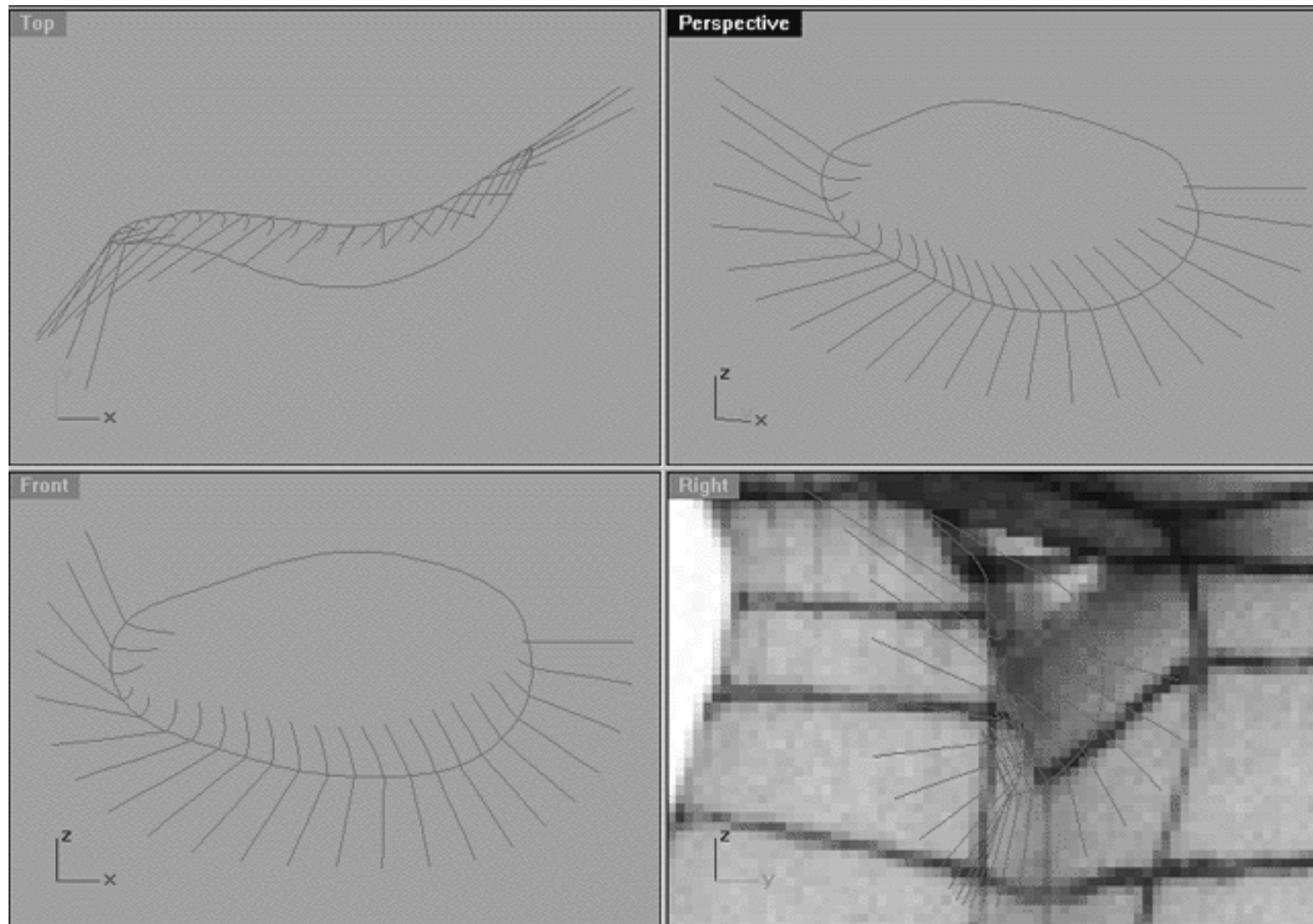
This **Front Viewport** screenshot shows the isoparms after extraction, take note of the following key areas. (A) This is the isoparm that has been extracted from the first interim surface running in the V (East / West) direction. (B) This is one of the isoparms that have been extracted from the first interim surface running in the U (North / South) direction. (C) This is one of the isoparms that have been extracted from the second interim surface running in the U (North / South) direction. (D) this is the location where the U direction isoparms extracted from the first and second interim surfaces meet (and will eventually be joined). (E) is the overhang or "tail" portion of the isoparms extracted from the first interim surface (we will trim this bit away). Please note, I've hidden the 1st & second interim surfaces for purposes of clarity within this screenshot, normally they would still be visible.

## Just a Trim

Right then, before we can join the extracted isoparms together we need to trim away the unwanted excess.

- Temporarily lock the first and second interim surface, to do this first hold down the Ctrl key and select them -- they will highlight, then type the command: Lock at the command line and press Enter.
- Open the Edit Layers dialogue, at this stage it might also be a good idea to temporarily turn off the layers entitled: Eyes\_Basic\_InPlace, Nu\_headsurf\_smooth\_2 and Nose Surface Final as with so many objects now visible on the screen it's getting hard to tell one bit from another.
- Once done, turn off the layer entitled: EYE\_BLEND\_FILL\_CURVS, then press OK to Exit.
- Make the Front Viewport active by clicking anywhere within it. You may now find it advantageous to temporarily turn off the background reference image. To do this type the command: HideBackgroundBitmap at the command line and press Enter.

- From the toolbar choose the Trim icon  the system will respond with the following prompt at the command line: Select cutting edges (Options):
- Maximise the Front Viewport.
- Select the V direction curve extracted from the first interim surface -- it will highlight, then press Enter.
- The system will respond with the following prompt at the command line: Select object to trim (Options):
- Begin by selecting the 1st overhang or "tail" portion of the isoparm extracted from the first interim surface and when you do it should disappear. Continue working in a clockwise direction until you've reached roughly the 10 o'clock position and all the tails have been trimmed off.
- Press the Esc key to complete the operation.
- When you've completed this procedure your monitor should resemble the following screenshot:



*This **All Viewport** screenshot shows that the excess "tail" portions of all the U direction curves that were extracted from the first interim surface (only) have now been trimmed off.*

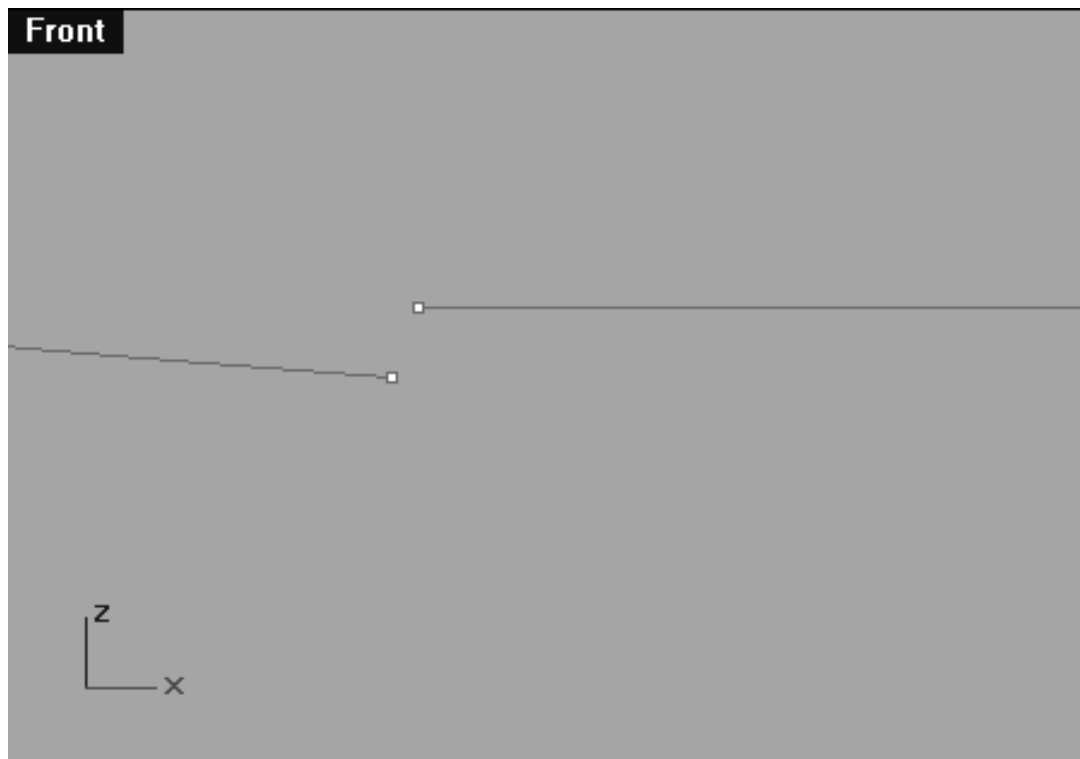


## View an example movie


### How to trim off the "tails" [Click Here](#)

We are almost ready to join all the U direction curves together but before we do, a few further adjustments are needed.

- In Any Viewport, locate the V direction isoparm that was extracted from the first interim surface, since it is no longer required, select and delete it.
- At this stage you can also turn off the layers containing interim surfaces one and two. First unlock the objects by typing the command: Unlock at the command line and pressing Enter. Once done, open the Edit Layers dialogue, locate the layers entitled: Blend\_Interim\_Surface\_01 and Blend\_Interim\_Surface\_02 and set them to OFF, then press OK to Exit.
- Beginning with the U isoparms located at roughly the 3 o'clock position, In the Front Viewport, Zoom in ultra tightly on the area where the curves meet.
- Select each of the curves and display their edit points, you will want to zoom in ultra tightly on the area where the 2 curves meet. Once done your monitor should resemble the following screenshot:



This **Front Viewport** screenshot shows the two U direction isoparms at the point where they meet with their edit points displayed. Observe how there is a gap between the two and that they don't quite meet up.

- Enable Osnaps, End and then move the 1st end point to that of the 2nd -- they should snap together.
- Continue working clockwise (as seen from the front view) until you've closed up the gaps between end points of the extracted isoparms. \* *Tip* -- this can be a somewhat slow and tedious experience, but do take your time and do a good job -- it's important. Something else I should mention, you may not move the 1st point to that of the 2nd, sometimes it will be other other way round. Which point you move to which really depends on how closely you extracted the curves. Your main aim should be to keep the overall shape of the curves as straight and as normal as possible in that particular area. It's not difficult to figure out which point you should move and it's almost an intuitive action -- you'll get a feel for it, don't worry!
- When you've finished the task of snapping all the end point of each of the extracted isoparms together disable any currently active Osnaps.
- Now we can join all the extracted isoparms together using Rhino's join command -- let's do that now.
- If you've not done so already turn off any edit points that may currently be displayed.
- From the toolbar choose the Join icon  the system will respond with the following prompt at the command line: **Select object for join:**
- In the Front Viewport select the isoparm located at roughly the 3 o'clock position -- it will highlight. The system will then respond with the following prompt at the command line: **Select next curve to join:**
- Now click on the bit of the curve that is not highlighted -- once you do both sides should become highlighted, when this happens press Enter to complete the operation.
- Continue working clockwise toward roughly the 10 o'clock position repeating the procedure with each extracted isoparm, thus joining them.
- Top Tip -- to make the job go a whole lot more quickly, instead of going back to the toolbar, choosing the join icon and then selecting the curves each time you can save a few steps by just pressing the right mouse button which will re-issue the last command entered into the system, which in this case is: Join. Now all you need do is select the 1st curve to join and then the 2nd, then once done press Enter on your keyboard. You can now move on to the next set of curves to be joined up and all you need do is start the whole process over again by pressing the right mouse button -- easy!
- Once done, confirm that you've not missed any out by clicking on each extracted isoparm. In each case the whole curve should highlight, if any do not then go back and rejoin that curve.

We are now almost reach the stage where we can loft the extracted isoparms into a hybrid surface that we can use as our blending fillet. However, before we do that we need to rebuild the curves so that they will be evenly parameterised -- let's crack on with it.

- If you've not done so already, do a Zoom Extents All, just to make all the viewports a bit more tidy.
- At the command line type: Rebuild and press Enter. The system will respond with the following prompt at the command line: **Select curves to rebuild:**

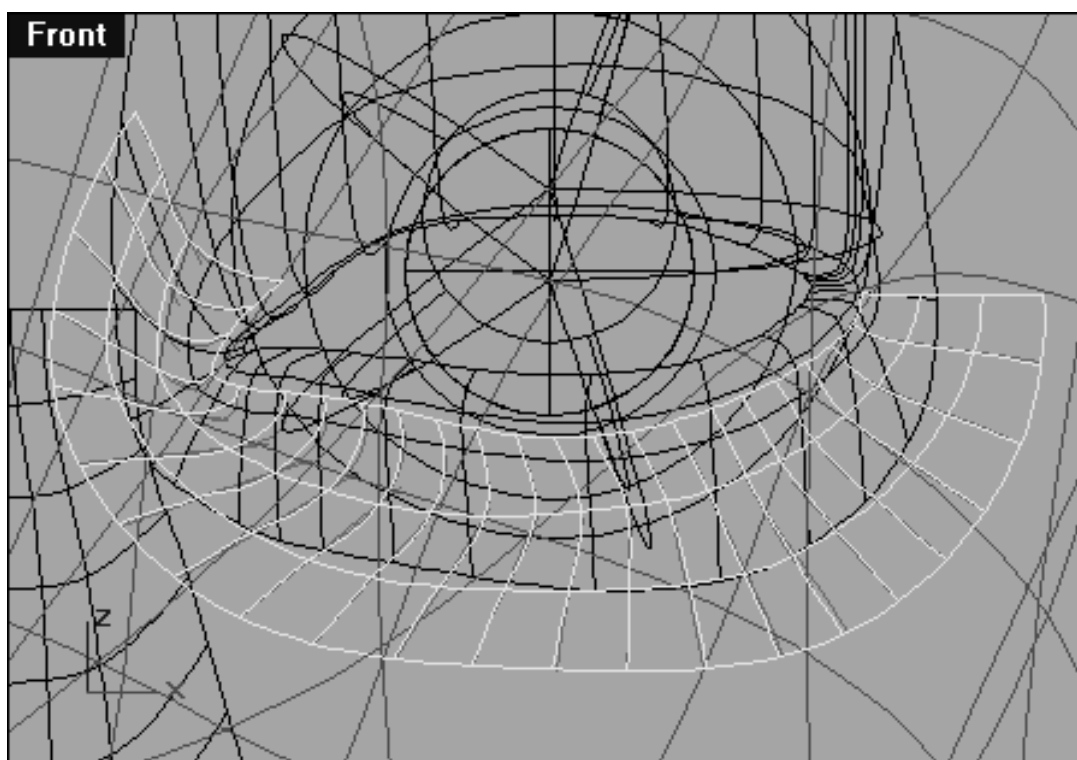
- In the Front Viewport select the base of each isoparm (near the outer edge) one by one until all are highlighted then press Enter.
- The Rebuild Curve dialogue box will appear. Set the point count to **6** and leave all other parameters at their default values, then press Enter.
- Rhino will now rebuild the curves -- a slight change in shape is normal and should be expected.

---

## Lofting the Blending Fillets

Now that the curves have been rebuilt it's just a matter of lofting them up into a surface.

- Choose the Loft icon from the toolbar, in the Front Viewport begin by selecting each of the rebuilt curves picking each of them at the base (near the outer edge). When all the curves have been selected, press Enter.
- The Loft Options dialogue box will appear, when it does, set the parameters as follows: Style: Normal, Simplify: Rebuild with **4** control points and press OK to complete the operation.
- A new surface will appear, when it does your monitor should resemble the following screenshot:



This **Front Viewport** screenshot shows the result of lofting all the curves and the surface which is produced.





This **Front Viewport** screenshot shows shaded view of the new blending fillet and the surrounding surfaces. Observe that while the blending fillet does conform fairly well to the underlying contours there are still a good many imperfections. These faults can be seen as areas that either poke through or stand away from the surface in places they should not. Despite having a few faults the surface produced will be useable after some very minor refinement of its control points.


As ever, it's a good idea to try and keep things nice and tidy -- let's do that now...

- Open the Edit Layers dialogue and create a new layer entitled: Eye Blend Fillets FINAL and set colour of the layer to magenta and make it the active layer, once done, press OK to Exit.
- In Any Viewport, select the new hybrid blending fillet and then assign it to the new layer entitled: Eye Blend Fillets FINAL using the Edit Layers icon and Change Layer flyout.
- Once again, select the hybrid blending fillet -- it will highlight.
- Open the Edit Layers dialogue, locate the layer entitled: surfacemaker and turn it OFF.
- Next, the layers entitled: Nu\_headsurf\_smooth\_2, Eyes\_Basic\_InPlace and Nose Surface Final should all be turned ON, once done, press OK to Exit.

## Time to Refine

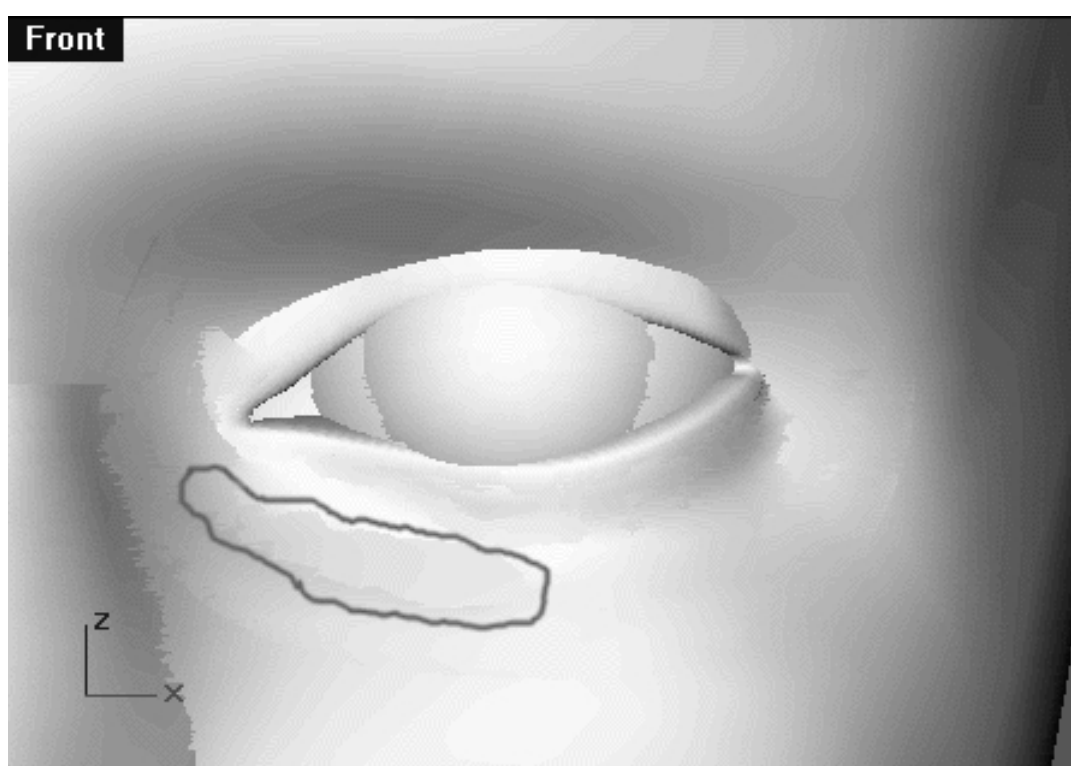
Although, it may come as a bit of a surprise it's important that you realize that the surface blending fillet should NOT actually be in contact with either the eyelid surface or the head surface, rather it should be positioned so that it is just "floating" slightly above it. Since it is nearly impossible to make such small adjustments using only your mouse to move the object this is a perfect situation to once again use Rhino's organic tool set and its nudge feature.



- In the Front Viewport select the blending fillet surface -- it will highlight.
- From the organic tool set choose the nudge Move World Y- icon by right clicking about twice on  this will move the surface forward (away from the face) along the Y axis.

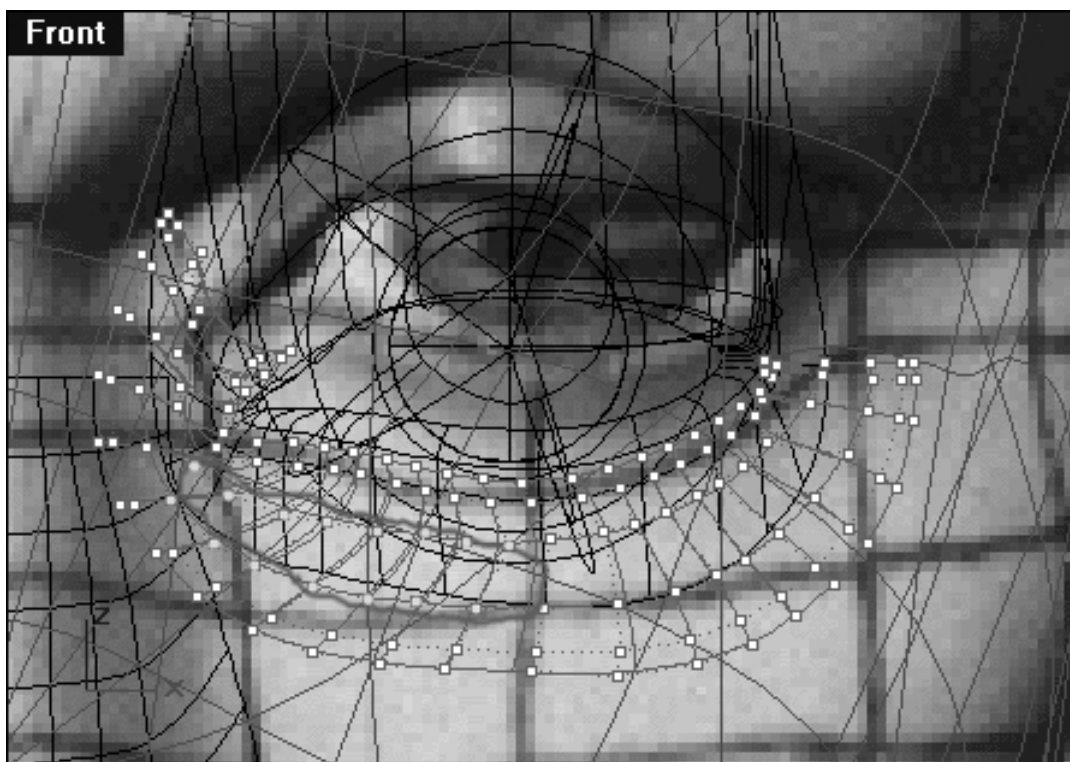
Once you've moved the surface off the face slightly you can set about making some fine adjustments to the control points as well, let's do that now.

- In the Front Viewport zoom in tightly so the blending fillet can clearly be seen, then do a quick shade of the view. Observe any areas on the surface of the blending fillet where the underlying surface of the eyelid may be poking through it. Using an O.H.P. pen mark these depressions on you monitor by tracing around them, refer to the following screenshot for an example.




*This **Front Viewport** screenshot shows that an area of depression where the underlying surface is poking through the blending fillet has been highlighted by tracing around the area with a red OHP marker pen directly on the monitor.*

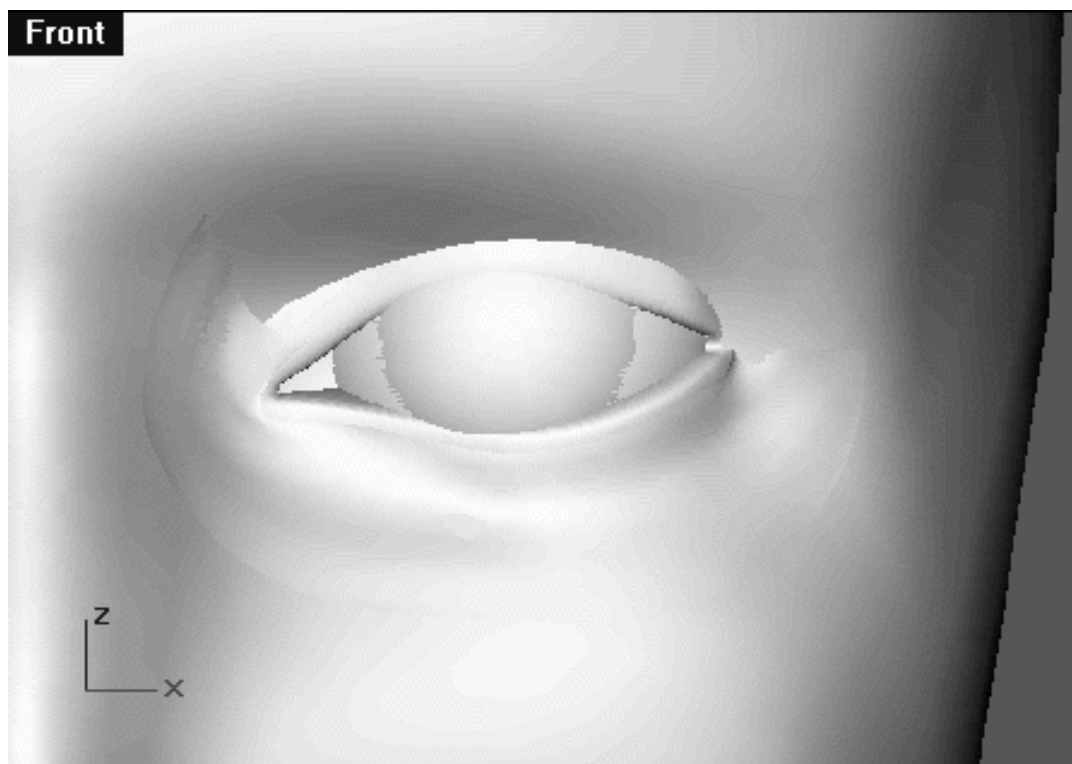
- Now that you have an idea where surface is depressed and have marked it with a pen on your monitor you can now select the surface and display its control points. Once done, select the multiple points in the offending area as in the following screenshot.



This **Front Viewport** screenshot shows that the control points in the depressed area have now been selected and are ready to be refined.

- Now from the organic tool set choose the nudge Move World Y- icon by right clicking on  After each click of the icon you should do a quick shade of the viewport and observe the results. Click as many or as few times as required until the depression disappears.

Editing and refining these surfaces does take a fair amount of time and practice and it is something that you need to get a bit of a feel for. As you work it's a good idea to keep a few things in mind. First, as you begin to refine an area you must carefully watch the rest of the surface as you do. Obviously you may have to select and move some control points along the World Y- axis (forward) whilst others will need to be moved along the World Y+ axis (backward) -- this is only logical. You should try to avoid selecting single points, try to move them in groups and usually moving them all in unison. The reason for doing so is that you do not want to create ridges or ripples in the surface, you only want to move things just enough to smooth out the transition between the surfaces without them showing through.




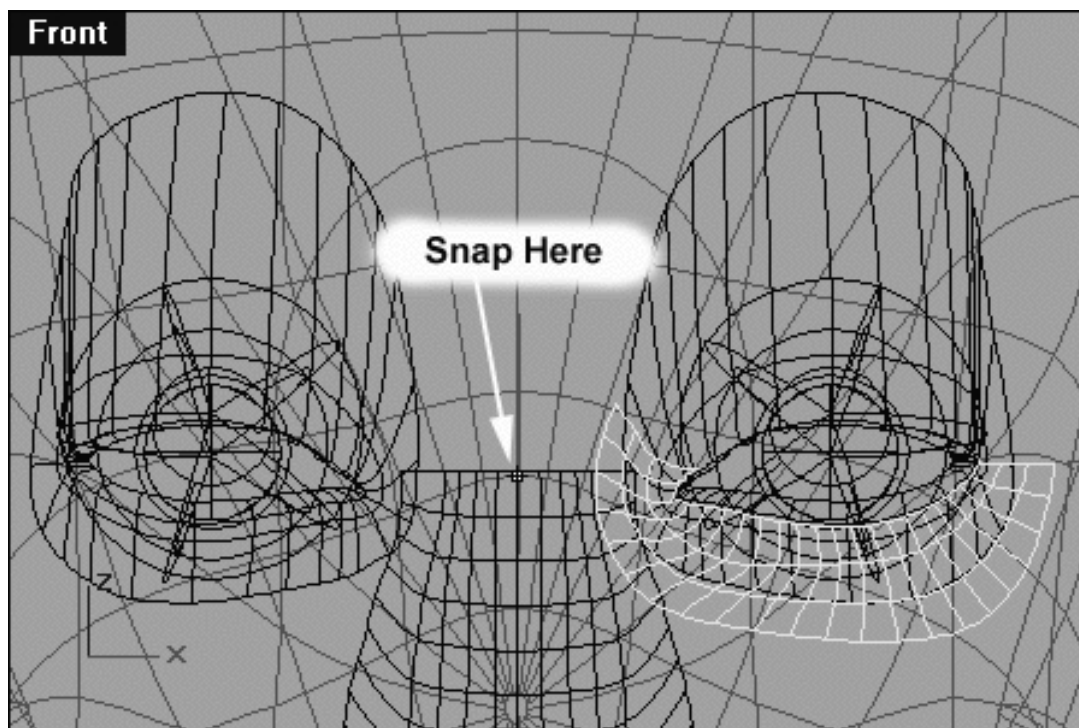
This **Front Viewport** screenshot shows the final result of refinement of the control points of the blending fillet.

While the blending fillet is still not perfect, it's very close and only a few minor adjustments should now be required.

## Eye Spy: Something Beginning with M

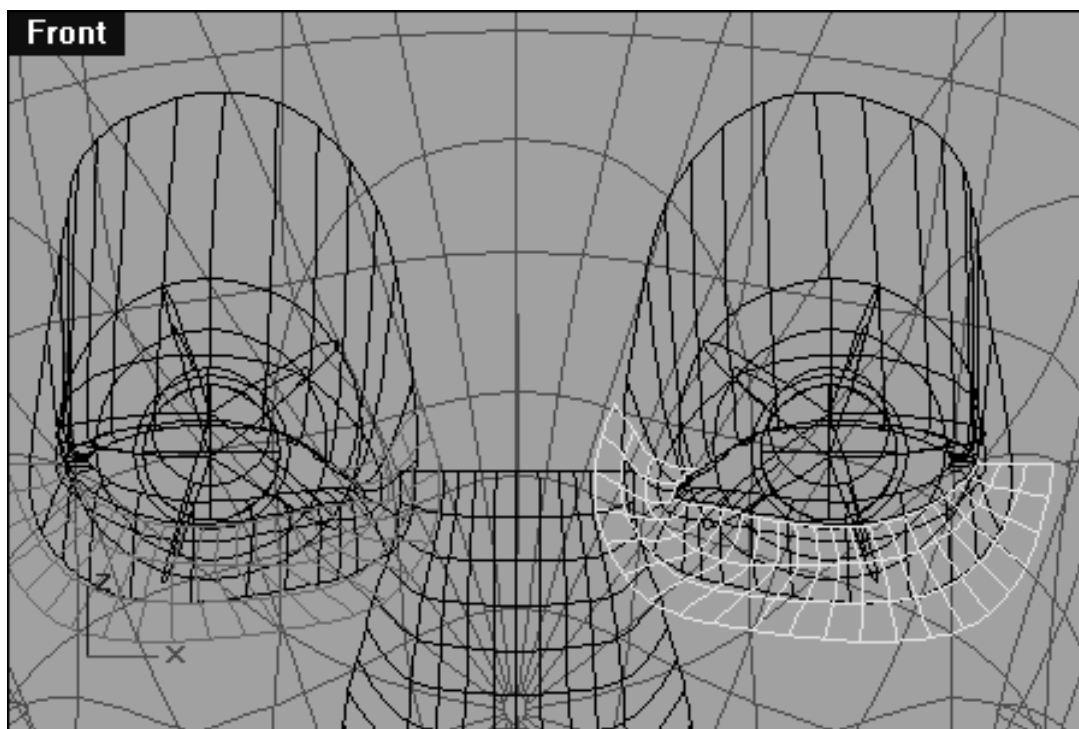
Once you feel happy with the results you've achieved in terms of editing, the blending fillet can then easily copied to the other side of the face for use on the opposite eye. Naturally, the quickest and easiest way of doing this is by using Rhino's mirror command.

- Maximise the Front Viewport and select the blending fillet -- it will highlight.
- From the toolbar choose the mirror icon  by clicking on it, the system will respond with the following prompt at the command line: Start of mirror plane:
- Press the F9 key to activate the Grid Snap feature, then move your cursor to the location shown in the following screenshot:



This **Front Viewport** screenshot shows the blending fillet has been selected and the mirror command issued. After pressing the F9 key the cursor should be snapped to the location indicated by the white arrow above.

- When your cursor has snapped to the correct location, left click the mouse and then rotate the object until it is positioned correctly in front of the opposite eye then click again to complete the operation.
- Press the F9 key once again to deactivate the Grid Snap feature.
- Once done your monitor should resemble the following screenshot:



This **Front Viewport** screenshot shows that a new blending fillet has been created and positioned on the opposite side of the face using the mirror command.

It's quite likely that this new mirror fillet will not be positioned 100% correctly (although it should be very close) so some minor adjustments may be necessary. In addition, some further minor refinement of the surface could be required to achieve a perfect fit on this side of the face. No worries, just edit the surface using the same techniques outlined previously.

---

## Summary


You have now learned one possible method for creating blending fillets. Blending fillets when used in conjunction with bespoke material shaders and ramped transparency maps within your chosen rendering / animation application can effectively hide seams within your model and create the visual illusion of a single contiguous surface. There are many ways to create the geometry for a surface fillet and you should experiment to find one that suits your style of working best and you are encouraged to pursue further investigation.

The most important things to keep in mind when creating your blending fillets should be:

- That it should cover the seam to be hidden with some material to spare on either side of the seam.
- That their edges conform to the underlying surfaces as best possible.
- That their overall surface is smooth and bridges between the (A) & (B) surfaces gracefully and with ease.
- That their geometry is as light and elegant as possible whilst still conforming closely to the underlying surfaces.
- That when completed they should not rest directly upon the underlying (A) & (B) surfaces, rather they should float just above them by only a very tiny amount.

Don't forget, when editing the fillets great care should be taken when moving the points, don't be too heavy handed. You should use the "nudge" feature found within the organic toolbox to move the selected points/objects incrementally in very minute amounts. Here are two icons from organic tool box that you should become familiar with:



use the  world Y- icon to move (nudge) forward within the Right Viewport.



use the  world Y+ icon to move (nudge) backward within the Right Viewport.

In addition, the Undo key can be of great help, if you don't like something you've done and it doesn't look right, just undo it!

---

# Shutting Down the Scene

- Save the scene.
- Confirm that no Osnaps are currently active, disable any that are.
- Hide any edit points that are currently displayed.
- Unlock any currently locked objects -- type **UNLOCK** at the command line and press **Enter**.
- Open the Edit Layers Dialogue box and locate the layer entitled **SCENE START UP**. Make it the currently active layer by clicking in the "check" field -- a check mark should appear in the column, when it has press **APPLY**. Once done, the layer entitled **SCENE START UP** should now have become the active layer and should be **ON**.
- Turn off the layers entitled: **Eye Blend Fillets FINAL**, **Nu\_headsurf\_smooth\_2**, **Nose Surface Final** and **Eyes\_Basic\_InPlace** and press **APPLY**.
- The layer entitled **Photopoints** should be **ON**.
- All other layers with the exception of those already mentioned should be **OFF** -- press **OK** to Exit.
- Perform a Zoom Extents All.
- **S A V E Y O U R W O R K..!**

---

RETURN to the Top of page -- [Click Here](#)

Go to the NEXT LESSON

Written by Joseph R. Saltzman.

Co-produced in association with Steven Ståhlberg

©1998-1999 Cinemagic Productions Limited. All Rights Reserved.

Duplication of this document including images and text by any means is expressly forbidden without prior written consent of Cinemagic Productions Limited.

Web Site: <http://www.cmagic.co.uk> Telephone: +44 (0)1753 733 190 Fax: +44 (0)1753 736 619 email: [cmagic@cmagic.co.uk](mailto:cmagic@cmagic.co.uk)

## TRIMMING OFF THE TAILS

To **PLAY** the example movie, double click below:

To **RETURN** to the tutorial -- [click here](#).

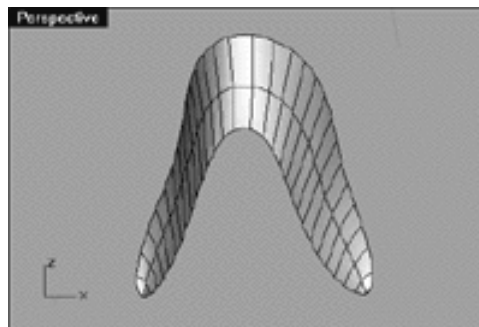


**RETURN** to previous page -- [Click Here](#)

**GOTO** the NEXT LESSON



## BLENDING SURFACES FOR THE NOSE





---

### Contents:

- [Scene Setup](#)
  - [Basic Considerations](#)
  - [Concocting the Curves, Creating Curve No. 1](#)
  - [Creating Curve No. 2](#)
  - [Creating Curve No. 3](#)
  - [Affection for Projection](#)
  - [Lofting the Surface](#)
  - [The Result](#)
  - [Shutting Down the Scene](#)
- 

## Scene Setup

- If you've not done so already start a Rhinoceros session by **Double Clicking** on the desktop icon  the application will begin.
- Choose File, Open from the menu bar and Double Click on **START\_B.3DM** in the file list, it will load and open.

- Confirm at the Lower Status Bar the currently active layer is entitled SCENE START UP. If it is active proceed to the next step, if its not then make it active by Left Clicking on the layer box, highlighting the correct layer and clicking on it.
- Again, at the Layers Box on the Lower Status Bar this time Right Click on the box, the Edit Layers Dialogue box will open. Confirm the following switches have been enabled or disabled:
- The Layer entitled: Nu\_headsurf\_smooth\_2 should be ON.
- The Layer entitled: Nose Surface Final should be ON.
- The Layer entitled SCENE START UP should be ON.
- All other layers should be set to OFF.
- When you've finished making your changes ( if any ) click on OK.
- Confirm that the grid display in the viewports has been disabled, if not turn it off now.
- Confirm that no Osnaps are currently enabled, if any are disable them.
- Confirm that no edit points are currently displayed, if any are hide them.
- Zoom out all the viewports by selecting the Zoom Extents/Zoom Extents All Views icon  or by typing **ZoomExtentsAll** at the command line and pressing ENTER.

---

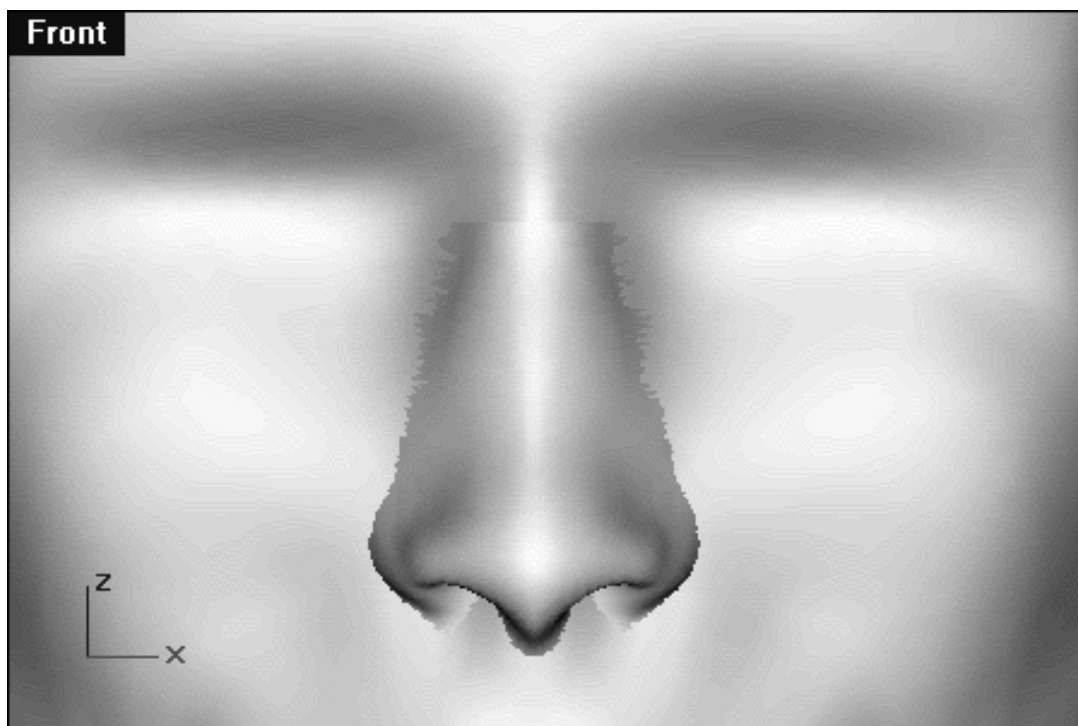
## Basic Considerations

Since you've successfully created the blending surfaces for the eyelids in the previous lesson, you now possess all the requisite skills to create them for the nose as well. The good news is that creating blends for the nose is a relatively easy job in comparison to the eye blends so that makes for a very nice change indeed!

As before you will create a new surface that will effectively hide the obvious occurrence of a seam produced at the point where the nose geometry intersects with that of the face. In the case of the nose blending fillet, its surface will be quite simple in terms of construction and not all unlike that of a plaster (Band Aid).

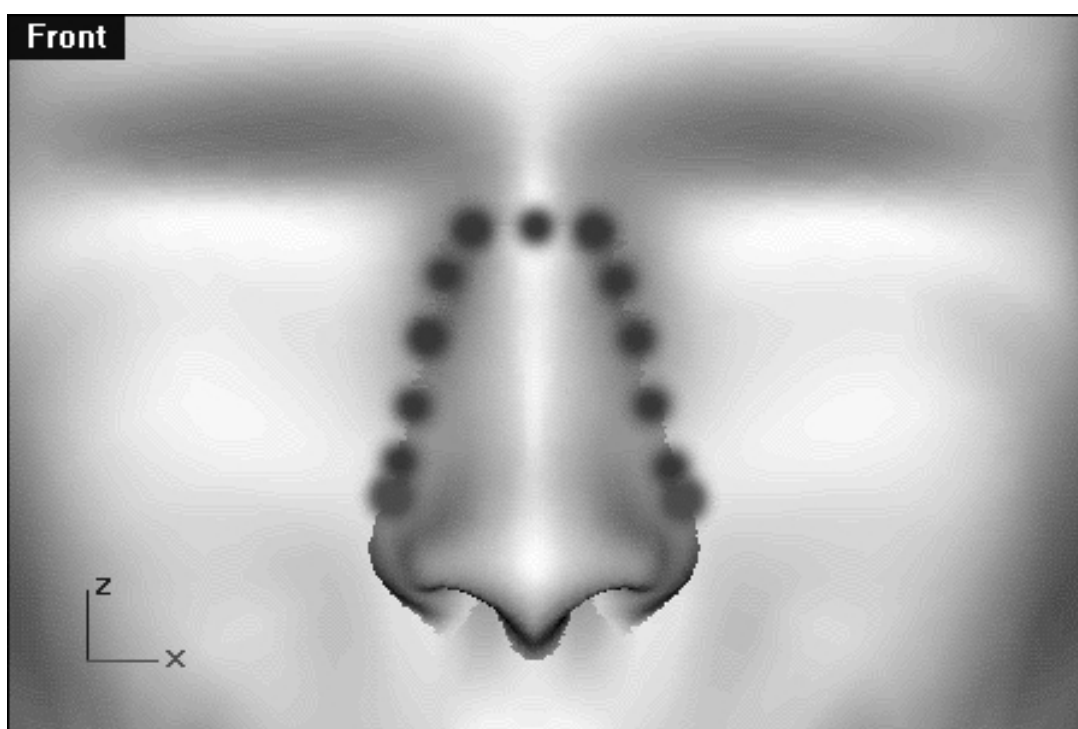
Essentially, your aim should be to create an upside down "U" or horseshoe shaped surface that will be draped over the nose with it's top starting at roughly the bridge of the nose and it's two ends located down near the nostrils.

Now that you have an idea what needs to be done let's have a look at what is actually going on with the surfaces in question.



This **Front Viewport** screenshot clearly shows the area where the nose surface and the head surface intersect.

As you can see from the previous screenshot when a quick shaded render is performed the area where the nose and head surface intersect is made evident by a jagged seam running around the perimeter of the nose. The task is now to create a blending surface that will follow this jagged seam, see the following screenshot.



This **Front Viewport** screenshot shows the area that we shall pay particular attention to covering up with the blending surface. The blue dot's represent the main area of concern, whereas, the purple dots indicate the areas that require "special" attention.

Right then, so in the previous screenshot you can clearly see that we need to create a horseshoe shaped surface (the purple dots). We don't need to concern ourselves with the area beneath the nose (the upper lip area) because it's unlikely that the seam located here would ever be seen largely because it's in a slight shadow cast by the nose itself most of the time. Of course later on when creating skin shaders and texturing the model if it were to become a problem you could always create another little blending fillet just for the purpose, so this method of killing seams is very flexible. In addition, we needn't worry about the very corners of the nose (the nostril flares) because it's advantageous to have a fairly "sharp" edge in this area of the face anyway.

Special attention must however be paid to the areas just above the nostril flares, this is the tricky part.


As with the eyelid blending surfaces that you created in the previous lesson you will probably find that creating effective blending fillets is not an exact science, it requires a fair amount of trial and error in terms of overall shape and refinement of the surface before you hit upon the solution that works best for you.

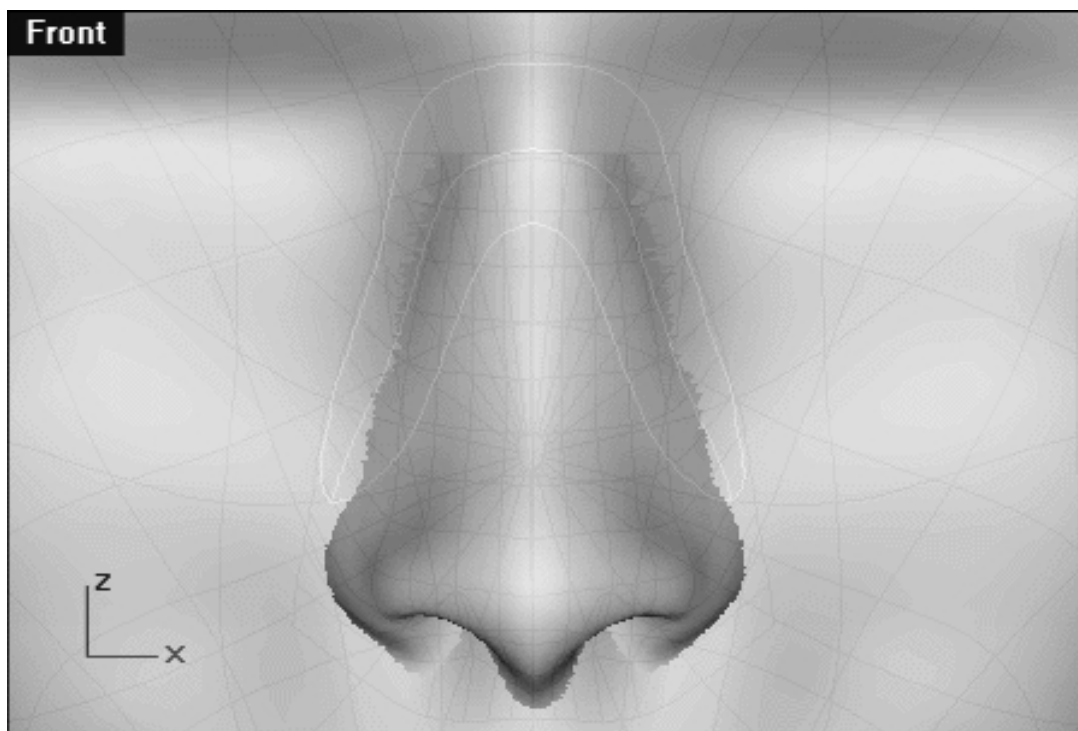
---

## Concocting the Curves

### Creating Curve No. 1


I don't think it's worthwhile to go into extreme detail as to just how you should go about creating and editing the curves for the nose blends. The reason for this is because it roughly the same procedure as you performed in the previous lesson in order to create the eyelid blends. Rather than repeat myself, here a somewhat abridged version of the steps you should follow:

- Create a new layer entitled: **nose blend fillet curves (orig)**, leave it's colour as default (black) and set the layer as currently active.
- Maximise the Front Viewport and zoom in tightly on the nose / face area.
- You will want to draw a total of 3 curves and will begin by drawing the outermost curve first.
- If you've not done so already, this would be a good time to get out your OHP marker pens. Do a quick shaded render of the Front Viewport and mark the area where the jagged seam occurs on your computer monitor.
- Next, choose the interpolated curve icon from the toolbar  and start by placing the first point in the creased area just ever so slightly above the nostril flare.
- Once the first point has been established continue on placing points working clockwise around the perimeter of the nose. You needn't worry about the number of points placed, it's the overall shape that is most crucial. The most critical points you place will be located at the 1st tip (the start) at the 12 o'clock position and the 2nd tip (the end) -- try and keep the points located here as evenly spaced as possible. Keep in mind that you are drawing a total of 3 curves and since you're now working on drawing the outer curve at the moment, this particular curve should be placed to one side of the seam. Confused, see the following screenshot.

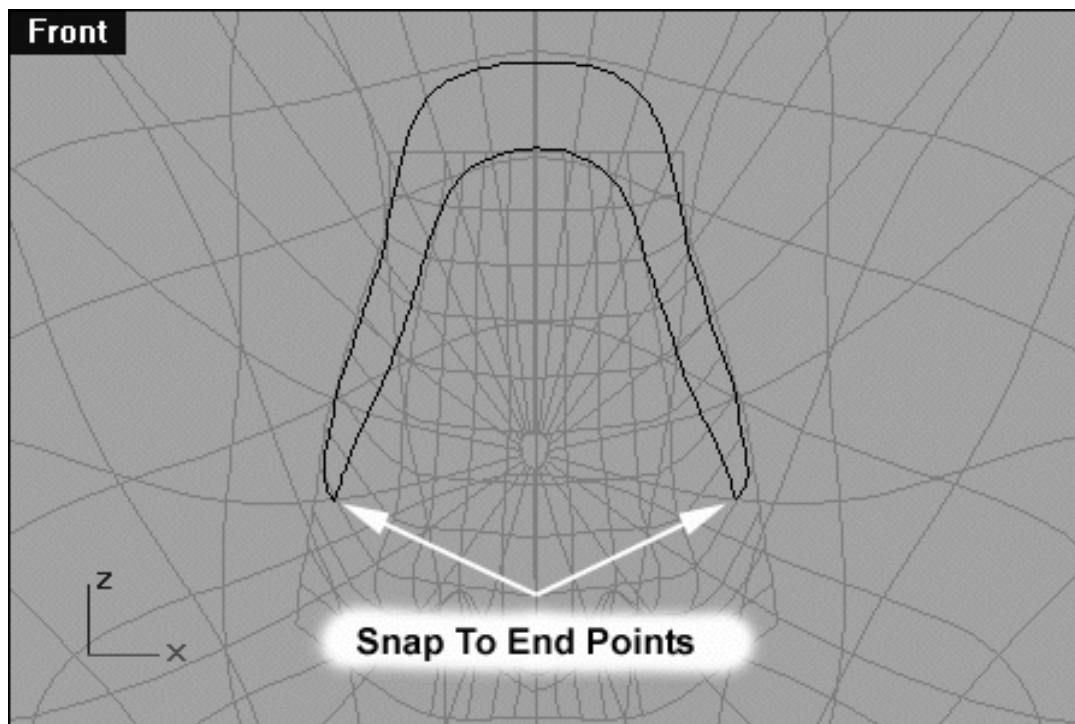


This **Front Viewport** screenshot shows exactly what we are trying to achieve. This image shows a composite of a quick shaded render of the nose and head surface and the area where they intersect with each other. The light yellow lines represent the shape of the curves we need to draw within the front view and their position in relation to the area of intersection of the head and nose surfaces. Notice how the 1st curve that we will draw (the outer curve) keeps to one side of the intersection, whilst the 2nd curve we will create (the middle curve) follows the intersection itself closely. Lastly, observe how the 3rd curve that we will draw (the inner curve) keeps to opposite side of the intersection.

## Creating Curve No. 2

- When you've completed drawing the 1st curve you can then move on to creating the 2nd, however you **MUST** do the following.
- Zoom in very tightly on the area where the 1st curve originates.
- Open the Osnaps dialogue and temporarily turn ON the End snap. Once done, choose the interpolated curve icon  from the toolbar and begin drawing the next curve (the middle). We want this curve to start at the exact same location (just above the nostril flare) as the curve we created just a few moments ago, so we will begin this new curve by snapping it to the end point of the previous curve.
- Once the first point of the new curve has been successfully snapped to end point of the previous curve open the Osnaps dialogue box and disable the End snap.
- Zoom out the view as required.

- Now continue working your way clockwise around the nose maintaining a fairly even distance from the previous curve. Remember, this middle curve that you are now drawing should follow the point of intersection of the nose/head surfaces reasonably closely (take look at the previous screenshot for guidance). Don't forget, you will be able to determine where the point of intersection is by doing a quick shaded render of the front viewport and marking the area with OHP marker pens on your computer monitor which can then be used as a template to guide you along.
- When you've almost reached the tip at the opposite side and are ready to place the last point, again, open the Osnaps dialogue and temporarily turn ON the End snap then zoom the view as required. Once done snap the last point to the end point of the previous curve and press Enter to complete (see the screenshot below).




This **Front Viewport** screenshot shows that the 2nd curve (the middle) has now been created. Observe how the end points of the 2nd curve have been snapped to those of the 1st.

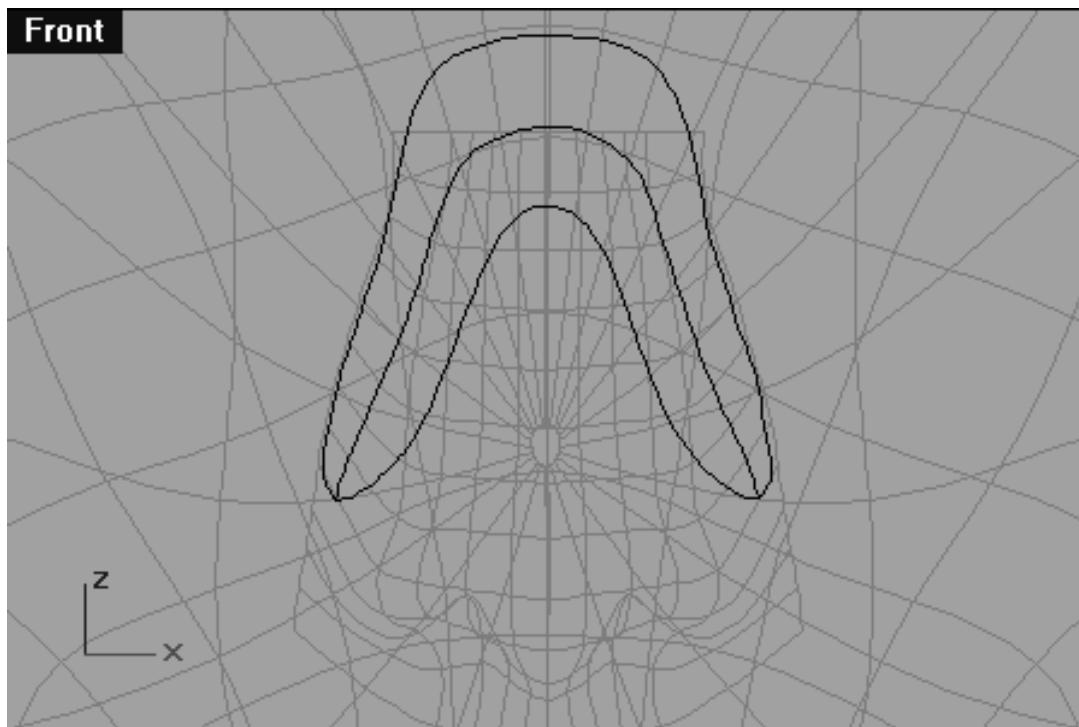
## Creating Curve No. 3

With the 2nd curve now complete we can set about creating the 3rd and final curve required to create the blending surface.

- Zoom in very tightly on the area where the 1st and 2nd curves originate.
- The Osnaps End point should still be active, if not, activate it now. As before, choose the interpolated curve

icon  from the toolbar and begin drawing the next curve (the inner). We want this curve to start at the exact same location (just above the nostril flare) as the last two curves we created, so we will begin this final curve by snapping it to the end points of the previous curves.

- Once the first point of the new curve has been successfully snapped to end point of the previous curves open the Osnaps dialogue box and disable the End snap.
- Zoom out the view as required.
- Continue working your way clockwise around the nose maintaining a fairly even distance from the previous curves. Remember, this inner curve that you are now drawing should be on the opposite side of the intersection of the nose/head surfaces.
- When you've come to the penultimate point and are ready to place the final point, again, open the Osnaps dialogue and temporarily turn ON the End snap then zoom the view as required. Once done, snap the last point to the end point of the previous curves and press Enter to complete (see the screenshot below).

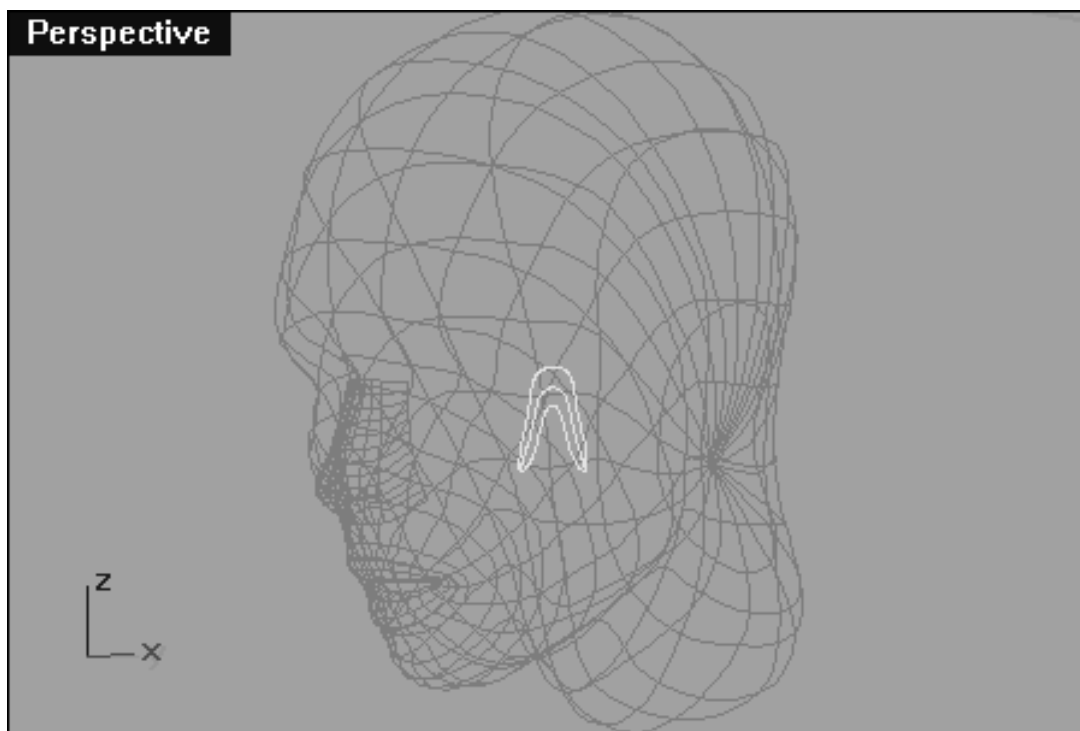


*This **Front Viewport** screenshot shows that all 3 curves required to create the blending surface have now been created. Observe how all 3 curves share the same end points at their beginning and end.*

## Affection For Projection

Now that we've successfully created the 3 basic curves needed to produce the blending surface they can now be used as the basis for projecting new curves upon the head and nose surfaces. Naturally, because we created these curves in the Front Viewport we can expect to find the curves currently positioned along the construction plane located in the centre of our head (see the following screenshot).

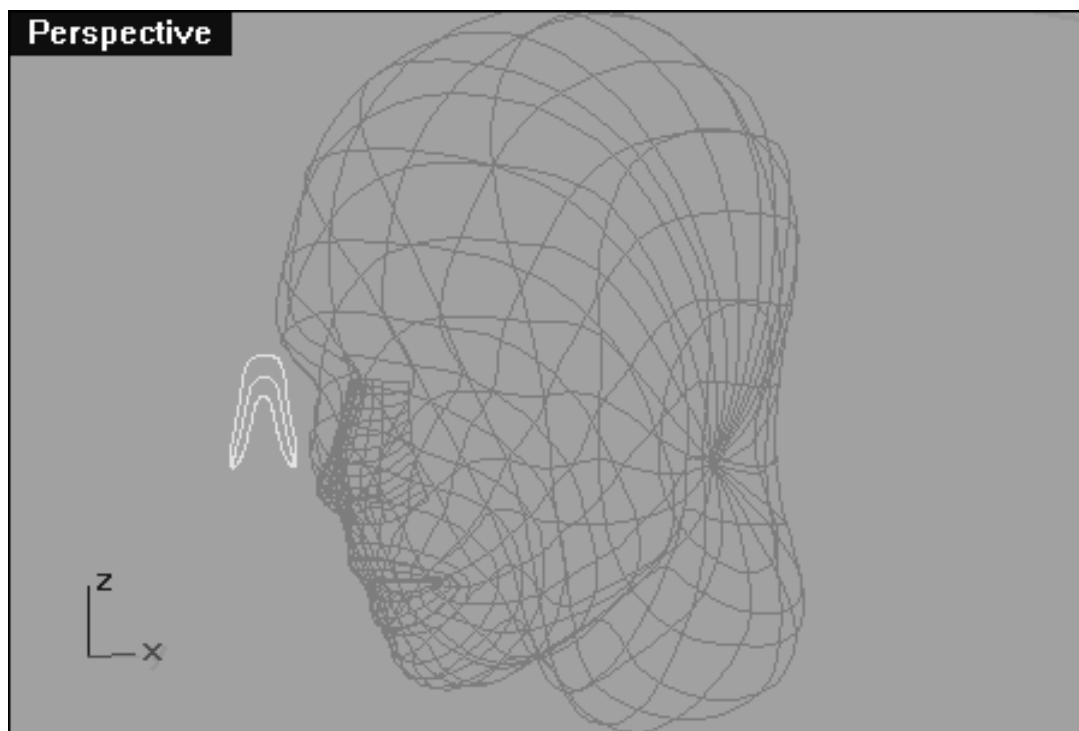




This **Perspective View** screenshot shows all 3 curves are currently located as expected along the construction plane at the centre of the head.


Although it's not necessary, I prefer to move the curves so that they are positioned in front of the object prior to projecting them (somehow this makes me feel better). Let's get on with it!

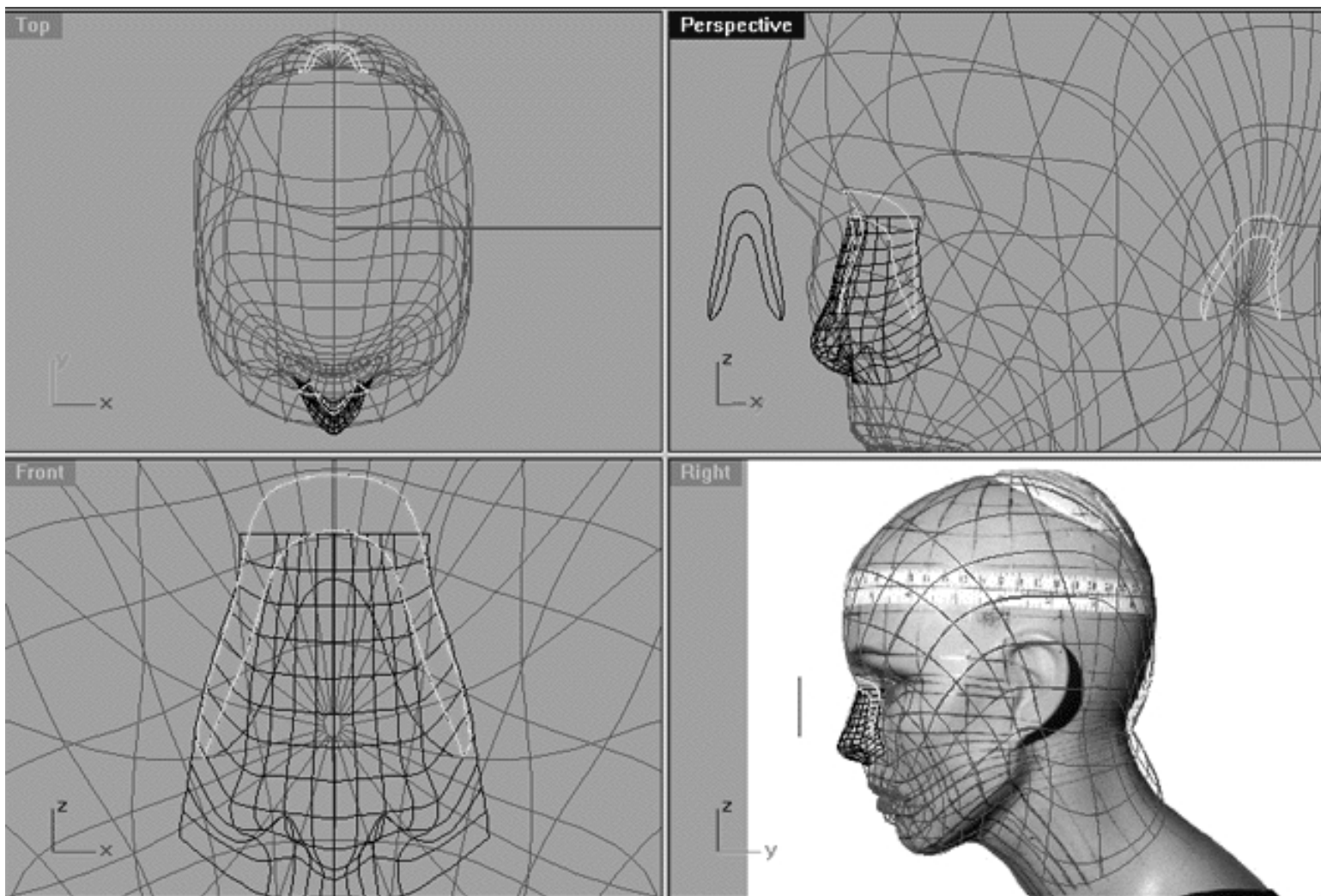
- Confirm that no Osnaps are currently active, disable any that are.
- In Any Viewport carefully select all 3 curves by holding down the Ctrl key and clicking on them in turn -- they will all highlight.
- Then in the Right Viewport, whilst holding down the Shift key move the curves along the Y axis until they are located in front of the head.
- Once done, your monitor should resemble the following screenshot:




This **Perspective View** screenshot shows all 3 curves have now been moved along the Y axis in the Right Viewport and are now located in front of the head.

With the curves now located in front of the head we can now set about projecting them.

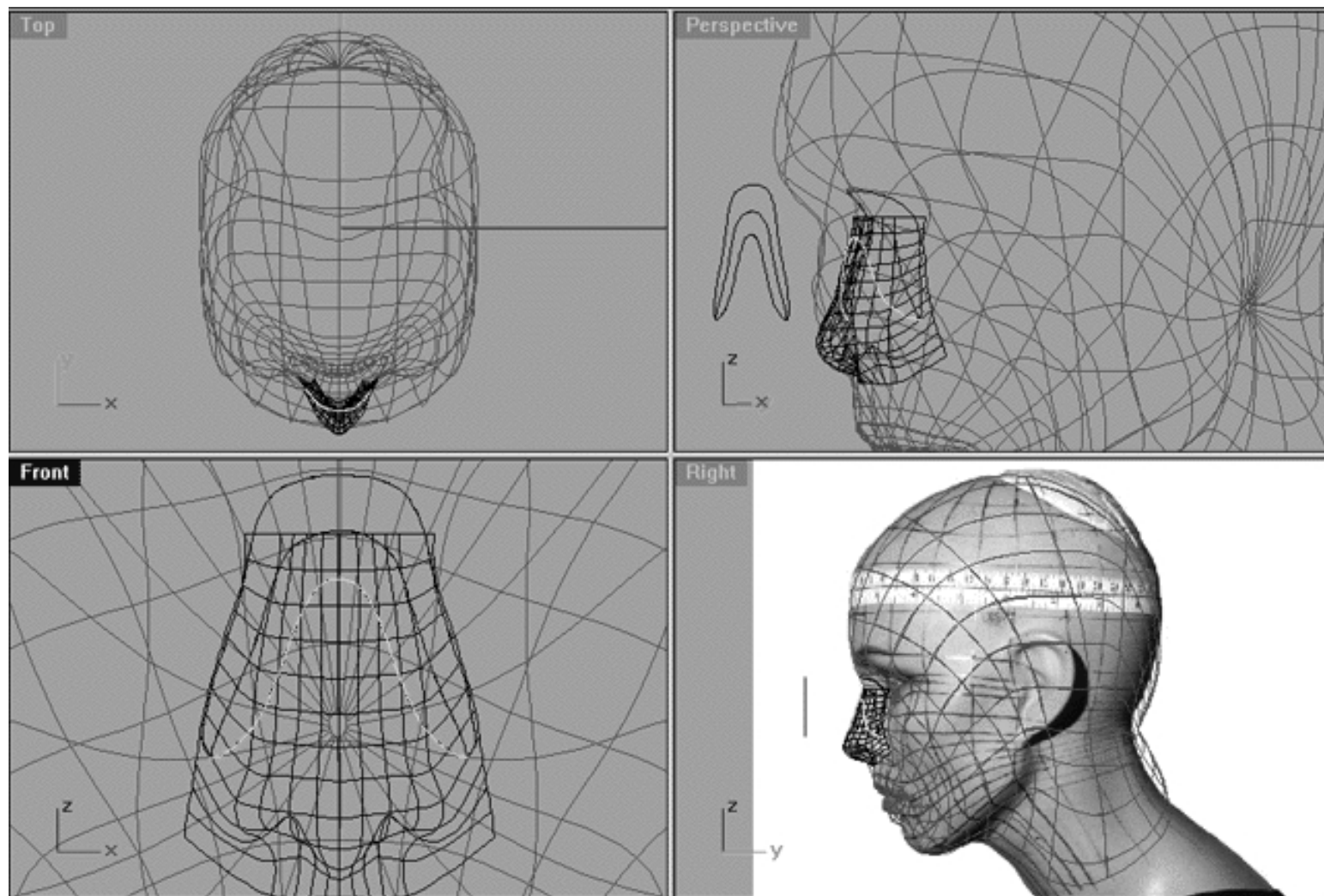
- If any objects are currently locked unlock them now.
- Make certain that no objects are currently selected.
- From the toolbar choose the project icon  the system will respond with the following prompt at the command line: **Select curves to project:**
- In the Front Viewport carefully select the OUTER and MIDDLE curves only, then press Enter.
- The system will respond with the following prompt at the command line: **Select surfaces or polysurfaces to project onto:**
- In the Front Viewport carefully select the **head surface** only and press Enter.
- Within a few seconds some new curves will appear and your monitor should resemble the following screenshot.



This **All Viewport** screenshot shows the result of projecting the outer and middle curves upon the head surface only. Observe that not only have 2 new curves been created at the front of the head but also at the rear.

- Press the Esc key to deselect any currently highlighted curves.
- Hold down the Ctrl key and in the Perspective Viewport select the 2 curves that have been projected upon the rear surface of the head -- they will highlight.
- Press the Delete key -- they're gone!
- Return to the Front Viewport, click on it's label to make it active.
- Again, from the toolbar choose the project icon  the system will respond with the following prompt at the command line: **Select curves to project:**
- This time, in the Front Viewport carefully select only the INNER curve, then press Enter.
- The system will respond with the following prompt at the command line: **Select surfaces or polysurfaces to project onto:**
- Now in the Front Viewport carefully select the **nose surface** only and press Enter.

- Within a few seconds some new curves will appear and your monitor should resemble the following screenshot.
- Once done, press Esc to deselect any currently highlighted curves and complete the operation.

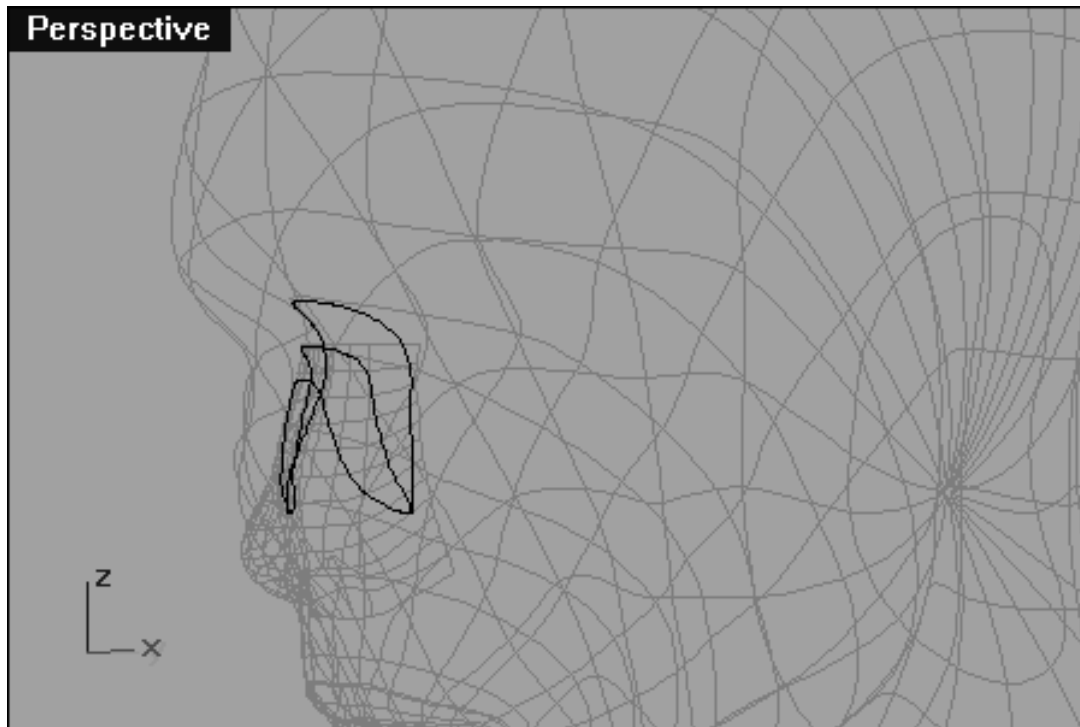


*This **All Viewport** screenshot shows the result of projecting the inner curve upon the nose surface only. Observe that only 1 new curve has been projected, no additional curves have been created at the rear.*

It's a good idea to keep things as neat and tidy as possible so let's create a new layer to keep the projected curves we've just created on.

- Open the Edit Layers dialogue and create a new layer entitled: **nose blend fillet curves (proj)**, leave its colour as default (black) and when done press OK to exit.
- Hold down the Ctrl key and carefully select the head and nose surfaces -- they will highlight.
- Next, lock the head and nose surface objects by typing the command: Lock at the command line and pressing Enter.
- In the Right Viewport, frame select the 3 projected curves (the ones lying on head/nose surface) -- they will highlight.

- From the toolbar choose the Edit Layers icon and then from the flyout choose the Change Layer icon.
- When the Layer for Object dialogue appears, find the layer entitled: **nose blend fillet curves (proj)** and double click on it -- the curves should now be assigned to the new layer.
- Open the Edit Layers dialogue and create a new layer entitled: **nose blend fillet surface (orig)**, leave it's colour as default (black) and set it as the currently active layer.
- Turn OFF the layer entitled: nose blend fillet curves (orig) and when done press OK to exit.
- Your monitor should now resemble the following screenshot:



*This **Perspective View** screenshot shows only the 3 projected curves are now visible, (the curves used for projection have been turned off) the head and nose surfaces objects have been temporarily locked to prevent them from being accidentally disturbed.*

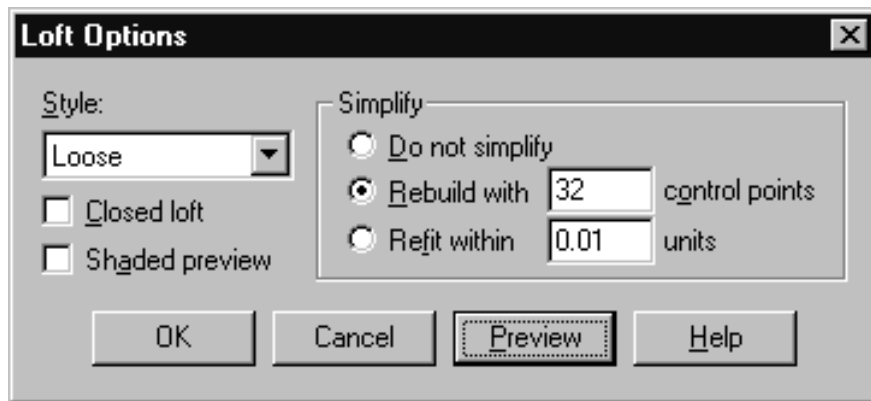
## Lofting the Surface

With everything now completed and cleaned up we can finally set about lofting up the 3 curves into a workable blending surface, let's crack on.

- From the toolbar choose the loft icon, the system will respond with the following prompt at the command line: **Select curves to loft (Point):**
- In the Front Viewport, start by selecting the first curve (the outermost) near its point of origin (just above the nose flair) -- it will highlight.
- Once done, select the 2nd (middle) and 3rd (innermost) curve, again, near their point of origin -- they will highlight.



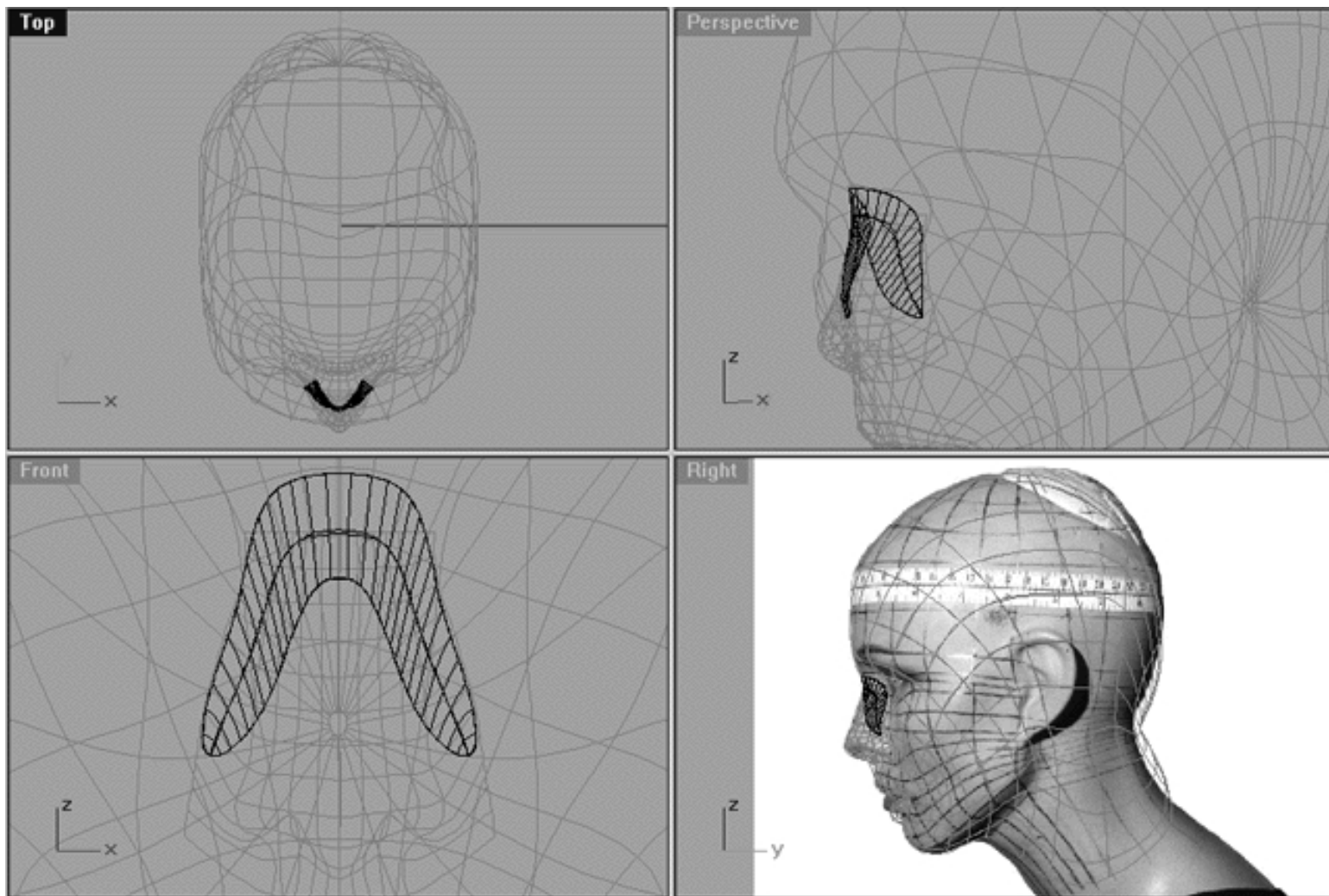
- When all the curves are highlighted, press Enter -- the Loft Options dialogue box will appear.
- Next, set all the values as shown in the following screenshot:



*This screenshot shows the Loft Options dialogue box and the values that you should enter.*

- You should set the style of loft as Loose and the surface should be simplified by rebuilding with **32** control points.
- Once you've set the parameters, press OK to exit.
- A new surface will now have been created.

So how did we decide on 32 as the number of control points to use? The honest answer is that we guessed -- this is a total arbitrary figure, it could have been anything! That said, we know from experience that a fair number of points would certainly be required to conform the curvature of the nose and head surface. Fewer points may not have been enough where as more points may have been nothing more than overkill and could have caused problems with rippling.



*This **All View Screenshot** shows the new surface that has been produced by lofting the 3 projected curves with the parameters and options as described above.*

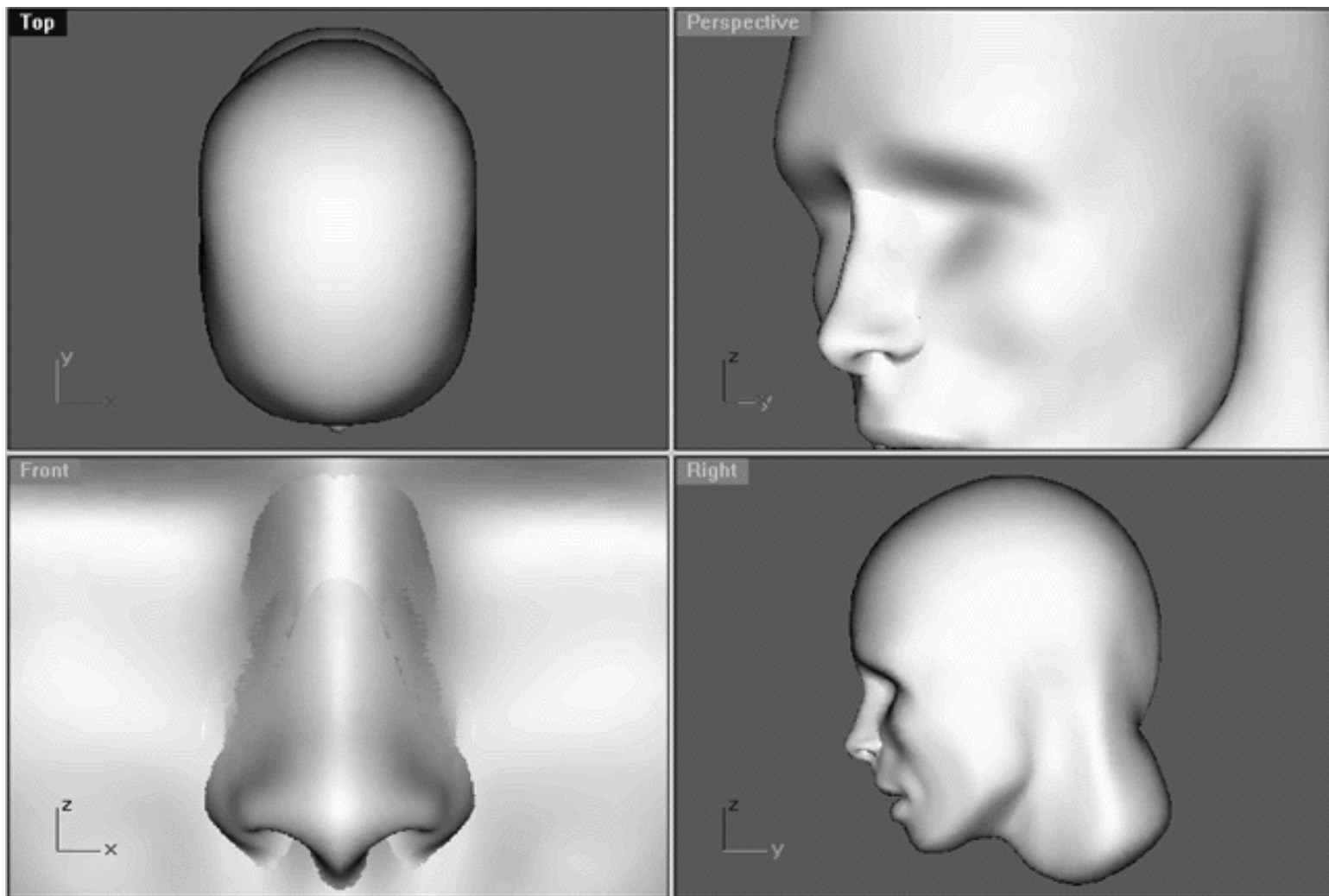
---

## The Result

Now that we've managed to produce a surface from the 3 curves this would be a good time to check if what we actually have is going to be useable by doing a quick shaded render.

Your monitor should now look something like this...





This *All View* screenshot shows a quick rendered view with the new surface in place.

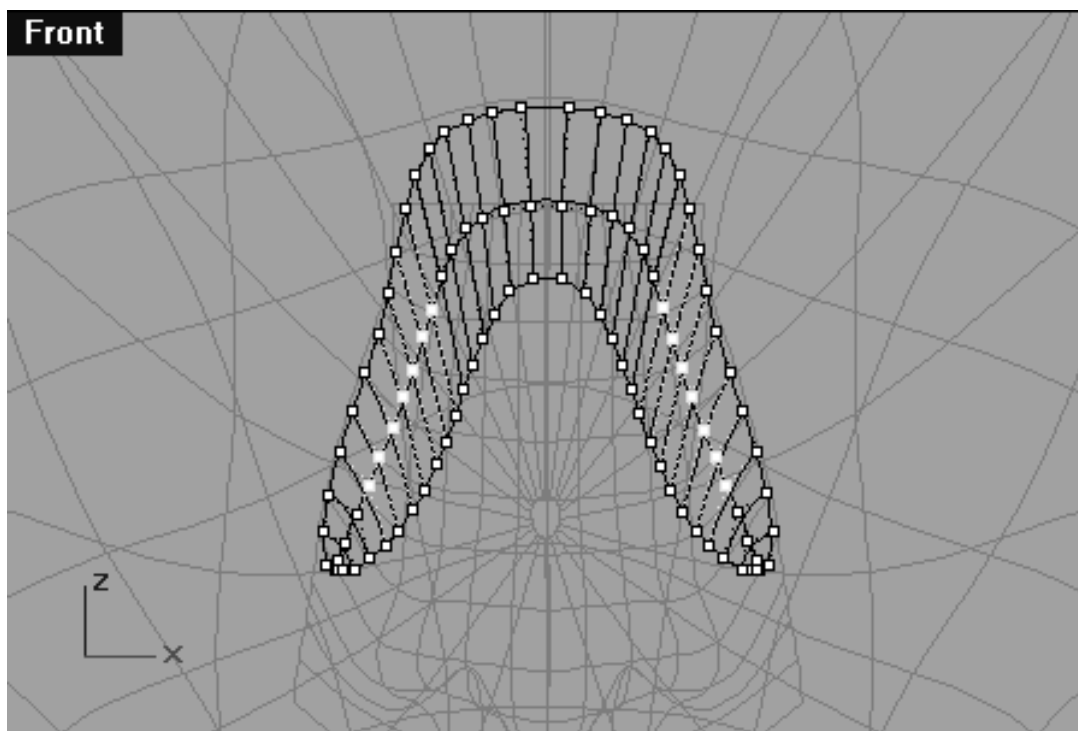
As you can see from the previous screenshot our blending surface isn't quite perfect -- not that we expected that it would be! Naturally, as with the eyelid blending surfaces we created in the previous lesson further refinement of the surface will be required. Still, we are not too far away from having a viable blending surface and only a minor amount of tweaking should be called for.

As you can see some of the surfaces are being covered up quite well, especially those near the top at bridge of the nose. On the other hand, the area at the sides of the nose and near the nostril flares are far less impressive. So how can this quality of this surface be improved then?

The first thing you can do is to select the nose blend surface and nudge it out (just a bit) along the Y axis in the

Right Viewport. To do this use the move world Y- icon  found in the Organic Toolbox. Keep in mind that it is important that you don't click any more than 1 TIME ONLY -- at least for the time being anyway.

Now do another quick render and see if there has been any improvement, you should notice a minor one. Using an OHP pen, your next task should be to carefully mark the areas of the blend directly on your monitor where you can still see the other surfaces poking through.



This **Front Viewport** Screenshot shows some of the more "problematic" points as revealed by a performing a quick shaded render.

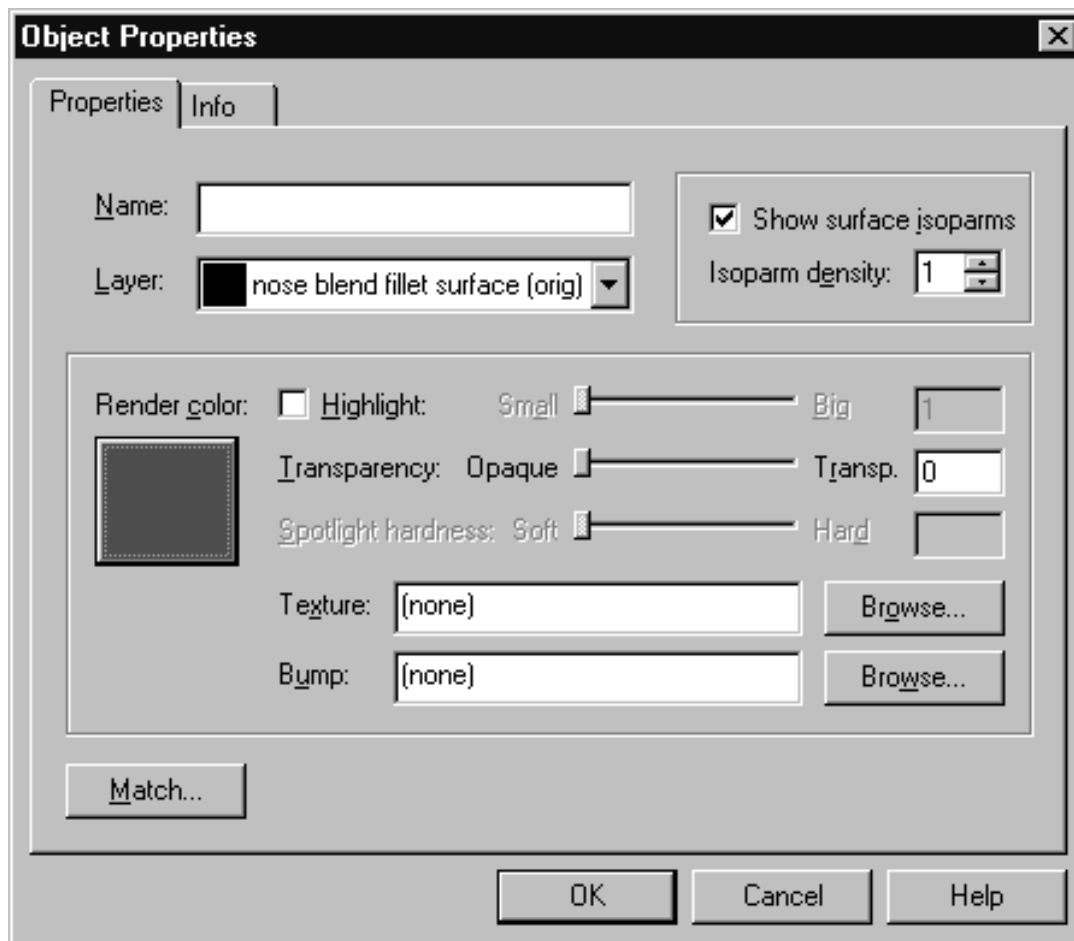
With some of the offending points now located you can experiment by nudging the points along a given axis. I recommend that your workflow go something like this. Nudge a whole group of points a few times (keeping track of how many), then quick render to see if you are achieving the desired results. If you determine that your results are not what you had hoped for then undo (the same number of times as nudges) and try something else.

Here are a few things to keep in mind:


- Don't move any of the point's on either the outer or inner isoparms -- you want them to stay just where they are. It is possible that it could become necessary at some stage, but I recommend that you select the entire blending object and move it as a whole before resorting to this.
- 99% of the time you will be able to make this blend look correct only by moving the control points on the middle isoparm.
- Avoid moving single points -- try to move them only as symmetrical groups if possible as moving single points can lead to rippling of the surfaces.
- It may become difficult at some stage to tell exactly which object is poking through what surface. In this case, you may find it helpful to do a full colour render. To do this, select an object and then from the

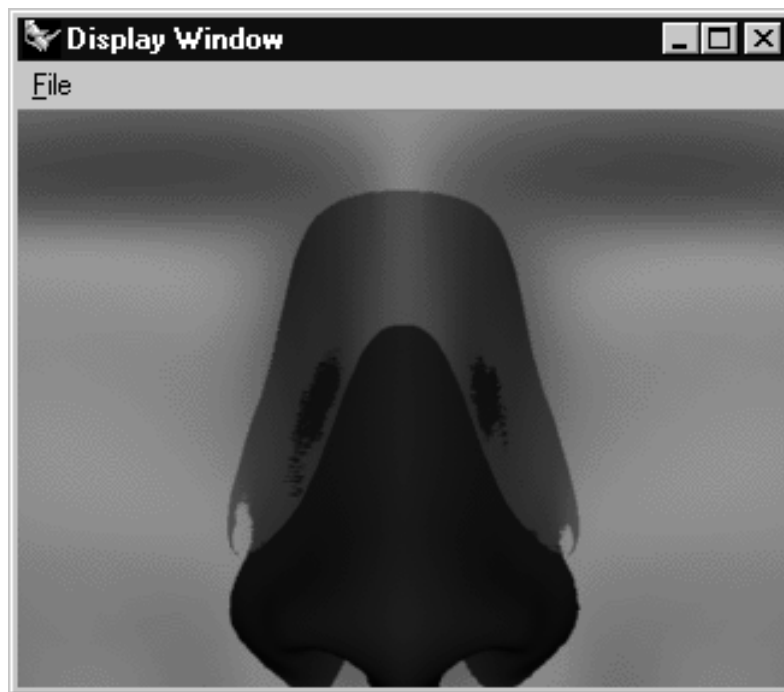


toolbar choose the Object Properties icon once done, the Object Properties dialogue box will open -- see the following screenshot:



*The above screenshot shows the Object Properties dialogue box.*

- In the Object Properties dialogue box, set the Render Colour of the object by clicking on the square and choosing a colour from the wheel or list (in this example I've set the render colour of the surface blend to red). Once you've decided on a colour click on OK to Exit.
- You can now repeat this process with the other surface objects in the scene, assigning each one a different render colour. For the purposes of this example I've set the colours of the surfaces in the scene as follows: Nose blend = **Red**, Nose surface = **Blue**, Head surface = **Green**.
- Now all you need do is perform a full render. To do this, select the viewport you wish to make active by clicking on it's label then choose the Render icon  from the toolbar. A few moments later a display window should open and your monitor should resemble the screenshot below:



*This screenshot shows the result of performing a full render having assigned the surface objects coloured materials.*

As you can see from the previous screenshot being able to see colour in your scene really can make a huge difference when trying to determine what exactly it is that your looking at, as especially when working in monochrome it's not always obvious. At the moment this is the only way you can see colour and admittedly it's a bit tedious to have to render a view after each minor adjustment to the surface be it in monochrome or colour. The good news is that this will not always be the case and although Rhinoceros version 1.0 does not offer Open GL shading at the moment it will do in the very near future. The next version of Rhinoceros is currently in beta and does support Open GL shading. This is brilliant news as it solves what has been our largest complaint about Rhinoceros thus far, mind you, it's not as if we have many complaints about Rhinoceros in the first place! Still, this is welcome news and something that will make Rhino even faster and more fun to work with -- so look out for these improvements, they are just on the horizon.

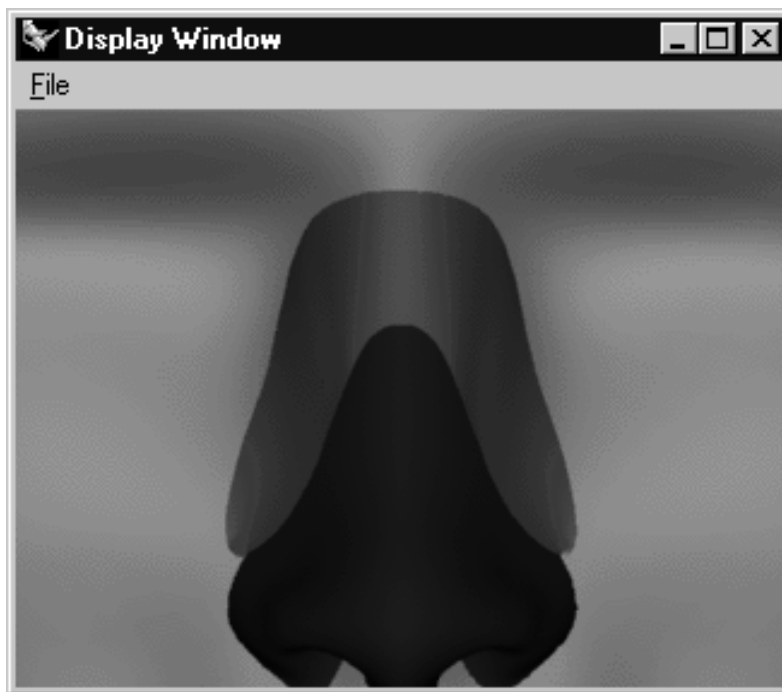
So what does this colour screenshot tells us then?

The colour in this image makes it quite clear that the tips of the blending fillet are a bit too far depressed into the head surface. In addition, we can see distinctly that the nose surface is poking through the blend at either side. Both of these problems should be easily solvable with only minor editing of the control points on the middle isoparm -- experiment.

- After adjusting the middle isoparm to the best of your ability and when you've reached the stage of diminishing returns, then and only then try nudging the whole blend object out along the Y axis (as seen from the right view) again.

How will you know when you've finished and the blend has been edited correctly?

See the following screenshot...



*This screenshot shows how your blending surface should look when correctly edited and refined. Observe how each of the colours on each of the surfaces remains separate and no jagged edges or "pop outs" are apparent.*

## Shutting Down the Scene

- Save the scene.
- Confirm that all background images are visible, restore any that are not.
- Unhide any objects that may currently be hidden.
- Turn off any edit points that are currently displayed.
- Unlock any currently locked objects -- type **UNLOCK** at the command line and press **Enter**.
- Open the Edit Layers Dialogue box and locate the layer entitled **SCENE START UP**. Make it the currently active layer by clicking in the "check" field -- a check mark should appear in the column, when it has press **APPLY**. Once done, the layer entitled **SCENE START UP** should now have become the active layer and should be **ON**.
- Turn off the layers entitled: **Nu\_headsurf\_smooth\_2**, **nose blend fillet surface (orig)** and **Nose Surface Final** and press **APPLY**.
- The layer entitled: Photopoints should be **ON**.

- All other layers should be **OFF** -- press **OK** to Exit.
  - Perform a Zoom Extents All.
  - **S A V E Y O U R W O R K..!**
- 

RETURN to the Top of page -- [Click Here](#).

Go to the NEXT PAGE

Written by Joseph R. Saltzman.

Co-produced in association with Steven Ståhlberg

©1998-1999 Cinemagic Productions Limited. All Rights Reserved.

Duplication of this document including images and text by any means is expressly forbidden without prior written consent of Cinemagic Productions Limited.

Web Site: <http://www.cmagic.co.uk> Telephone: +44 (0)1753 733 190 Fax: +44 (0)1753 736 619 email: [cmagic@cmagic.co.uk](mailto:cmagic@cmagic.co.uk)

**RETURN** to previous page -- [Click Here](#)

**GOTO** the NEXT LESSON



## THE EAR



---

### Contents:

- [Scene Setup](#)
  - [Run in Fear, Because it's the Ear](#)
  - [Basic Structure, The Helix](#)
  - [Interior Design](#)
  - [The Upper Cavity](#)
  - [Tragus / Meatus](#)
  - [Make the Connection](#)
  - [Now Hear This](#)
  - [Shutting Down the Scene](#)
- 

## Scene Setup

Please be aware that this chapter uses a different geometry file than that of previous lessons. The file that you should be using during the course of this lesson is CM\_EAR.3DM (as listed below). The ear and its associated geometry is also contained within the START\_B.3DM file, however, this should not be used as the components are in situ for purpose of understanding placement and blending with the head surface.



It is recommended that you study both geometry scene files carefully -- take your time.



By its very nature the ear is a very free form organic object so there is really no single correct or incorrect way of producing an accurate representation. This lesson will take a much more relaxed approach to outlining its construction. For the most part, our method of creating an ear is very much that of a free form sculpture and as such is nearly impossible to describe on a step by step basis. Therefore, during this lesson I will try my best to explain what my overall strategy and general thought process were during each step of the construction. I recommend that you take some time to study the actual geometry that I've created, by doing this the aim of the particular exercise should become much more obvious. Once you understand what I've done and why, only then should you try and proceed on your own, replicating what I've done previously.

Right then, let the fun begin...



- If you've not done so already start a Rhinoceros session by **double clicking** on the desktop icon  the application will begin.
- Choose File, Open from the menu bar and double click on **CM\_EAR.3DM** in the file list, it will load and open.
- Confirm at the Lower Status Bar the currently active layer is entitled: **scene startup 2**. If it is active proceed to the next step, if it's not then make it active by left clicking on the layer box, highlighting the correct layer and clicking on it.
- Again, at the Layers Box on the Lower Status Bar this time right click on the box, the Edit Layers Dialogue box will open. Confirm the following switches have been enabled or disabled:
  - The Layer entitled: Layout Guides should be LOCKED.
  - All other layers should be set to OFF.
  - When you've finished making your changes ( if any ) click on OK.
- Confirm that the grid display in the viewports has been disabled, if not turn it off now.
- Confirm that no Osnaps are currently enabled, if any are disable them.
- Confirm that no edit points are currently displayed, if any are hide them.
- Zoom out all the viewports by selecting the Zoom Extents/Zoom Extents All Views icon  or by typing **ZoomExtentsAll** at the command line and pressing ENTER.

# Run in Fear Because it's the Ear !

Of all the modelling tasks that we've encountered throughout the course of this tutorial creating the ear has to be one of the most difficult subjects of all. Over the years here at Cinemagic, we've tried countless ways of creating realistic human ears and unfortunately our experiments have proven one thing, that there is no really easy way round the problem -- blast!

The ear IS the object from hell, with it's mobius like structure and countless undulations modelling it is at best of times an arduous task.

Because of it's natural organic complexity constructing the ear with NURBS requires a fair number of curves, thus creating a relatively heavy surface in comparison with its diminutive size. In life the ear is constructed from a single piece of flexible cartilage with the exception of the lobe which is of fatty tissue, however using computer graphics I wouldn't recommend the single surface approach -- not unless you like driving yourself insane.

So what are some of the problems to be faced when modelling the ear?

First, the ear's many undulating surfaces requires the artist to create numerous "undercuts" which make modelling quite a challenge. Second, although the ear is naturally a radial object it's surface folds over itself which causes even more headaches for the artist (or earaches as the case may be). Third, the ear is attached to the head, attachments of any sort are troublesome and will necessitate the need for it's antihelix and canal to actually penetrate the head surface at the sides. This is not good news because it may require that you trim holes in the head (something that we still want to avoid at all costs). A far better option would be to create a depression just beneath the location where the ear will join with the side of the head, this way the head surface will not poke through the antihelix and canal where it would be easily seen, thereby destroying the illusion. Unfortunately, creating such a depression may not always be possible due to a lack of points in the area. In addition, even if there are a few spare points creating a deep enough depression may not be possible without overtly distorting the sides of the head. I suppose it boils down to how picky you are.

I think it's possible that creating realistic human ears can create depressions of an altogether different sort ;-)

I hate to admit it but the ear is one of those objects that might be better created using polygonal methods, h-splines, or some modelling technology other than NURBS -- still, I don't think the problem is insurmountable if one is a bit creative.

So what can be done?

Avoid the difficulties in the first place, don't add ears unless they will absolutely be visible within the shot! Fortunately with a female character it's easy to get away with this avoidance tactic because most of the time the ears would be hidden by hair, if not a hat would certainly do the job nicely!

If you must model the ears, then I strongly recommend that you create them as separate surfaces. To be very blunt, if you can't manage to create ears that look fairly convincing then my opinion your best bet is to find a way to do with out them. I've seen many excellent examples of head modelling that have been completely ruined by ears that look, well, fake.

For some strange reason CG ears tend to just look weird, there is something that is not quite right about them. Often I think it's down to a combination of overall modelling technique and of surface material applied, but not always.

Ears are a very challenging subject and very difficult to get just right.

Another point to consider about ears is that no two look exactly alike with the folds of the interior unique to a given individual.

When constructing an object as complex as an ear you should try and find some quality reference material with the very best being real life examples. I think it's also a very good idea to create a 3D model ear in clay or Plasticine before modelling anything at the computer. Upshot, anything you can actually look at is bound to help.

To be fair, when I created Rhinette's ear it was very much a case of making things up as I went along. Again, I tried various approaches and found that there was no perfect solution.

---

## Basic Structure

### The Helix

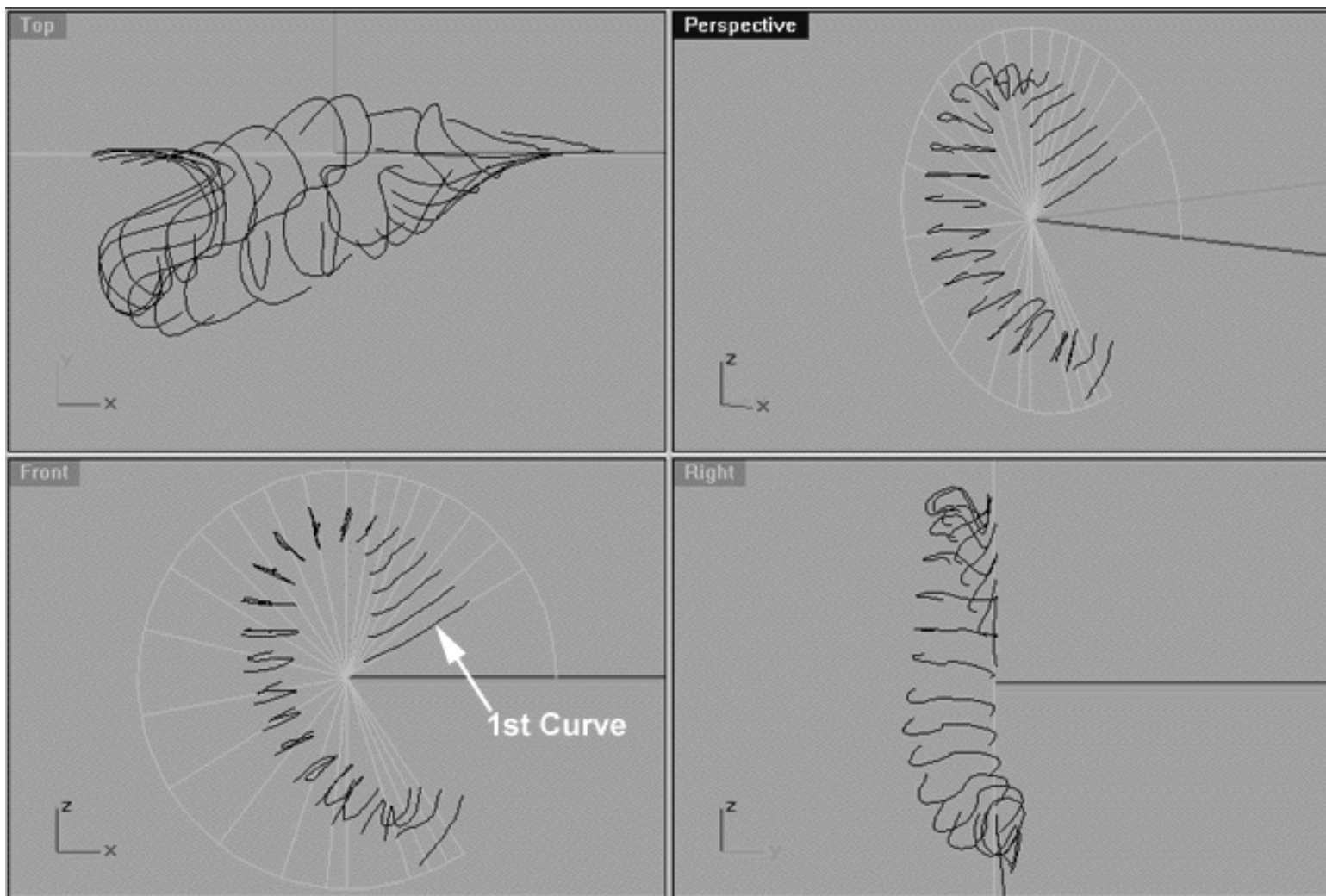
I began by creating a simple template grid so that I could better orientate myself in 3D space -- this is the layer entitled: Layout Guides and should currently be on and the layer should be locked.

This grid was not intended to be accurate, rather its purpose was just to give me some idea as to possible placement of the curves I would create and was only a guess. In all, I created a total of 25 interpolated curves, many shaped similar to the number "2" (as seen from the top view).

To see the curves that I created, turn on the layer entitled: Helix Curves -- you can use them as guides for creating you own if you fancy.

I was not too concerned about maintaining similar point counts on each of the curves (although I did try when possible) as I intended to use a combination of loose lofting and simplification (lofting was done using a rebuild with 15 points).

So, starting with the first curve, I worked my way anti-clockwise building one curve at a time and performing numerous test lofts from these curves. See the following screenshot:

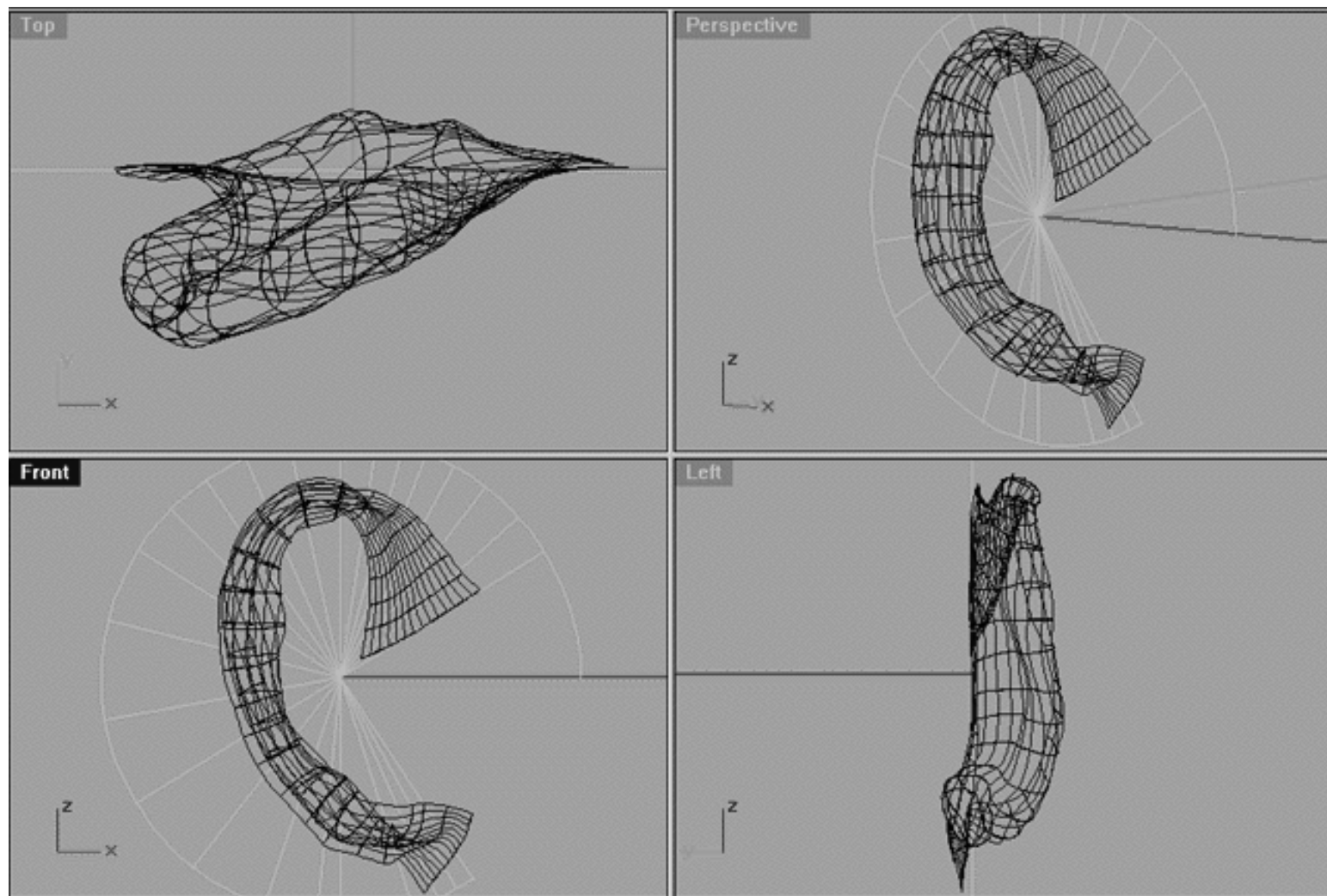


This **All Viewport** screenshot shows all 25 interpolated curves against the crude template I created to produce the basic outside ear shape. Again, creating the "2" shaped curves was just a purely a case of experimentation, no specific rules or guidelines were followed -- essentially free form sculpture.

Study the curves that I've created carefully observe how they have been produced and try to produce similar ones on your own.

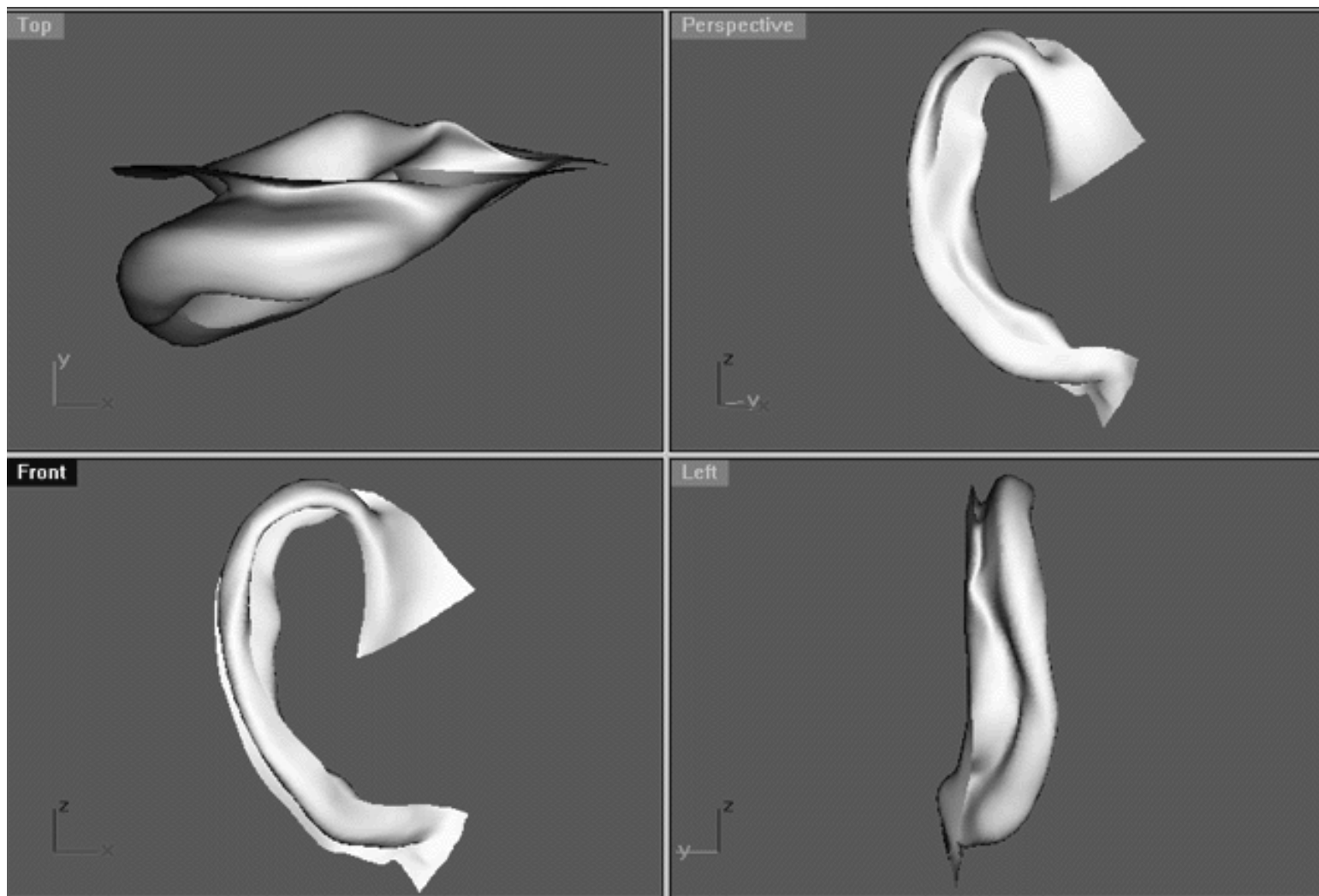
*Top Tip* -- In some cases I would draw the "2" shape about the size I thought it should be in the Top Viewport. Once done, I would then move it to it's approximate location in the Front Viewport. Often, I would then rotate the curve, scale it or both, all the while performing numerous test renders until I thought the surface it produced looked about as it should.

Once I felt fairly satisfied by the results being shown in the test renders, I then created a new layer entitled: Helix Surface, assigned the layer colour to dark blue and set the new layer as active. Next, I lofted the curves and the results are shown in the following screenshots:



This **All Viewport** screenshot shows the wireframe image of the surface produced by lofting all 25 interpolated curves.





This **All Viewport** screenshot shows a quick rendered shaded image of the surface produced by lofting all 25 interpolated curves.

Now it's your turn -- try and do the same as I've done above.

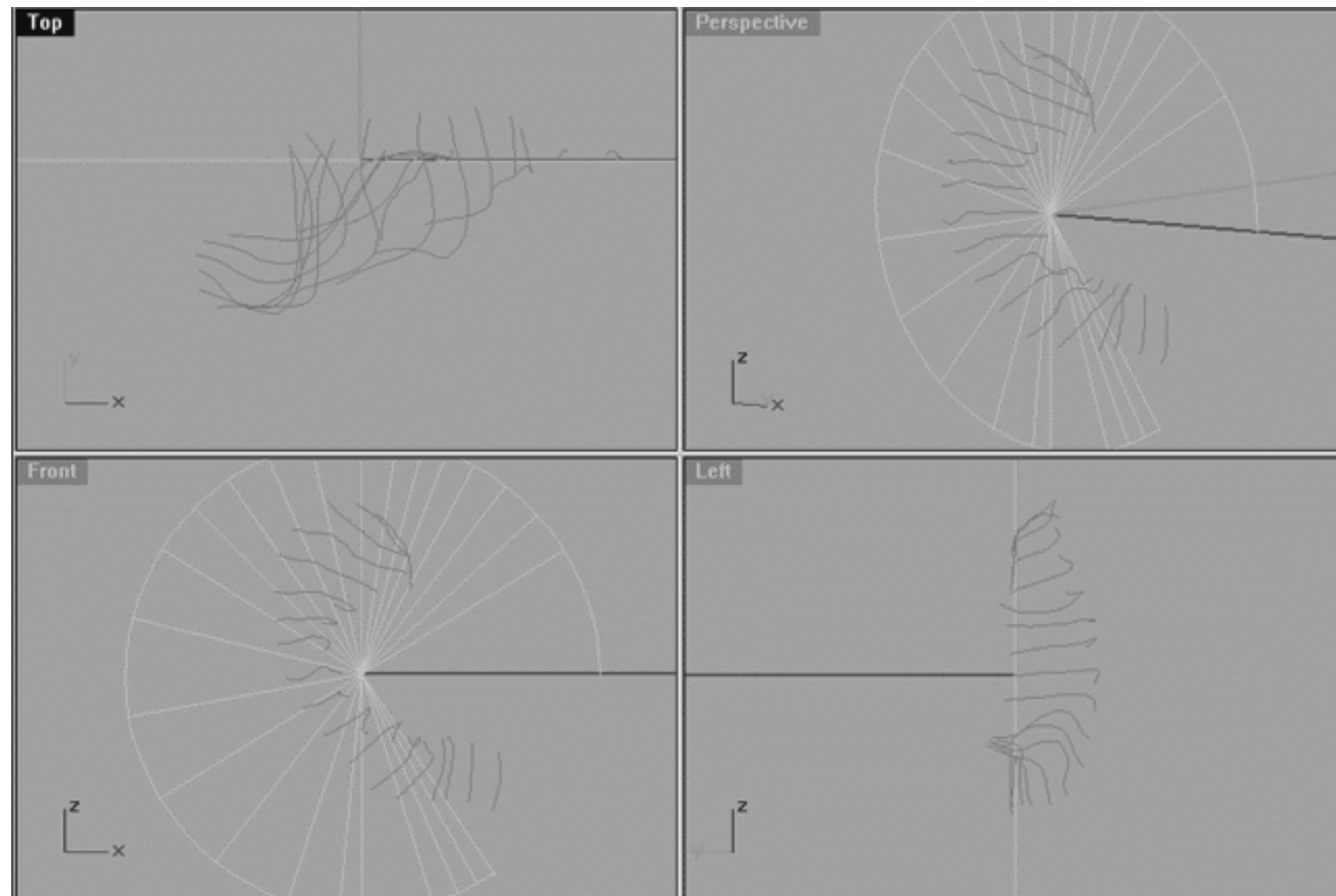
## Interior Design...

With the stem, outer lip and lobe of the ear successfully created the next task on the list was to create the interior surface. This was done by creating a new layer entitled: Interior Curves and producing a total of 18 new "J" shaped (as seen from top view) interpolated curves.

You should turn on the layer entitled: Interior Curves and take some time to study what I've done. By now you should have created the helix surface and placed it on its own layer. If the helix surface is currently visible you probably should either turn it off or temporarily hide it. Again, feel free to use the Interior Curves that I've made as templates for creating your own curves.

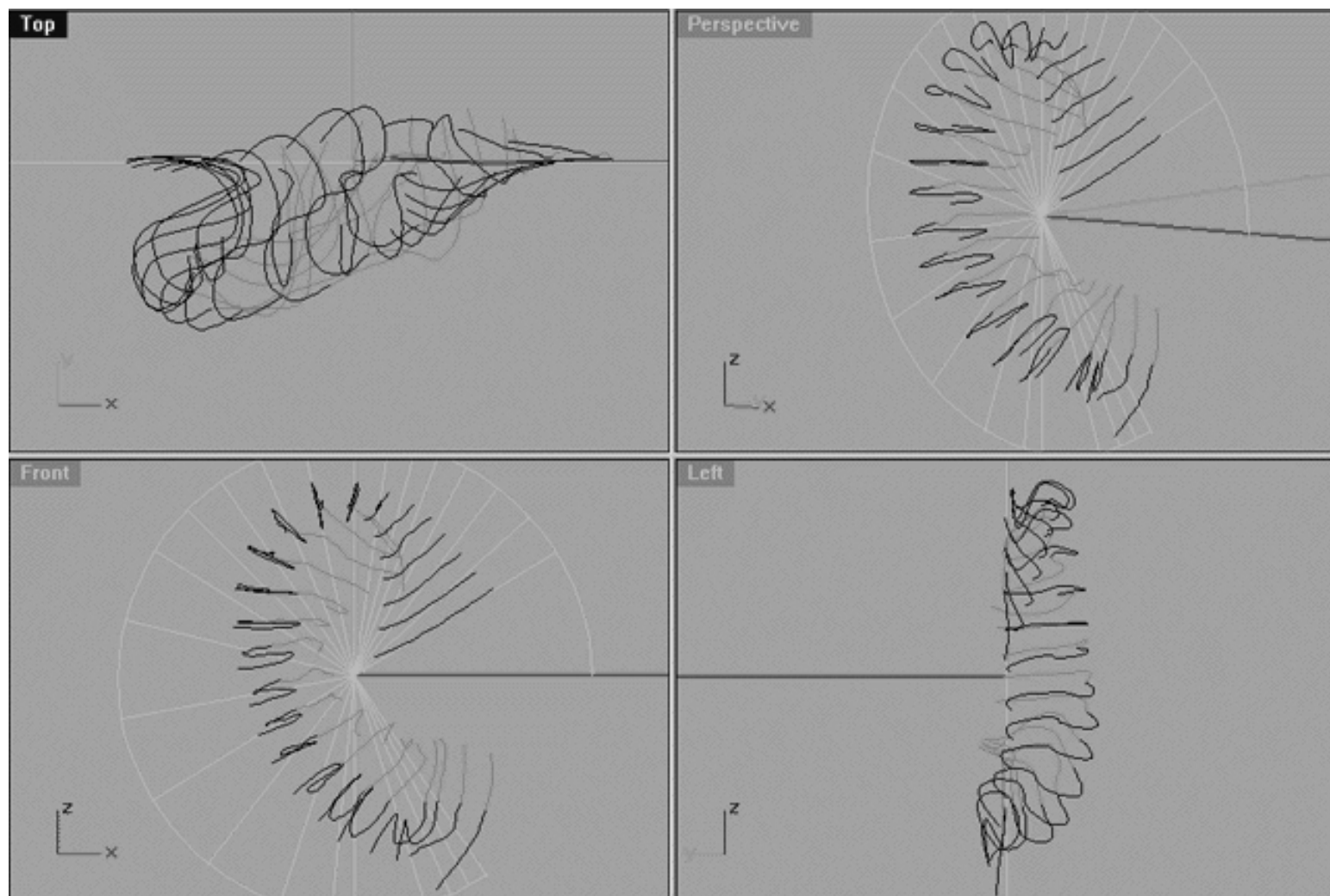
For the most part these curves began at the end points of the helix curves and were either snapped to them or orientated very near by. The new interior curves then carried on downward into the cavity of the ear. These interior curves start at about the 7th upper helix curve and carry on until the lobe at the bottom. Again, like the curves created for the helix no particular attention was paid to the number of points on each curve, it's just simply a matter of trial and error.

One of the most important areas to get correct on this surface is the arc shape that follows the upper helix/lip of the ear and is created by roughly the first 3 to 4 curves. Once these curves were in place it's once again free form sculpting all the way.

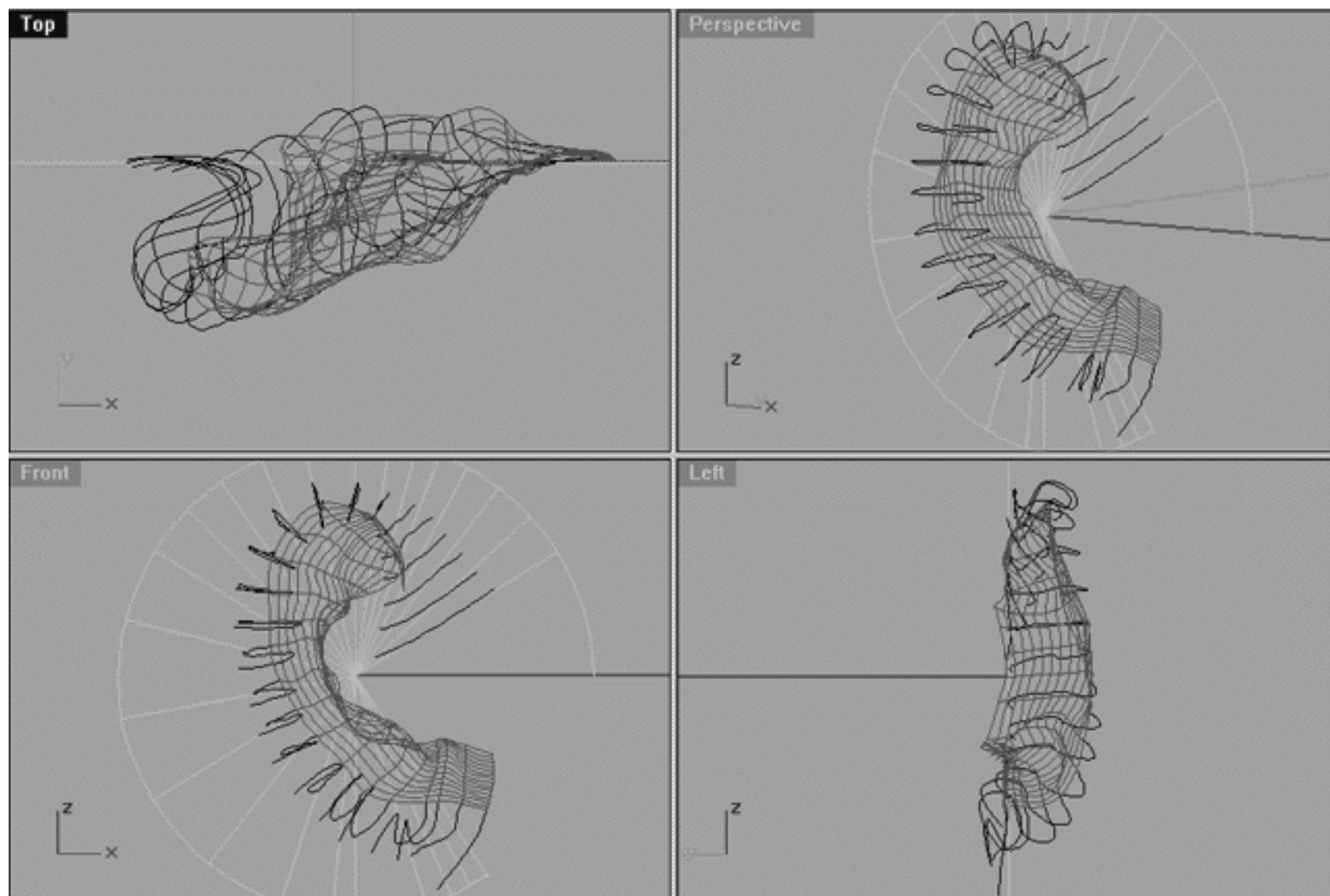


This **All Viewport** screenshot shows the 18 new interpolated curves -- note the helix curves have been hidden for purposes of clarity.

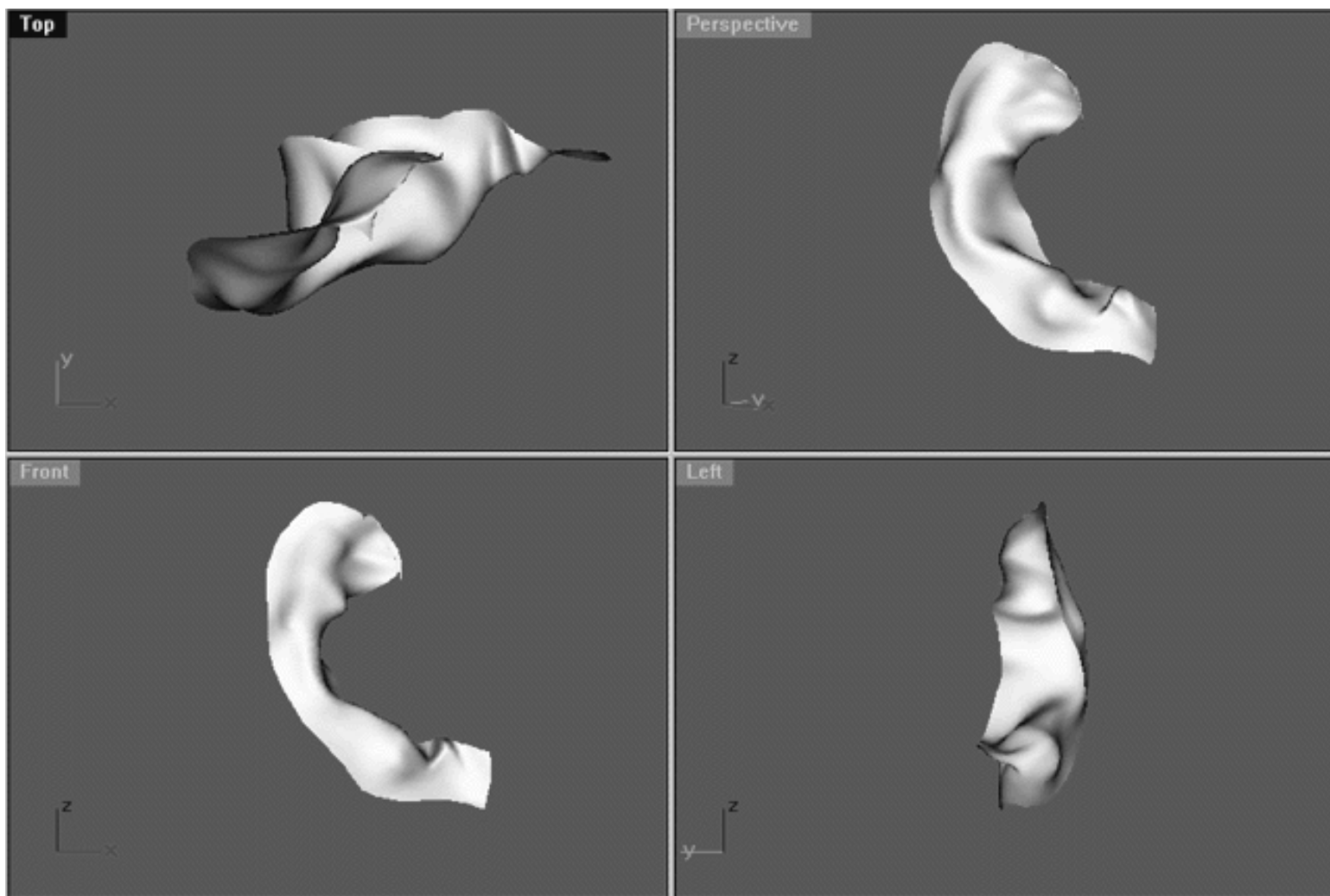




*This **All Viewport** screenshot shows the 18 new interpolated curves -- note the helix curves are now shown in place. Here you can see that the beginnings of each of these curves is snapped to (or placed very close by) the end points of the "2" shaped curves that created the helix. It all get's rather messy to look at and can be a bit confusing. I recommend that you spin the object round in the perspective view quite a bit and do plenty of test lofts and renders while you are trying to sculpt the surface. Trust me, taking things a few curves at a time makes building a complex object such as this much easier!*

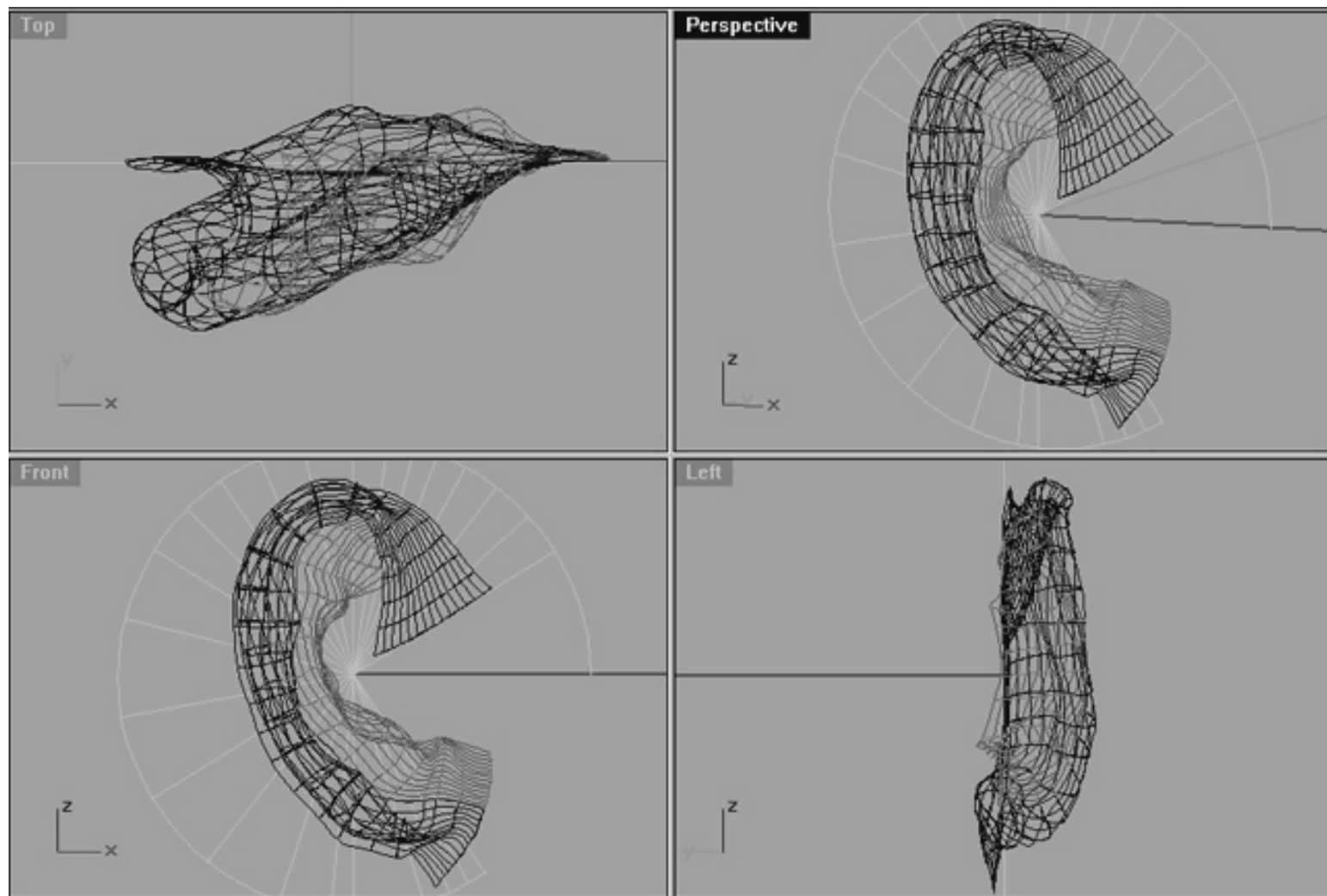


*This **All Viewport** screenshot shows the wireframe image of the surface produced by lofting all 18 interpolated curves.*



This **All Viewport** screenshot shows a quick rendered shaded image of the surface produced by lofting all 18 interpolated curves.

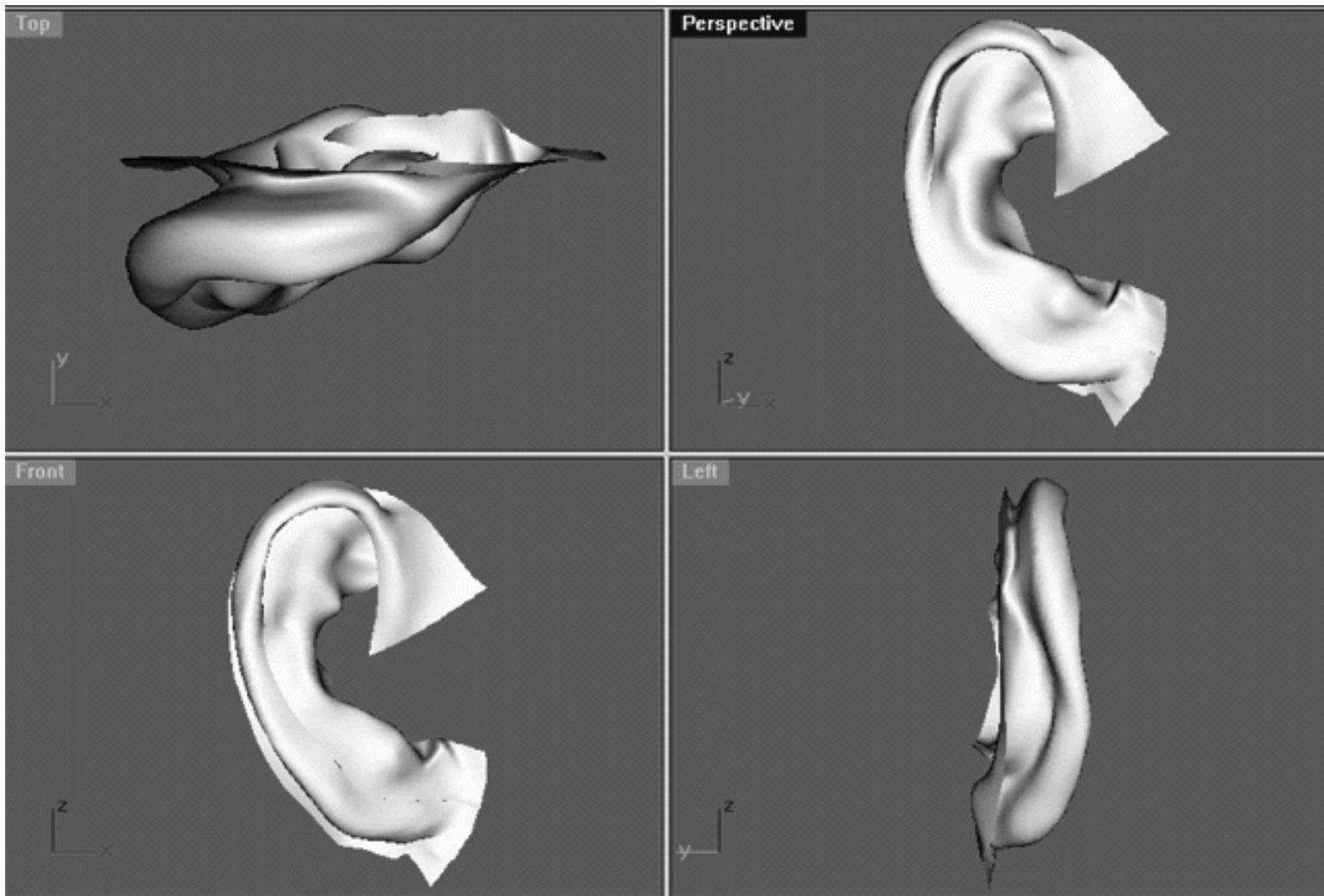
Right then, now we can take a look at how helix and the interior surface will work together as a unit -- I'll turn on the layers entitled: Helix Surface and Interior Surface. Let's look first at the wire frame...



*This **All Viewport** screenshot shows a wireframe image of helix and interior curves and the respective surfaces produced from them, notice how they work together as a unit. \*Note -- these curves have not been joined or blended in any way whatsoever, they are only snapped to or positioned nearby each other.*

Now let's see what these objects look like shaded...





This **All Viewport** screenshot shows a quick shaded image of helix and interior curves that have been lofted as surfaces, holy *Q* Tips -- things are certainly looking more ear like now! \*Note -- these curves have not been joined or blended in any way whatsoever, they are only snapped to or positioned nearby each other. You will notice that a seam can be seen running near the lip of the ear in the front and perspective views. This is nothing to worry about and can be killed later on by using a transparency/opacity map.

Right then, now it's your turn -- try and do the same as I've done. If you have any trouble be sure to refer to the curves I've made for further guidance.

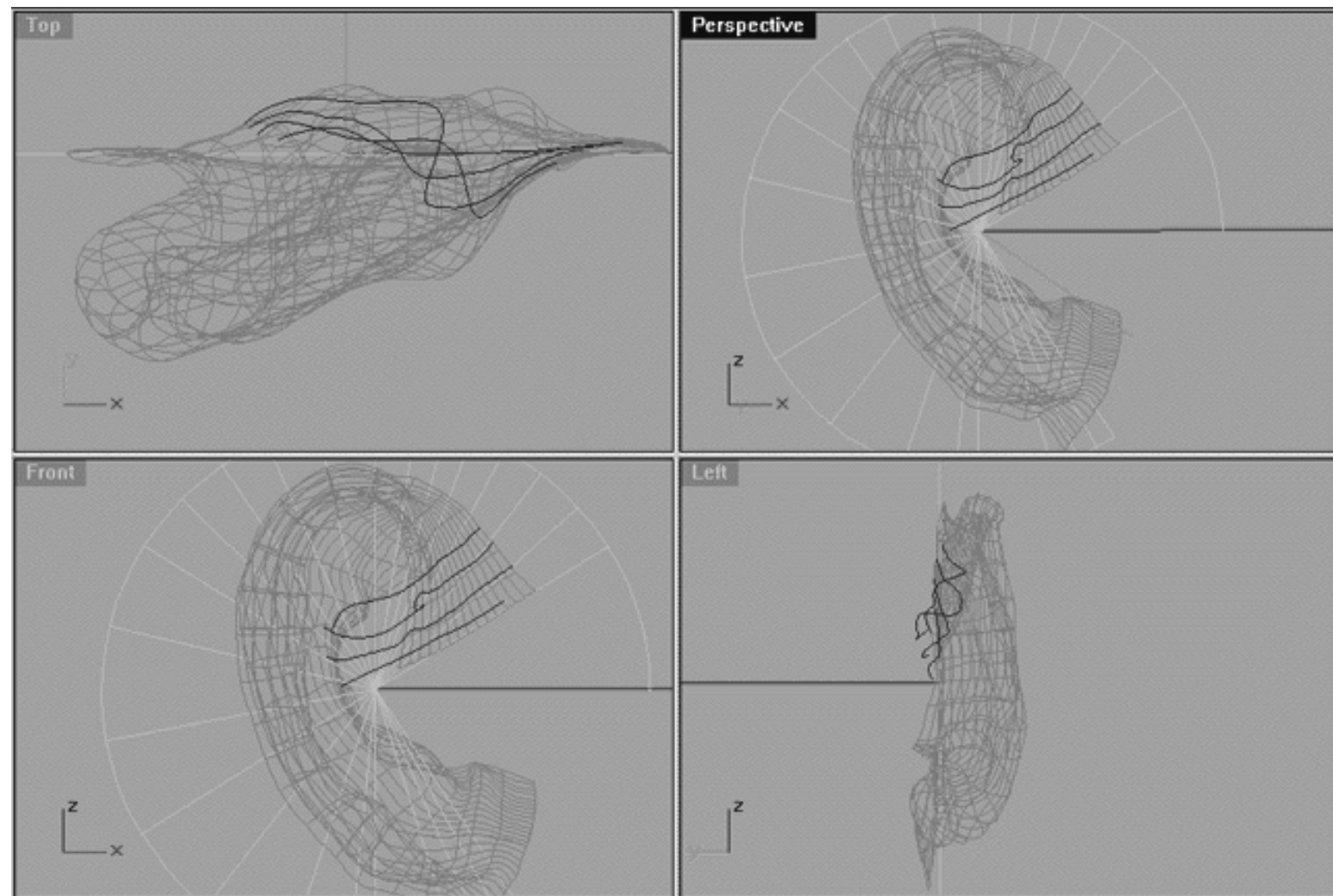
## The Upper Cavity

Now that the helix and interior surfaces seem to be working together well the next step is to create the upper cavity. A new layer entitled: Upper Cavity Curves was created and it's colour was assigned to blue, the layer was then set to active.

If you've not already done so, turn on the layer entitled: Upper Cavity Curves and take some time to study the curves that I've created.

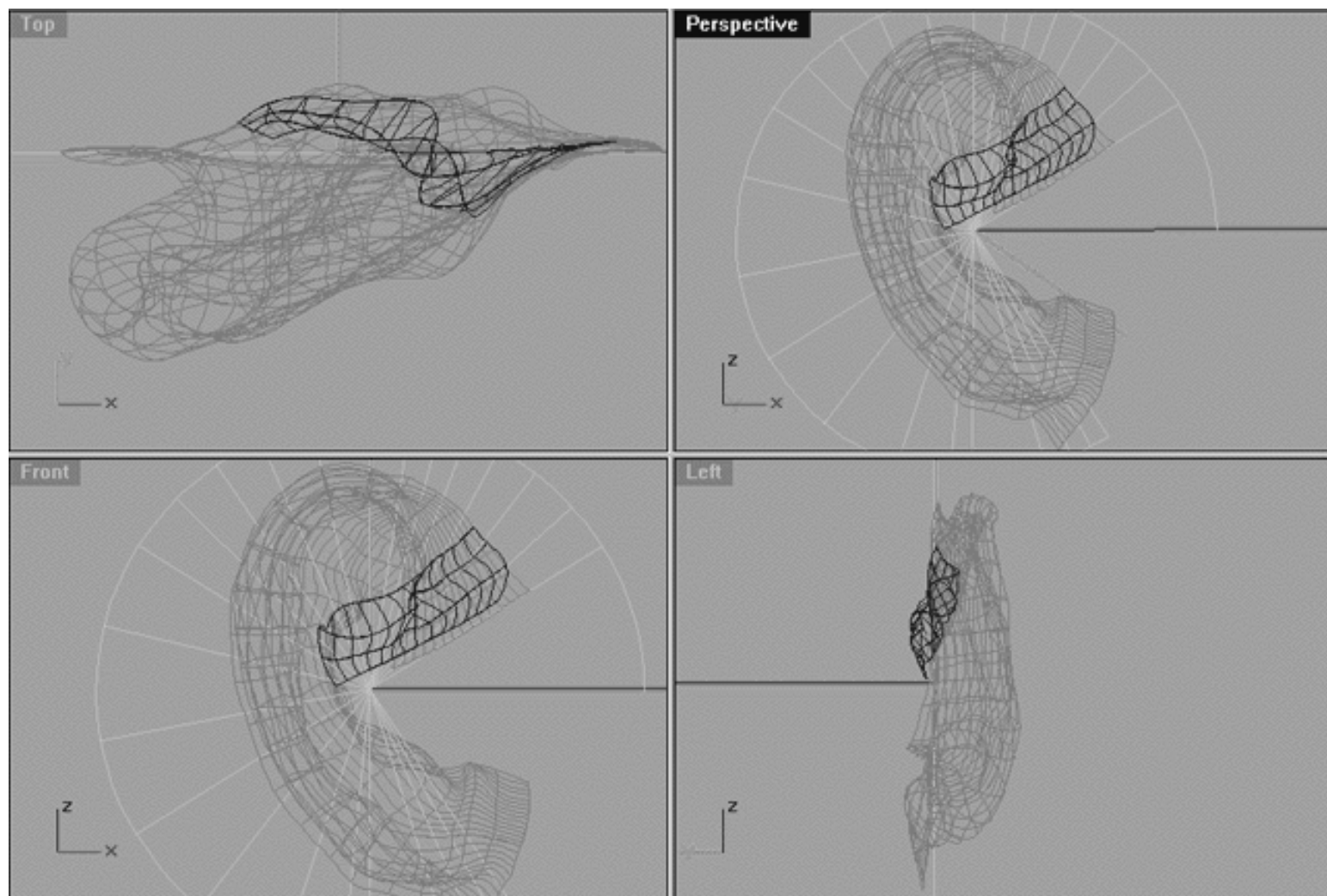
A total of 4 interpolated curves have then been drawn to create this new object which begins at the lower edge of the interior surface, running nearly to the centre of the ear. To the east the curves run beneath the lip of the helix and are purposely obscured by it, whilst to the west they meet with the lower edge at the bottom of the interior surface.

Again, no prior consideration was given to the number of points placed on each of the 4 interpolated curves (although I tried to keep them close when possible). The major aim is to convincingly tuck the curves under the rim of the helix whilst making sure that the surface edges produced by these curves would meet up with the edges of the interior surface object. The following screenshot will give you a better idea of how to place these curves:



*This **All Viewport** screenshot shows the 4 interpolated curves that have been created to produce the upper cavity. Observe how these curves look a bit like a sine wave in when seen from the top viewport.*

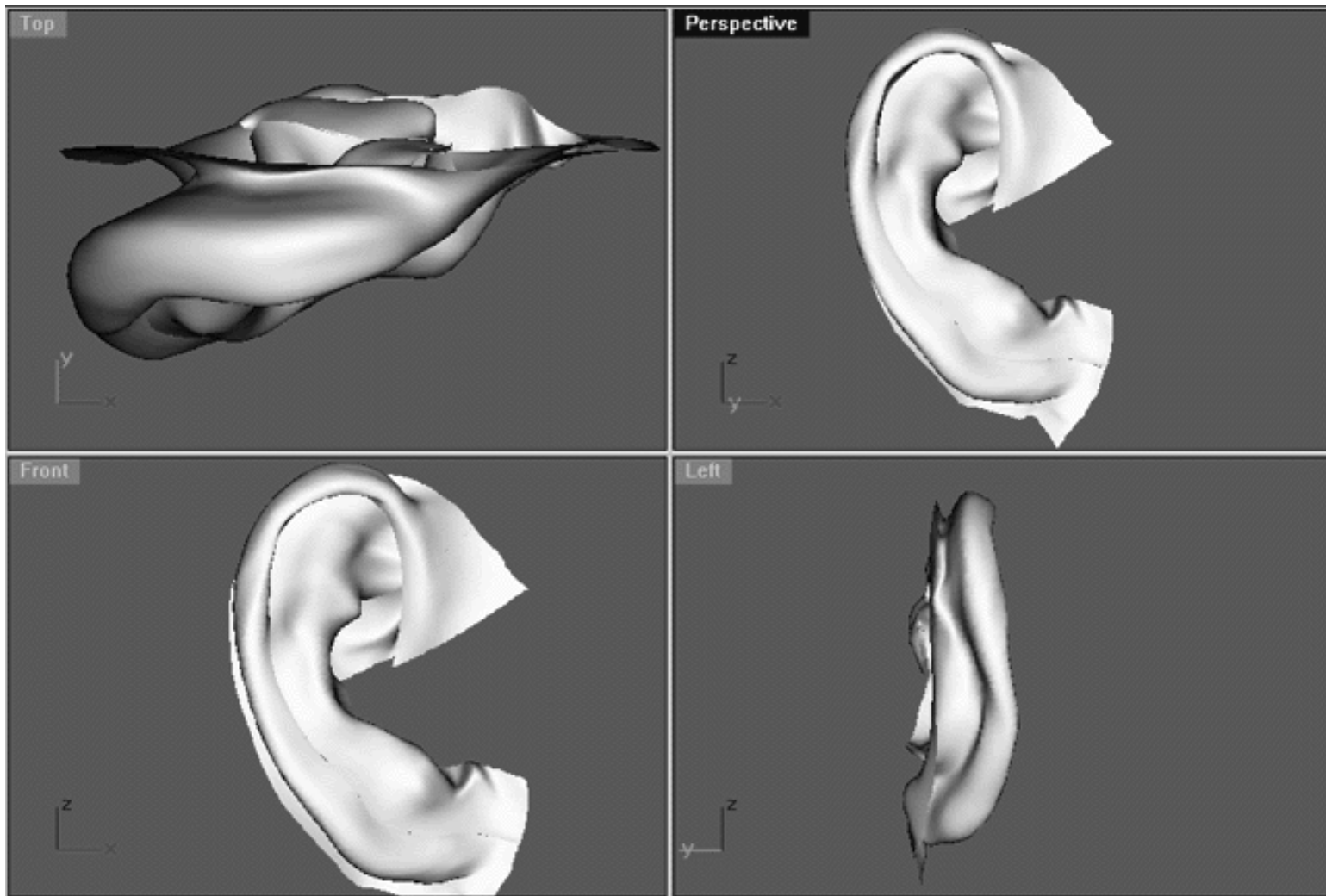
The technique used for establishing the previous surfaces surface was repeated once again. Essentially, it is a case of free form sculpting of the curves, lofting interim surfaces and doing test renders until you are satisfied with the results. See the screenshot below:



*This **All Viewport** screenshot shows a wireframe image of the surface that has been produced by lofting the 4 interpolated curves. The curves were lofted into a surface as previously done, using the loose loft parameter and rebuilding with 15 control points.*

Now let's see what these objects look like shaded...





This **All Viewport** screenshot shows a quick shaded image of the surface that has been produced by lofting the 4 interpolated curves.

You guessed it, now it's your turn! Take your time and try and reproduce what I've done above.

## Tragus/Meatus

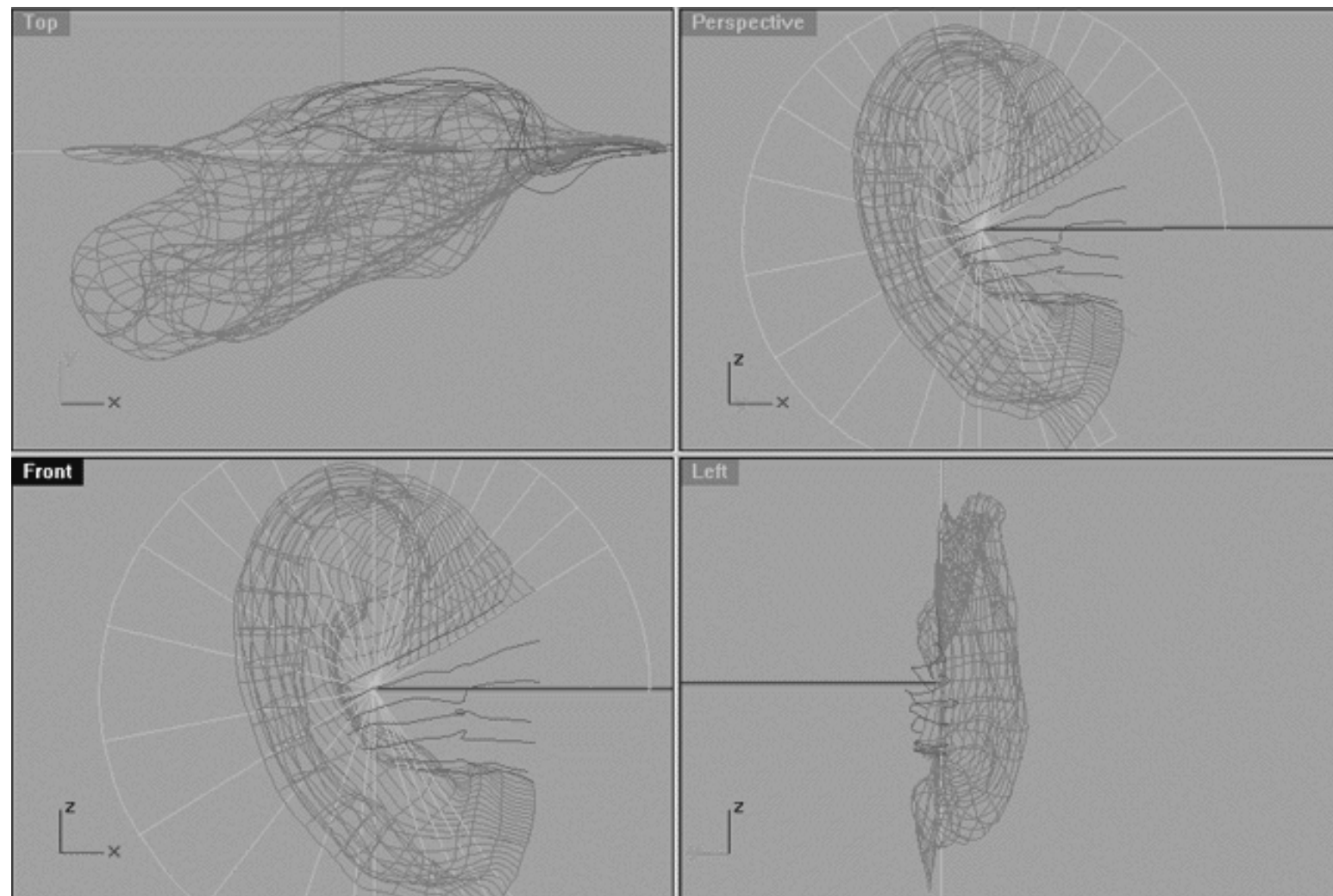
Last but not least, the focus of the job is to create all the remaining bits and pieces which mainly consists of the deep lower ear cavity and that little bump on the side of the head just forward of the ear canal. You'd be amazed how many artists never bother to create this little bump but oddly without it the ear will always look strangely incomplete.

I began the process by creating a new layer entitled: Tragus Meatus Curves, assigning the layer colour to purple and setting the layer as active.

Turn on the layer entitled: Tragus Meatus Curves and carefully observe how these curves were produced.

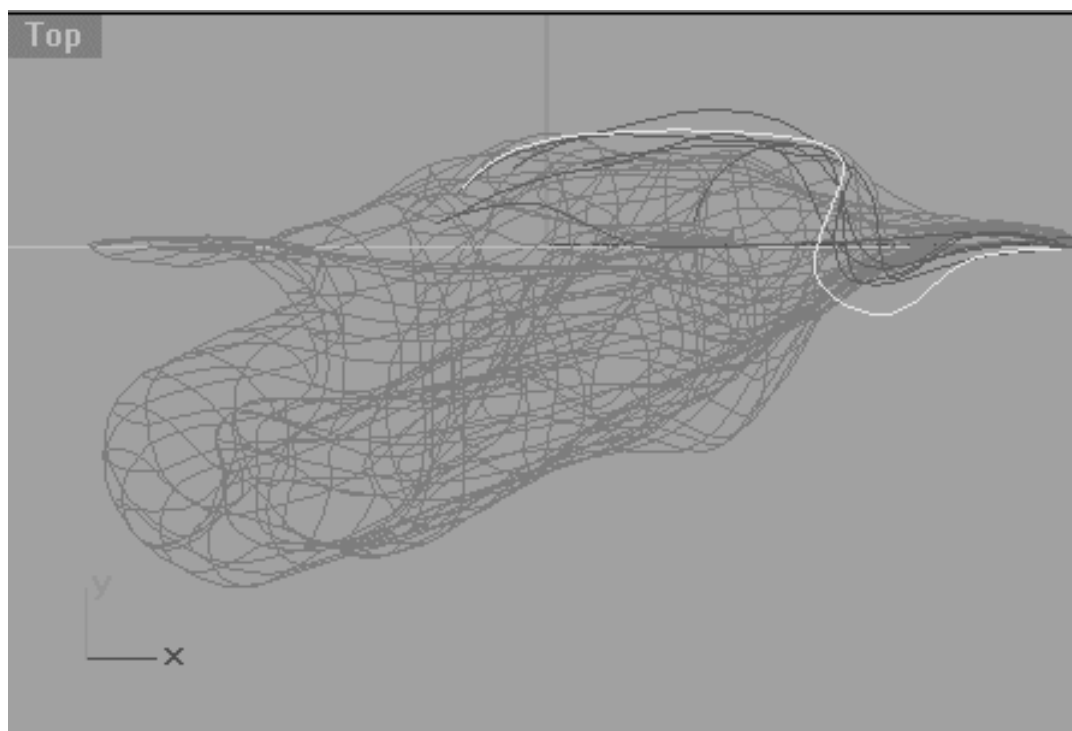
I set about creating the curves for this new object by drawing a total of 7 interpolated curves. The first curve that I produced was made from a copy of last curve I drew for the upper cavity (i.e. the curve located at about the centre of the ear).

Next, I knew that because the following few curves would make up the deepest part of the ear cavity that I would have to draw sine wave shaped curves similar to those produced earlier only a bit more radical. See the following screenshot:

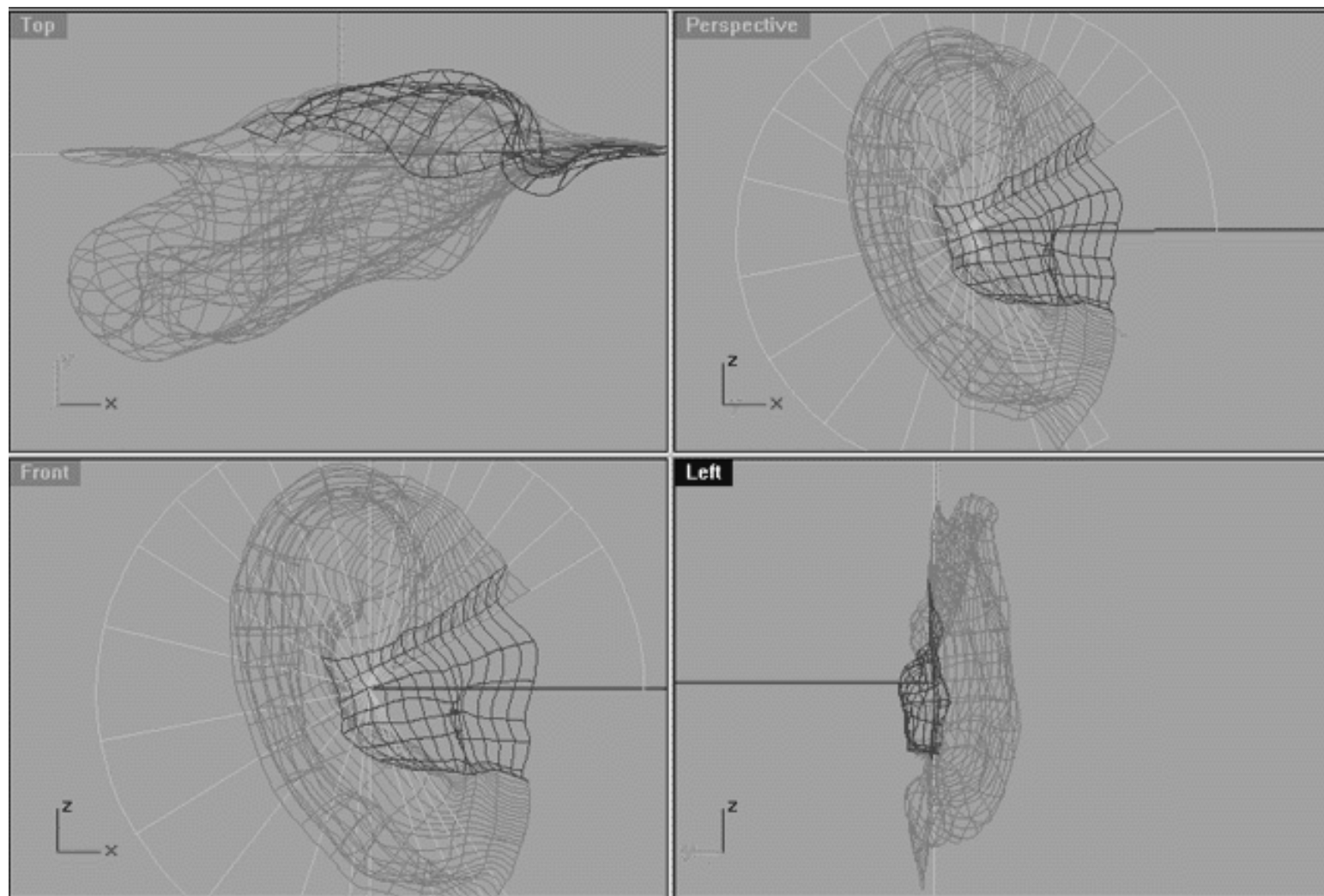


This **All Viewport** screenshot shows the 7 interpolated curves that will produce the Tragus Meatus surface. The 1st curve (near the centre of the ear) is a copy of last used for the upper cavity as we want our new surface to start at exactly the same position as the upper cavity ends. Observe how the western portions of these 7 curves all meet up with the edge at the base of the interior surface whilst those at the eastern side form nearly a flat surface that will interface with the side of the head itself.

In order to get a better idea of the overall shapes of these 7 curves, have a look at the following screenshot:



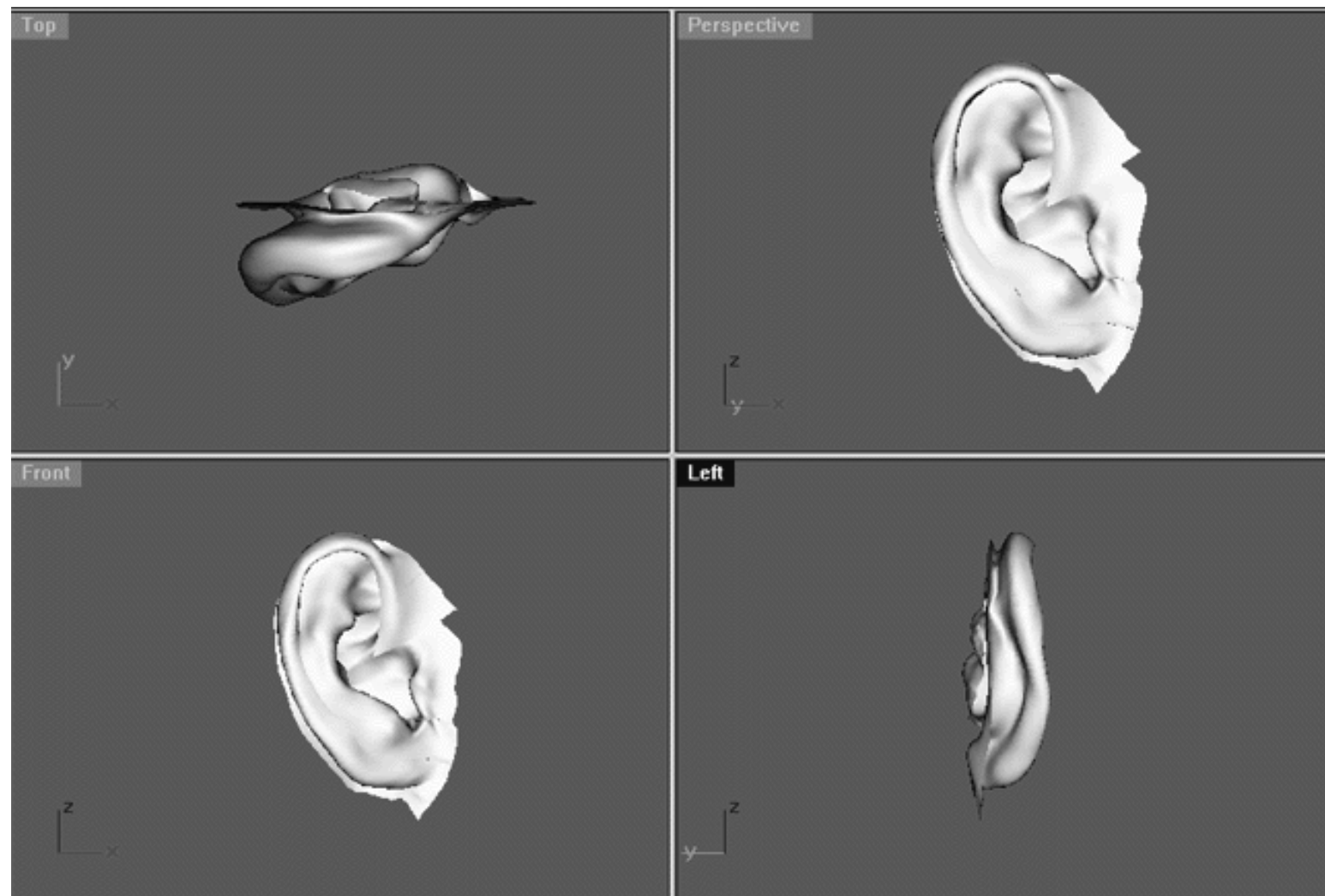
*This **Top Viewport** screenshot shows fairly clearly the type of basic shape you'll need to create. I've highlighted the 4th curve which is roughly the deepest curve of the lot. Study these curves in the top view, as you do you'll notice that the first curve (the copy) is fairly flat. As you progress downward toward the lobe the curves get progressively deeper -- which makes sense!*



This **All Viewport** screenshot shows a wireframe image of the surface that has been produced by lofting the 7 interpolated curves just drawn. The curves were lofted into a surface as previously done, using the loose loft parameter and rebuilding with 15 control points.



The proof of the pudding is in the shading -- let's see if what's been done makes any sense...



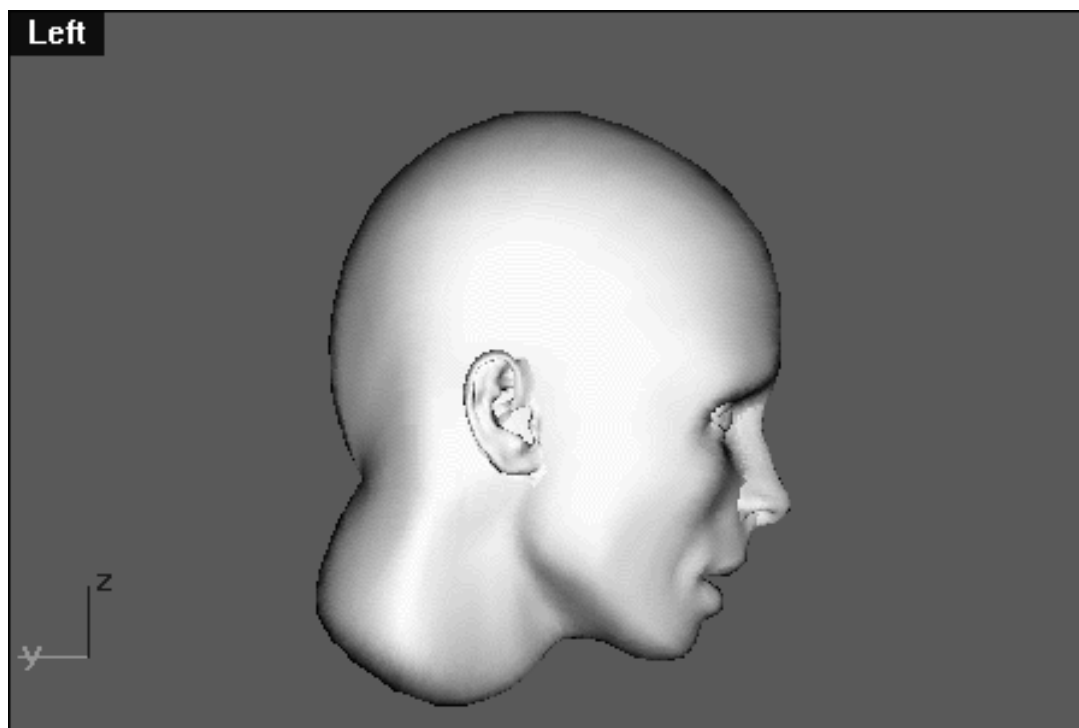
This **All Viewport** screenshot shows a quick shaded view of the Tragus Meatus surface, the ear is now complete.

Yes, it's your turn...!

---

## Make the Connection

By this stage you might be wondering how to connect the ear to the head. You might also be worried that making a connection will be difficult because the ear is comprised of multiple components. Don't worry, you will find that connection is easy -- see the following screenshot:



*This **Left Viewport** screenshot shows the MC (multiple component) ear surface in place with the head.*

As you can see from the previous screenshot, the addition of the ear does make the head look much more realistic, still, if the ear is not needed in the shot then I would not include it. Blending the ear to the head is really just a matter of positioning it correctly and then making the necessary adjustments to either the ear surface, head surface or both until it looks correct.

For the most part you don't have to worry about seeing any seams as they don't tend to show due to the way the ear was constructed in the first place. For example, the edge of the ear that mates with the jaw although is comprised of separate components, was designed and built so that the mating edge would be quite flat. This flat bit is supposed to sit just below the head surface, so that only the relevant bits of the ear poke through as shown in the screenshot. Despite the decent match on the forward side, it's the behind the ear, it's stem that can prove far more problematic to deal with.

Once you've manoeuvred the ear into position by moving and rotating the MC ear surfaces on the head it will probably look quite good from the front. Unfortunately, the front of the ear (the part we so most often) doesn't tell the whole story, you'll need to spin the perspective view around and look what's going on behind and underneath. Chances are it is here that you're going to see a gap.

You have a couple of choices, they are: (a.) close the gap by moving the control points of either the ear stem (recommended) or the head surface (not highly recommended) until they meet up. Yes, you may see a bit of a seam but no one is ever likely to notice because it's behind the ear / back of the head. Or, the (b.) option, which is to do nothing -- why worry about something you're not going to see? Of course if you're picky the do nothing option may not sit well with you, but often time is a factor in the equation and you can save yourself some this way.

The other problematic area to beware of is the lower ear cavity / ear canal. As I mentioned earlier, the issue here is that because the cavity is quite deep the surface of the head tends to poke through. You can try to move one of the control points on the head surface just in back of the ear so as to create a depression, however, this rarely works. Another option is to trim a hole in the side of the head into which the lower ear cavity can fit into (this is not recommended). If you are determined to trim then don't perform the trim inside of Rhinoceros, wait and do it inside of your rendering / animating application. This is because trimming can cause a lot of file import / export problems -- and you don't need any extra problems!

Lastly, you always have the option to do nothing (that's the one I vote for). Look at the model in the screenshot above, here I've done nothing there are no blends and certainly no trims. Chances are 99% of people wouldn't even notice a bit of the head surface in the ear cavity unless it were mentioned, it's not as if people spend a lot of time looking inside ears.

Remember, after positioning the ear against the head surface if you can see any seams that you don't like you always have the option of killing them using the same blending techniques used on the eyelids and nose. Just create fillet surface to cover the seam and put a custom materials shader on it and poof, the seam is gone when rendered! Yet another example of how flexible this blending technique is!

---

## Now Hear This!

Congratulations!

You have now created the ear object -- wasn't that fun?

Hopefully this lesson hasn't driven you round the bend but as you can see it is possible create a fairly realistic ear in NURBS after all. The essence of our method has been to create the ear from several separate objects rather than try and do it with a single surface. I maintain that with a complex and convoluted organic object as the human ear working in this manner is easier, but if you feel more comfortable with the single surface approach then by all means, go for it!

---

## Shutting Down the Scene

- Save the file.
- Confirm that no Osnaps are currently active, disable any that are.
- Hide any edit points that are currently displayed.
- Unlock any currently locked objects -- type **UNLOCK** at the command line and press **Enter**.
- Open the Edit Layers Dialogue box and locate the layer entitled: **scene startup 2**. Make it the currently active layer by clicking in the "check" field -- a check mark should appear in the column, when it has press **APPLY**. Once done, the layer entitled: scene startup 2 should now have become the active layer and should be **ON**.
- Turn OFF all the layers with the exception of the following: scene startup 2 and Layout Guides.



- All other layers should be **OFF** -- press **OK** to Exit.
  - Perform a Zoom Extents All.
  - **S A V E Y O U R W O R K..!**
- 

RETURN to the Top of page -- [Click Here](#)

Go to the NEXT PAGE

Written by Joseph R. Saltzman.

Co-produced in association with Steven Ståhlberg

©1998-1999 Cinemagic Productions Limited. All Rights Reserved.

Duplication of this document including images and text by any means is expressly forbidden without prior written consent of Cinemagic Productions Limited.

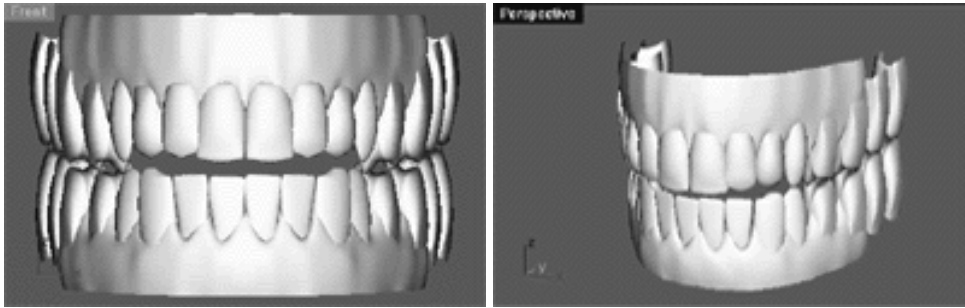
Web Site: <http://www.cmagic.co.uk> Telephone: +44 (0)1753 733 190 Fax: +44 (0)1753 736 619 email: [cmagic@cmagic.co.uk](mailto:cmagic@cmagic.co.uk)

**RETURN** to previous page -- [Click Here](#)

**GOTO** the NEXT LESSON



## CREATING THE TEETH & GUMS




---

### Contents:

- [Scene Start Up](#)
  - [Basic Considerations](#)
  - [Some thoughts about texturing](#)
  - [Creating the Gums](#)
  - [Creating the Geometry for Teeth](#)
  - [The Method](#)
  - [The Molars](#)
  - [Bite It!](#)
  - [Shutting Down the Scene](#)
- 

## Scene Start Up

- If you've not done so already start a Rhinoceros session by **Double Clicking** on the desktop icon  the application will begin.
- Choose File, Open from the menu bar and Double Click on **START\_B.3DM** in the file list, it will load and open.

- Confirm at the Lower Status Bar the currently active layer is entitled SCENE START UP. If it is active proceed to the next step, if its not then make it active by Left Clicking on the layer box, highlighting the correct layer and clicking on it.
- Again, at the Layers Box on the Lower Status Bar this time Right Click on the box, the Edit Layers Dialogue box will open. Confirm the following switches have been enabled or disabled:
- The Layer entitled SCENE START UP should be ON.
- All other layers should be set to OFF.
- When you've finished making your changes ( if any ) click on OK.
- Confirm that the grid display in the viewports has been disabled, if not turn it off now.
- Confirm that no Osnaps are currently enabled, if any are disable them.
- Confirm that no edit points are currently displayed, if any are hide them.

Since the teeth have been constructed using much the same free from sculpting technique as performed with the ear we will not be following our usual "structured" approach during this lesson. We have provided you with all the necessary curves and surfaces for you to study and they can be found on the following layers:

- JR\_Frnteeth -- This layer contains the surfaces comprising the visible front teeth.
- JR\_gum\_curves -- This layer contains the 6 curves used to construct the gums used to create the upper and lower gum surfaces.
- JR\_Gum\_Surf -- This layer contains the surfaces comprising the upper and lower gums.
- JR\_molars -- This layer contains the surfaces comprising the rear molars.
- JR\_Tooth\_Curves -- This layer contains the all the curves used to construct every tooth in the mouth.

---

## Basic Considerations

The teeth are an often overlooked aspect of model creation, yet the are one of the most crucial components. The teeth are so very important for a number of reasons. First, they impart a great deal of overall emotion to the face, even the most subtle gesture or change in appearance will telegraph a myriad of deep psychological meanings to the observer. Second, structurally speaking they are key in defining the overall look of the face as the way in which they are set into the head, their width, height and shape go a long way to determining a face that is considered either beautiful or ugly.

The teeth are an aspect of the modelling of a human face that as an artist you can really agonize over. At the end of the day how much time you decide to spend working on this particular area is purely up to you as you can literally spend hours, days or even weeks on a full set of teeth.

Of all the parts of the face we've constructed so far the teeth are personally my least favourite to model. Why, well mainly because the job is pretty repetitive and dare I say a bit boring. Although you can overcome some of the tedium by creating half a jaws worth of teeth and then mirroring them to the other side, there are still a lot of them to deal with nevertheless so there is really no quick fix.

Creating a reasonable set of teeth for your model is not as difficult than you might first think and a few points should be considered before beginning any work. To start with, a normal and healthy adult human mouth in life should contain 32 teeth (obviously there are exceptions to this). It's clear to see that an additional 32 geometric objects placed inside your models head are really going to slow things down, ( a lot ) after all that's going to mean a whacking amount of additional computational overhead. So what can be done about this? Well first off, you may wish to consider not actually creating a full set of 32 teeth, (highly recommended) after all, unless your character is really screaming, yawning, or doing something along those lines chances are your never going to see all of those teeth anyway. Since it's pretty dark in the mouth you can probably feel safe about not creating the back molars.

Like everything else we've done so far in this tutorial there are million different ways to create the geometry that will make up a tooth, with no one right or wrong way per se. However, when setting out to create a tooth one of the pitfalls that beginners often fall into is creating more surfaces than are actually really needed and a tooth is a great example of this. If you stop to think about it, you rarely if ever see the back side of a person's teeth (unless you stick you head in their mouth) and I don't know why you'd want to do that. So this is a great opportunity to do a little "cheat" by not creating or getting rid of the back surface altogether so that only the front and sides will be visible. This alone will reduce the weight of your geometry considerably and ease the overall computational burden.

Another trap people often fall into is in creating teeth that look to perfect. Most people don't have perfect teeth, there are usually defects such as a slight chip here or there or a tooth that has grown at a bit of a funny angle. The point is that "perfect" teeth can call unwanted attention to your model and create a psychological cue that something not quite right, after all you don't really want to model looking like that actor from that 80's TV show "Chips" -- or do you?

Teeth are not all the same, some are flat while others are more rounded. Some are pointy and sharp still others are dull -- you get the idea. I recommend that you take some time to look at your own teeth in a mirror and make some observations about them. See how they are set into your jaw and feel their placement in your gums.

Remember -- The teeth on the lower jaw should be set behind those of the upper..!

## Some thoughts about texturing:

In your rendering application, think about shading the gums with ramped maps so that they become darker further from the teeth and lighter closer. Then use an additional ramp to make them darker the further back into the mouth you go. The same procedure is also recommend for the teeth, darker towards the base and back of the mouth.

Also keep in mind that teeth are rarely pure white (unless they've been bleached) and especially if your character drinks tea or coffee or for that matter smokes. Also consider the that because of the moisture inherent in the mouth the teeth tend to be very shiny and pearl like in appearance.

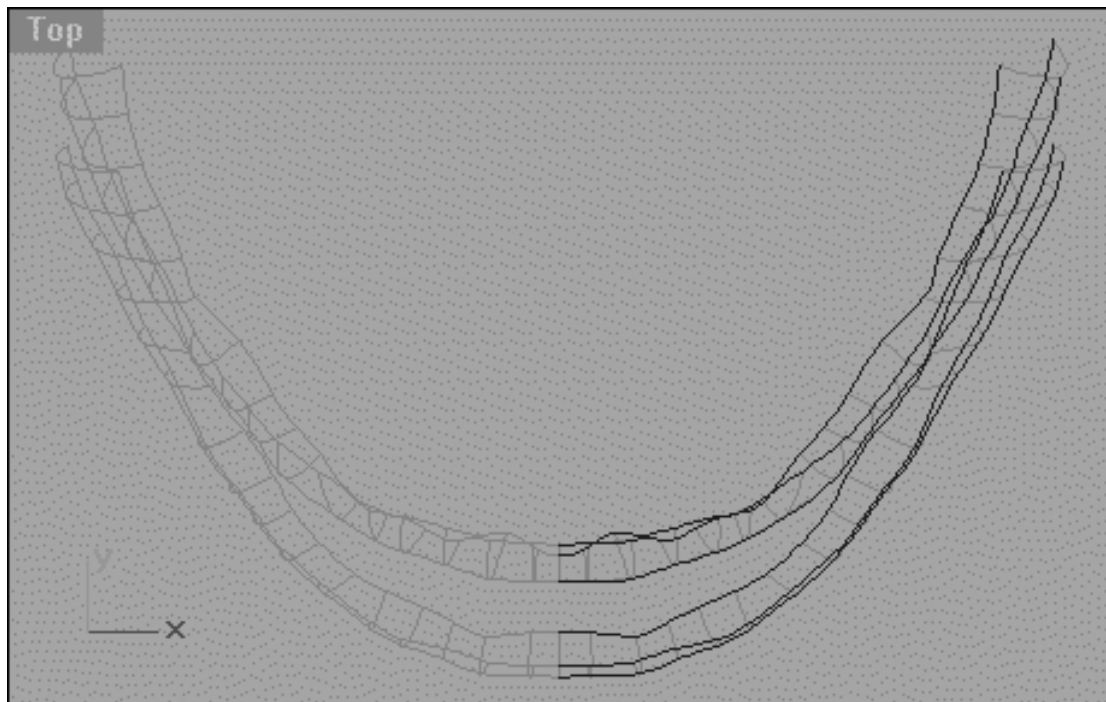
# Creating the Gums

Creating the gums is a fairly straight forward process, yet it does require a fair bit of forethought. The first step as always is to find yourself some good visual reference material on which to base the design of your gums and teeth. I don't recommend that you try and wing it without reference images because it's pretty difficult to get all the geometry right on just the basis of memory.

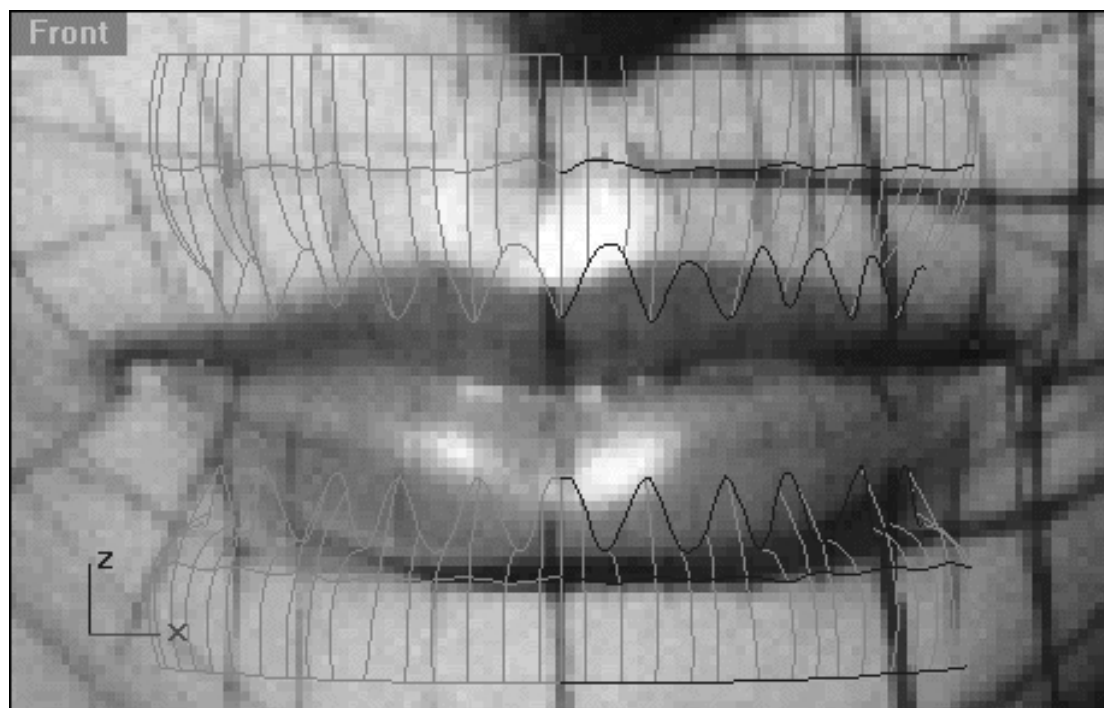
So how should you go about seeking out such material? In my experience you can often find pretty good close up images of smiles in fashion magazines or catalogues. Failing that, you can always use yourself as a source. One of the first things that you need to consider is the shape of the jaw and gums from the top and side views. Thinking about the the top view for a moment you know that jaws should obviously create a "U" shape of sorts. Now something that you should realize about this shape is that it is not a perfect "U" the back ends should splay out a bit. Getting this "U" shape correct is very important and can make a big difference in how well your face looks when its finished, especially if you plan on animating a smile later on. So how can you figure out the correct curvature of this "U" shape.

One good way is to create a template by biting into something soft, like a piece of cheese or some non-toxic Plasticine ( but don't eat it -- no matter how hungry you may be!) You can scan the cheese (or whatever you've use -- but don't leave the cheese in the scanner or that could get messy!) into the computer and this image as a template on which to base your curves. If you don't have a scanner you can always trace the shape of the template onto your monitor with some OHP markers.

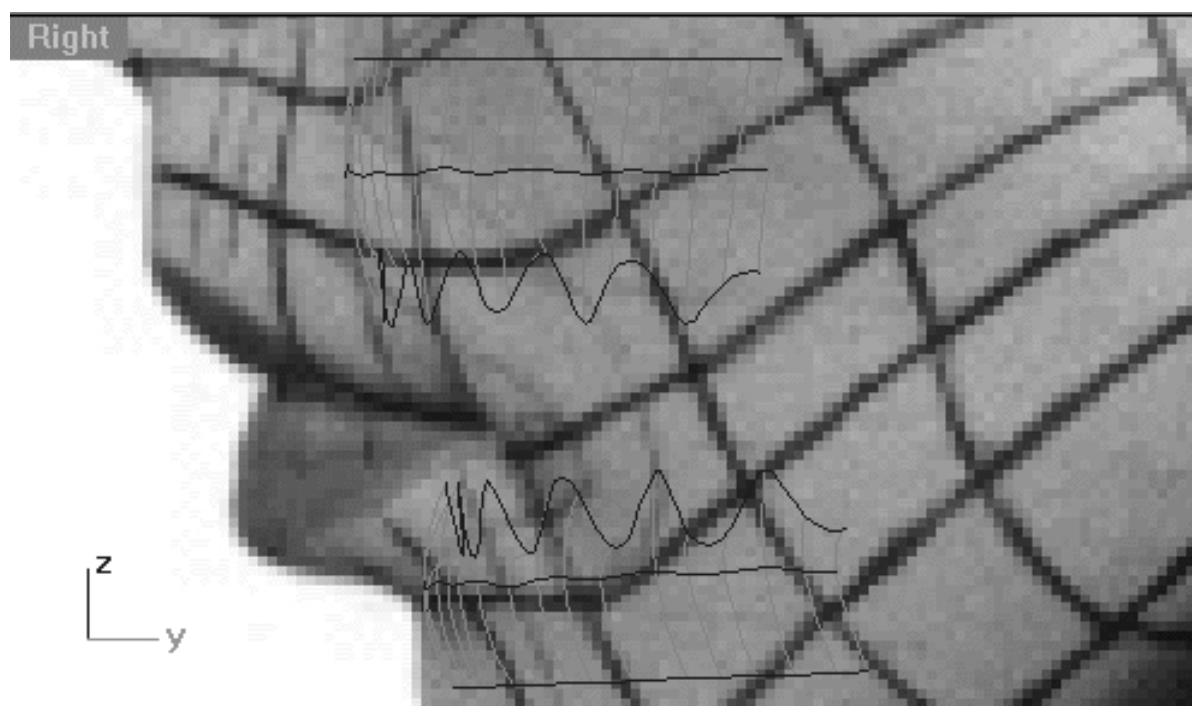
Now why don't you take a look at the following 4 screen shots and study them carefully...



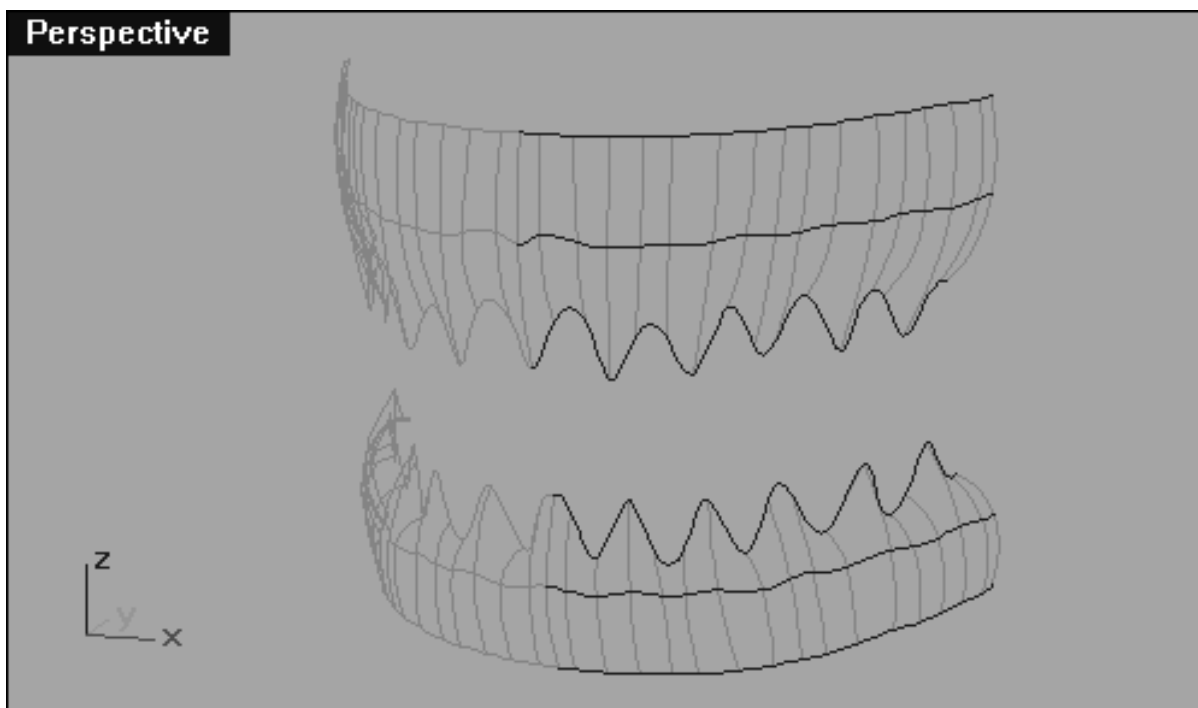
*This **Top Viewport** screenshot shows the basic U shapes (in blue) used to construct the upper and lower gum surfaces (in cyan).*



This **Front Viewport** screenshot shows the gum surfaces very clearly. Observe how the innermost top and bottom curves (in blue) run in a sine wave pattern. The teeth will be set in the depressions between the each of these pointy areas. The pointy areas will represent the fleshy bits of gum in between each of the teeth. Notice also that the middle rows (in blue) on the top and bottom jaw also undulate in and out quite a bit, this can also be seen clearly in the previous Top Viewport screenshot. This was done to produce a far more lumpy and bumpy surface -- just rub your finger over the the tops of your gums inside your mouth and you'll understand why -- the surface of the gums are not smooth!



This **Right Viewport** screenshot shows the gum surfaces of the upper and lower jaw. Observe how the lower jaw is set slightly behind that of the upper jaw.



This **Perspective Viewport** screenshot shows the gum surfaces of the upper and lower jaw. As you can see, it looks like a set of dentures or a set of those clockwork comedy teeth.

The 4 previous screenshots show quite clearly one of the many possible methods for creating an upper/lower jaw and set of gums. So what sort of information can you gather from these images? Firstly, both the upper and lower jaw/gums have been created from a set of 3 (dark blue) curves each (the squiggly curve is the one closest to the root of the teeth. From each set of these curves 1/2 of the total gum surfaces have been produced by lofting (light aqua blue). The surfaces for the other 1/2 are easily created by mirroring thus producing a complete upper/lower jaw and gums -- easy.

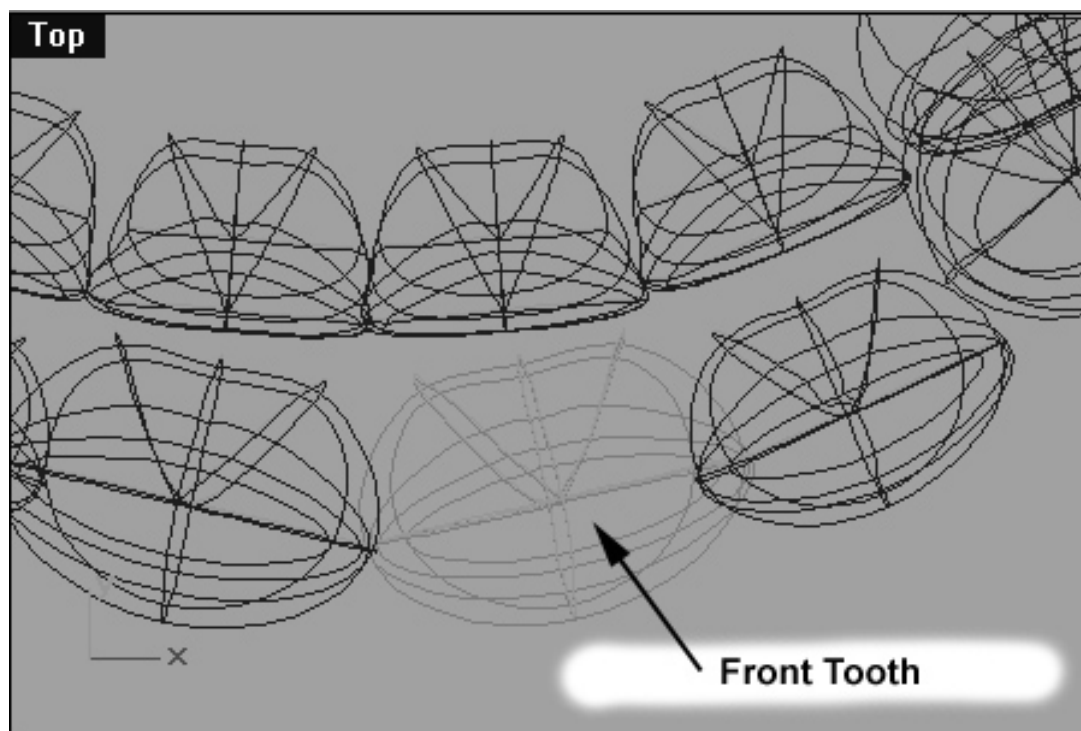
Now the observant among you may have noticed that when looking at each set of 3 curves from the Top View they seem to be undulating in an out and don't run in a very smooth manner. This is one of the nice things about creating the gums, for once in this project we don't want a perfectly smooth surface, rather we are intentionally trying to create a lumpy, bumpy surface just like gums in real life -- take a look at yours in the mirror and you'll see why we've done this.

---

## Creating the Geometry for Teeth

I don't think it's prudent to try and describe the step by step process behind building the gums and teeth. Not only would take nearly forever to do so, there is actually no point in it as almost every tooth in the mouth is created using exactly the same method. To gain a better understanding of what I mean, have a look at the following screenshot:

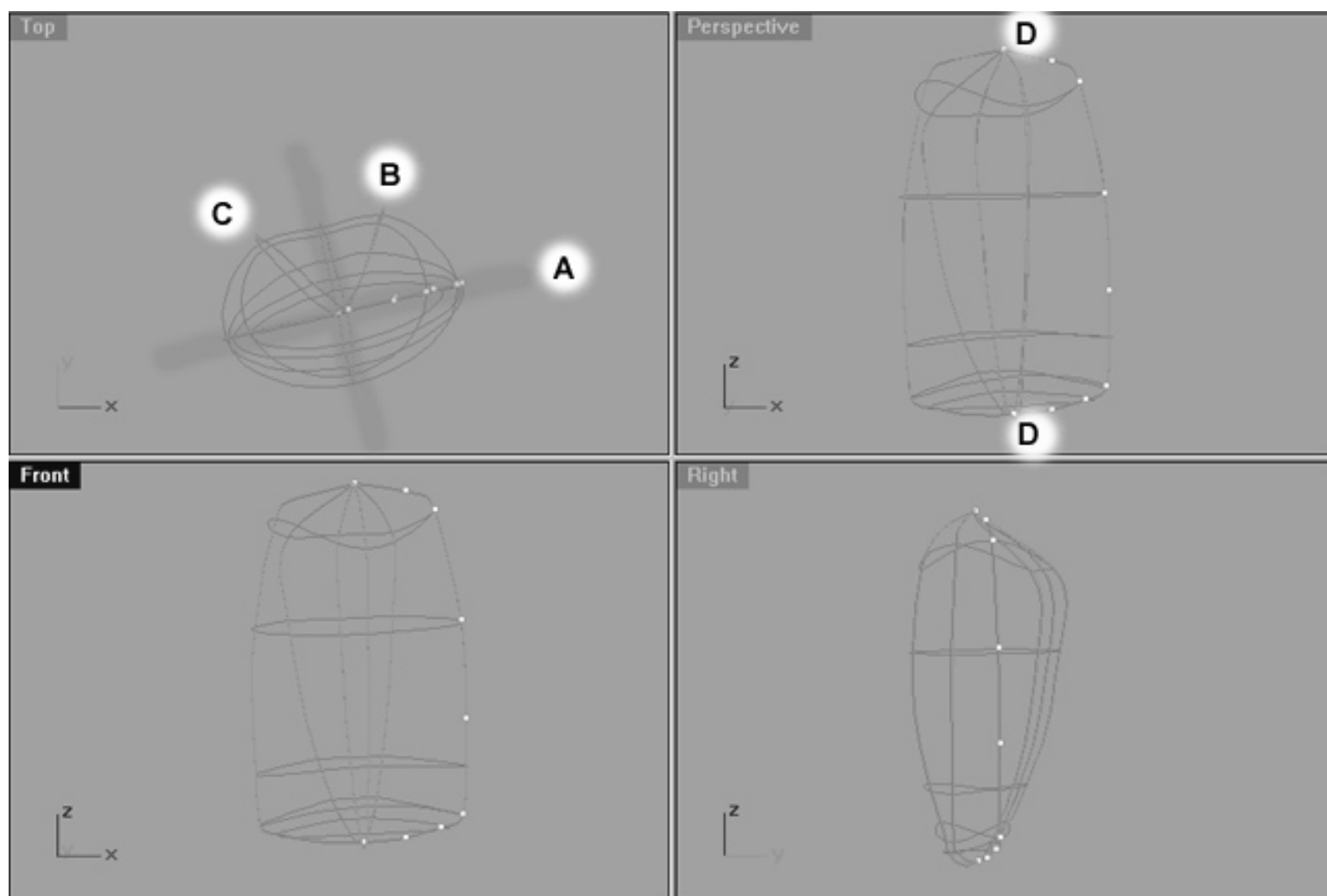




*This **Top Viewport** screenshot shows the method by which nearly every tooth in the mouth has been created. Here a typical example can be seen (the front tooth) notice that a total of 6 curves (in orange) make up this object.*

## The Method:

We've created nearly every tooth in the mouth the same way, that is by first drawing a single curve with 9 control points. This initial curve is then copied and rotated in such a way that a cross shape is created (as seen from the top view) with each of the curves start and end points snapped to each other. This cross shape will define the front, back and both sides of the tooth. Once done, 2 additional curves have then been drawn as "struts" to fill out the back and sides of the tooth, see the following screenshot:



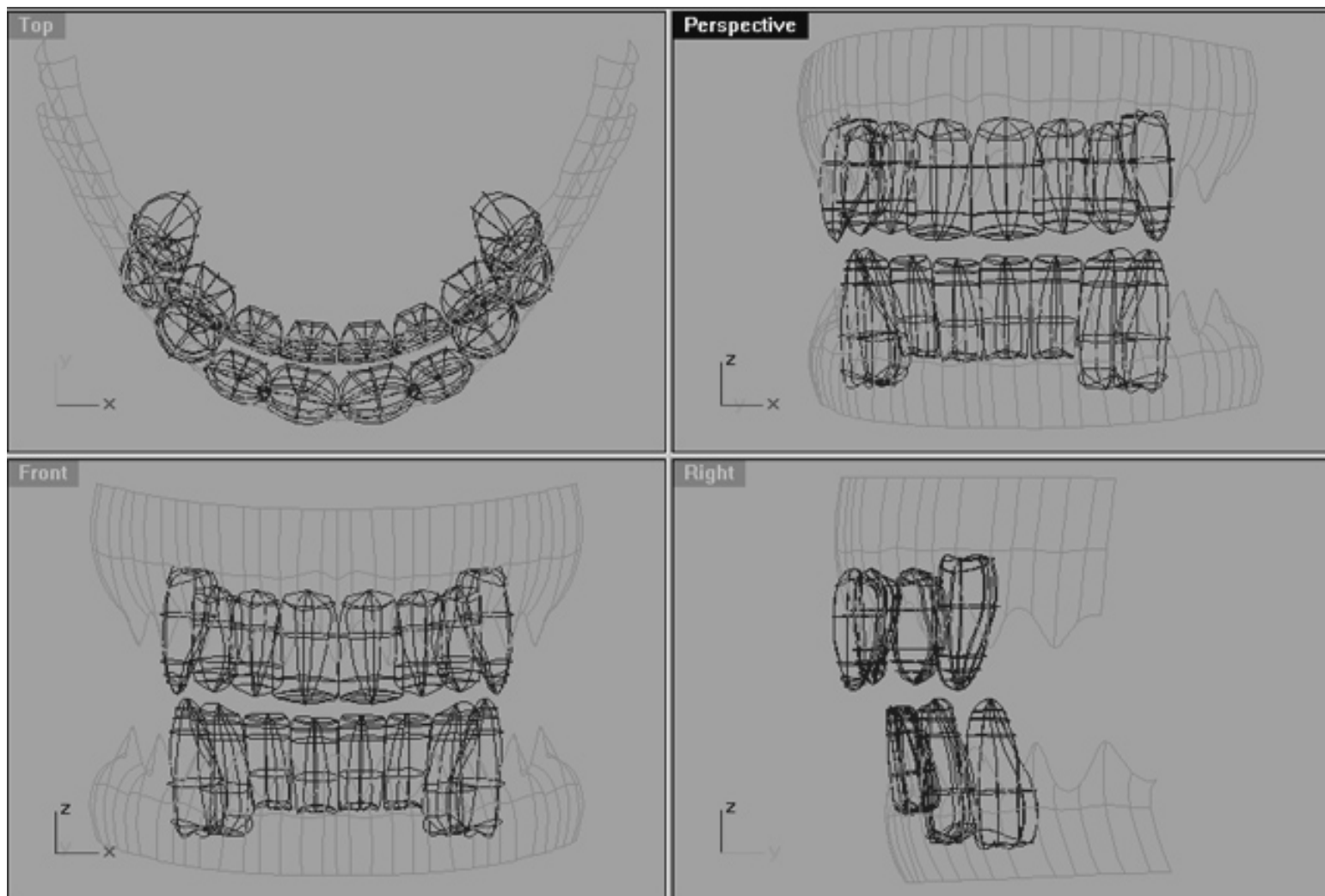
This **All Viewport** screenshot shows how the curves were used to create each tooth. The first four curves {(A) highlighted in green} that were produced create a cross like shape (as seen from the top view). Once in place, an additional 2 curves were drawn (B) & (C) which act as struts to fill out the back and sides of the tooth. Notice that all of the curves share the same start and end point (D).

In order to get the shapes correct, numerous test lofts of the curves were performed using the loose option. Based on the results of these test lofts, points were then moved until a tooth like shape was produced -- very much a case of free form sculpture.

Suffice to say, if you've managed to come this far in the tutorial then creating such a simple object as a tooth should be relatively simple matter. In many respects creating the tooth is no different than creating the initial north/south pole method used in creating Rhinette's initial head shape.

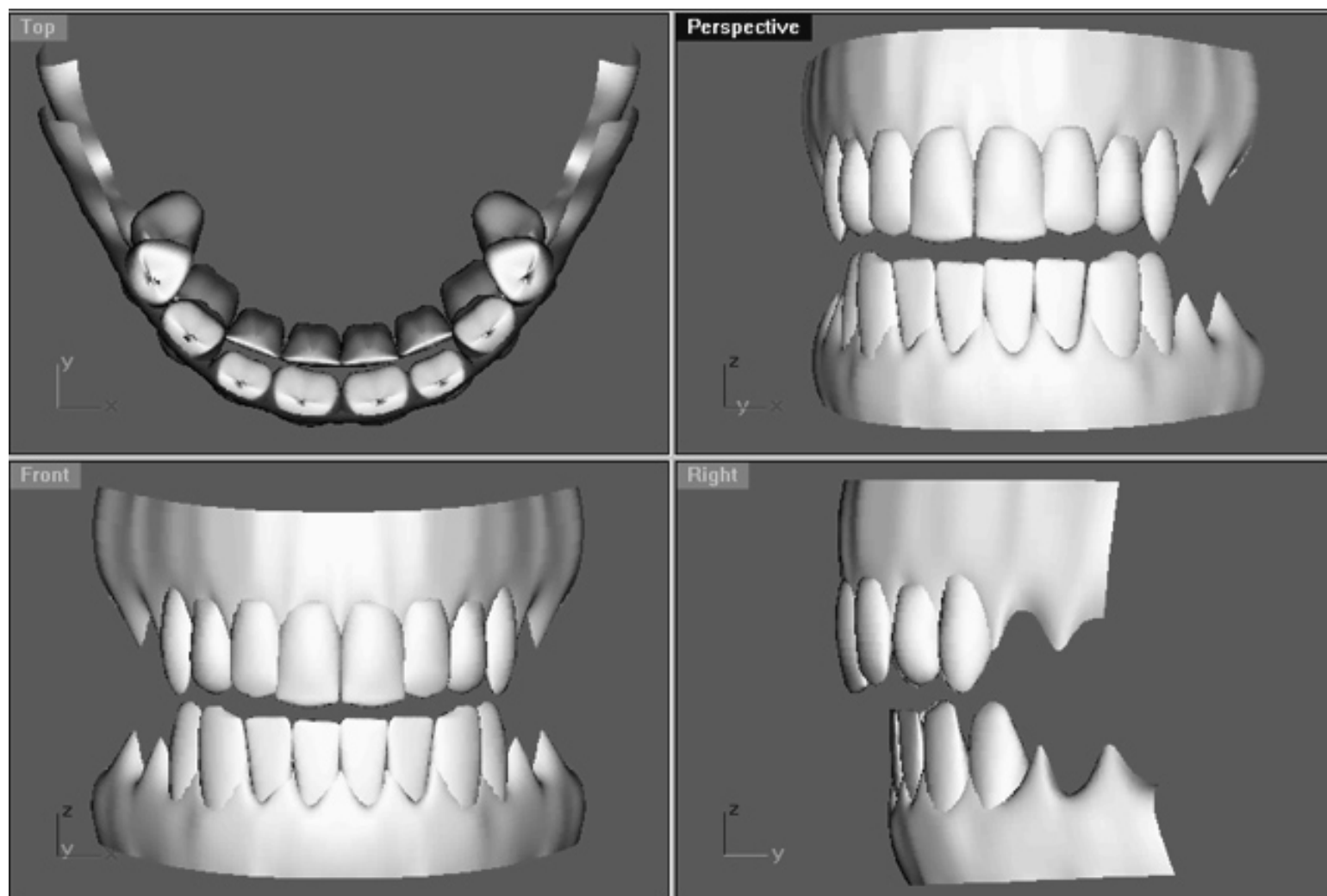
We recommend that you take time to study the tooth curves that we've already created for you. You can find these curves on the layer entitled: **JR\_Tooth\_Curves**.

Once you've created a single tooth you can clone and edit it repeatedly in order to create most of the remaining teeth. It is recommended that you create the teeth along one side of the jaw and then use mirror command to place them on the other side. Naturally, some tweaking will be necessary in order to make everything fit within the gum surface, and this is perhaps the single most time consuming aspect of the job. See the following screenshot:



*This **All Viewport** screenshot shows the upper and lower gum surfaces (in cyan) and the now completed and correctly placed front teeth in wireframe.*

Now let's have a look at a shaded view...



This **All Viewport** screenshot shows the upper and lower gum surfaces with the front teeth now in place. Observe how the teeth sit in between each depression on the gums.

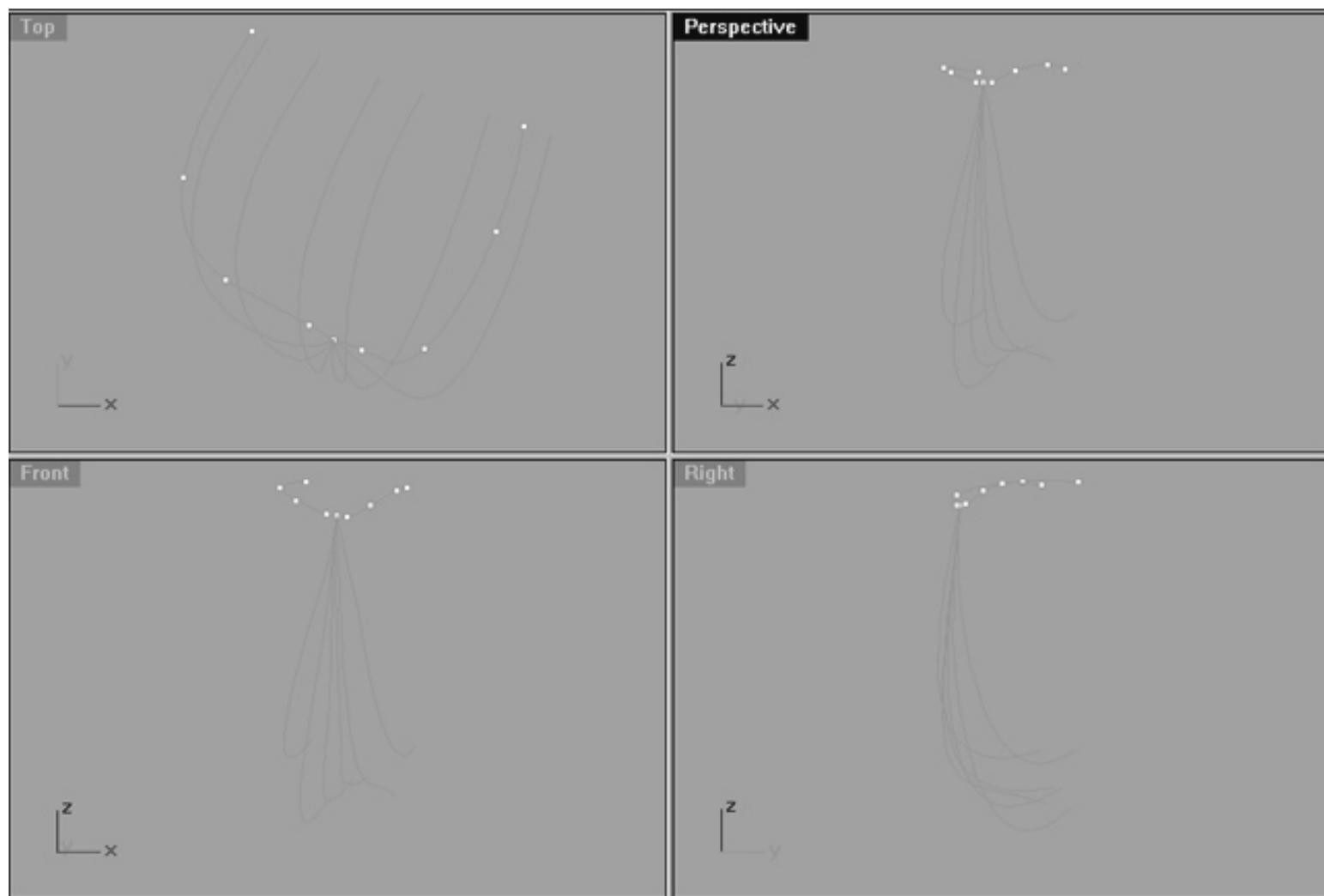
We recommend that you take time to study the front teeth and gum surfaces that we've already created for you. You can find the surfaces for the front teeth on the layer entitled: **JR\_Frntooth** and the gum surfaces can be found on the layer entitled: **JR\_Gum\_Surf**.

Once you've created your teeth and feel satisfied with them it's a good idea to split them up and then to put them on different layers. For example, you might put the group of front teeth (i.e., the ones that show) on it's own layer, and perhaps the molars could on yet another.

The reason for doing this is that teeth create a lot of additional and often unneeded geometry. Most of the time you will only need to show the front teeth, so why have the molars displayed and hogging valuable resources if they not needed. Because there are so many teeth in a mouth it's a pain to try and select the ones you want or don't want, so putting the groups of them that you might require later makes a lot of sense.

## The Molars:

The construction of the molars is just a bit different from that of the other teeth, see the following screenshot:

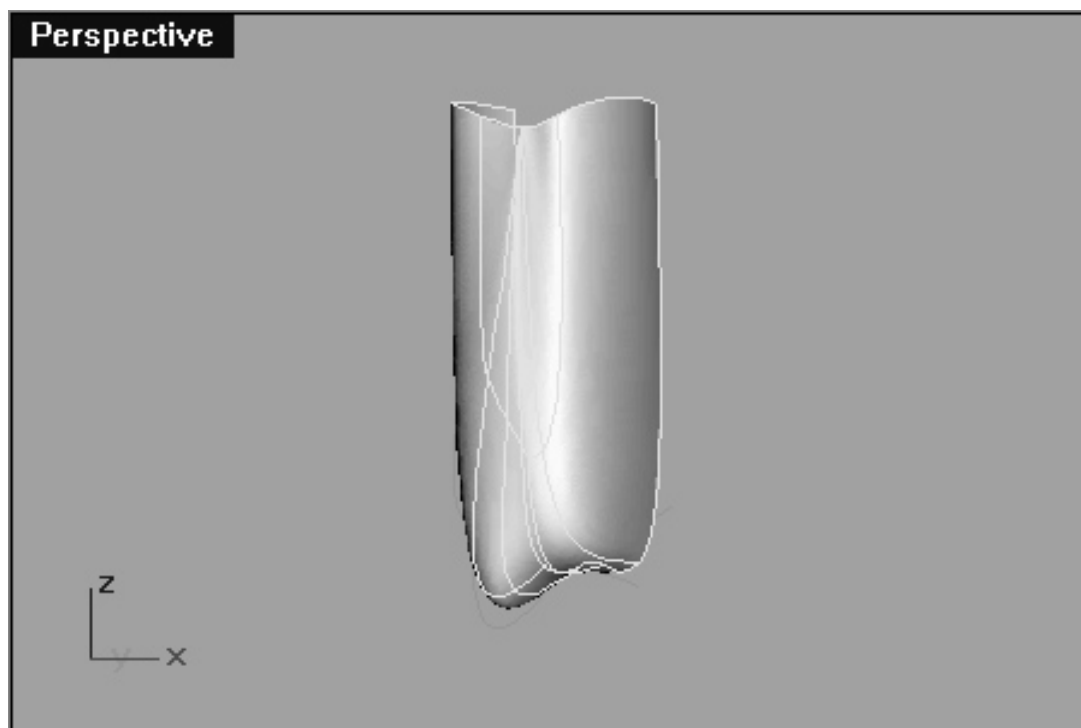


*This **All Viewport** screenshot shows the curves that will make up a molar. We've created a molar using a total of 8 curves. Each of these curves contains a total of 5 points, note that all of their starting points have been snapped together. Observe the curve with it's edit points displayed, this was the initial curve drawn. Note this is not a single curve, it is 2 separate curves that have been mirrored their start points have been snapped together.*

We began the molar by drawing a curve with a total of 5 control points. This initial curve was then mirrored and start points of each curve were snapped together. Once done, a copy of the initial curve was made and this copy was then rotated using the "snapped" start point as the centre of rotation. Once rotated into position the curve points on the curve where then stretched out. This process was repeated until a total of 6 lower curves have been produced and orientated as in the previous screenshot.

Again, in order to get the shapes correct, numerous test lofts of the curves were performed using the loose option. Based on the results of these test lofts, points were then moved until a molar like shape was produced -- very much a case of free form sculpture.

Let's produce a surface from these curves and see what it looks like shaded.

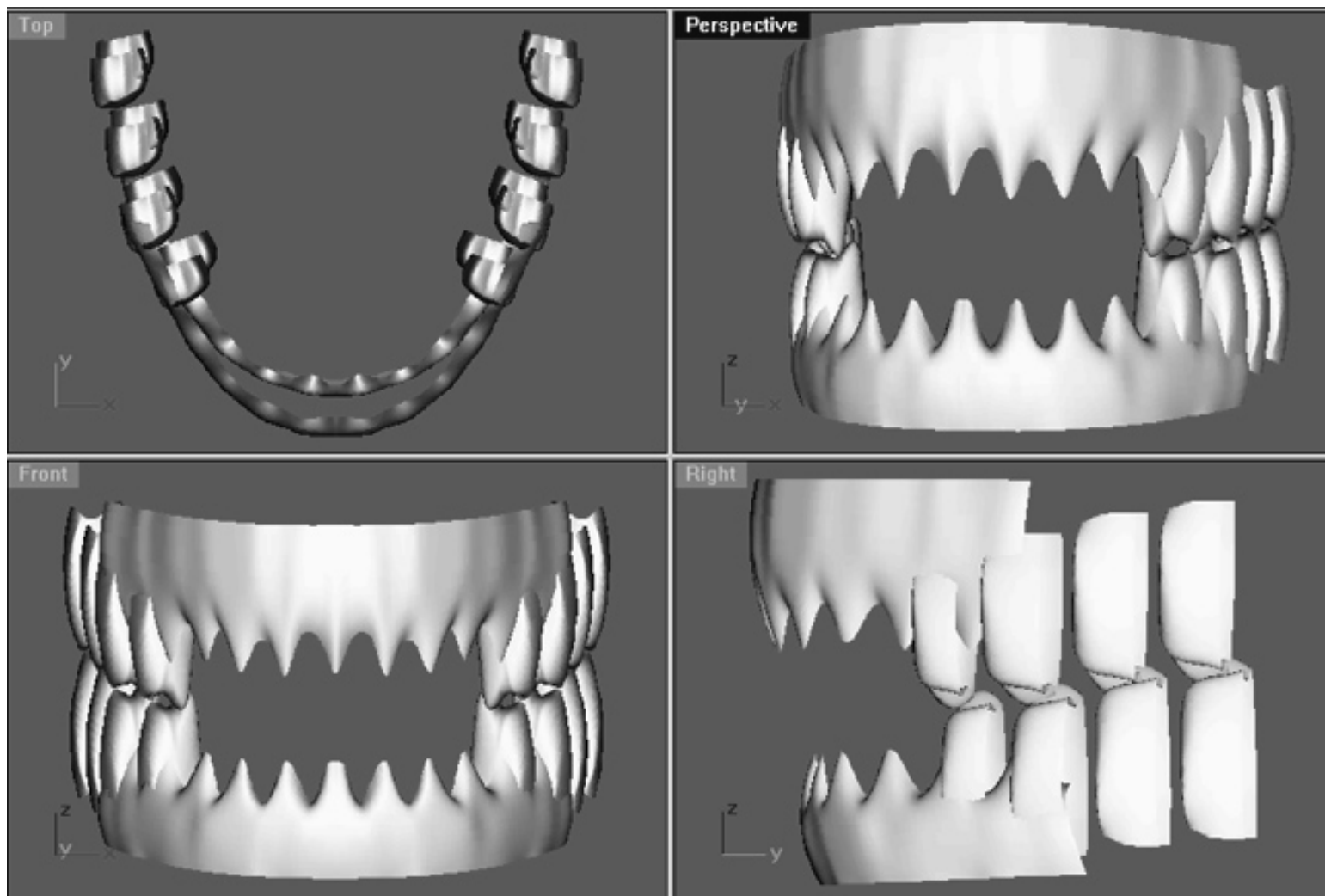


This *Perspective View* screenshot shows the curves that make up the molar now lofted using the loose option. Observe that the top and back of the molar remain open.

It is recommended that you carefully study the curves that make up the molars, we've provided them for you and they can be found on the layer entitled: **JR\_Tooth\_Curves**.

You will notice that this tooth has been designed so that its top and back remain open. This is an attempt to cut down on excess and unneeded geometry and is something that you may also wish to do with the front teeth as well (highly recommended). Remember, if you're not going to see it, why include it?

Once you've created a molar to your satisfaction you can the duplicate it and use it on the lower jaw. Be aware that the upper and lower molars are offset from each other with the those on the top jaw slightly forward and on the bottom jaw backward. In addition, the molars on the bottom jaw are set inward toward the tongue cavity, whilst on the upper jaw they are slightly outward. To help you visualise a bit better, have a look at the following screenshot:



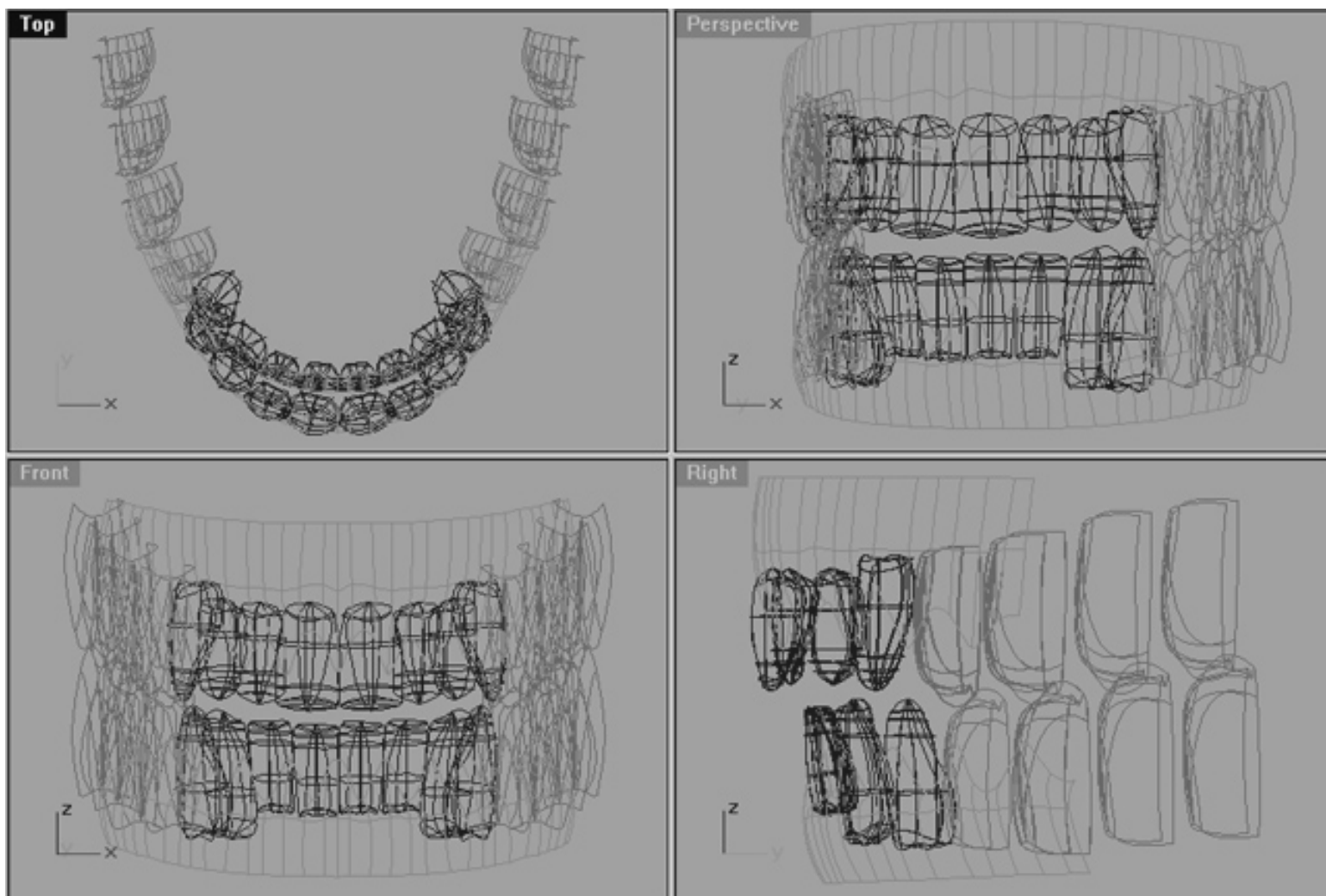
*This **All Viewport** screenshot shows a shaded view of the upper and lower jaw surfaces with the molars now in place. Observe that the molars extend further rearward than the gum surfaces, this is intentional. Once again, this is an attempt to reduce unnecessary geometry and conserve processing power.*

Keep in mind that positioning all the teeth correctly does take a bit of time and effort. Undoubtedly, you will find that it will be necessary to move, rotate and occasionally scale the teeth before they look just right. Once you've created the top and bottom molars for once side of the jaw, it's easiest to then create them for the opposite side of the head simply by mirroring them. Again, all of this is a time consuming and rather boring process but it's difficult to avoid when creating a set of teeth. Fortunately, once you've created a full set you can use them again and again for different projects so don't get too discouraged by the tedium.

If your having trouble creating or orientating the molar surfaces remember you can study the ones that we've provided. You will find the molar surfaces on the layer entitled: **JR\_Molars**.

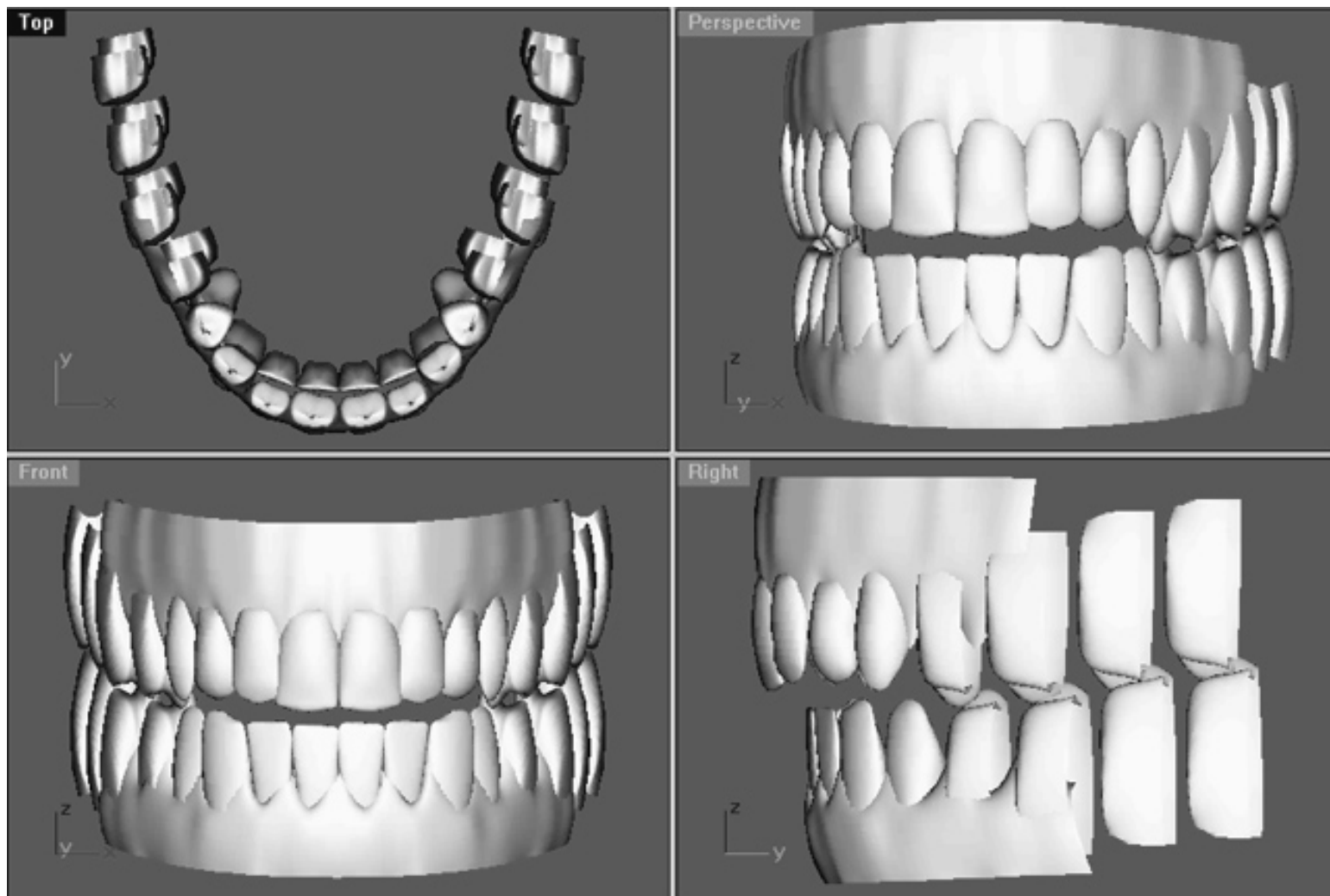
When you've completed all molars, teeth and gum surfaces your monitor should resemble something like this...





*This **All Viewport** screenshot shows a completed full set of teeth. Shown here is the following: Upper and lower gum surfaces (in cyan wire), the front teeth (in dark blue wire) and the molars (in light blue wire).*

Now let's see how things look in shaded view...



This *All Viewport* screenshot shows the completed set of teeth and gums -- chomp!

## Bite It!

Congratulations!

If you've not expired from the tedium of this job then you should have now completed a set of teeth -- well done!

As you've now witnessed it is entirely possible to create a decent looking set of teeth using only simple methods combined with a dash of common sense. When creating teeth the main points to keep in mind are as follows:

- Make sure the overall "U" shape of the jaw is as accurate as possible.
- Create the teeth from as simple geometry as you can get away with.
- Vary the shape, size and placement of the teeth -- if they all look alike the illusion of reality will be destroyed.
- Don't create the back sides of the teeth and rear of gums if possible -- this will substantially reduce the geometry and thus the load on your system.
- Don't include the teeth within the head unless absolutely required for the particular shot.

- If you feel insanity taking a grip -- get out and take in some fresh air!

---

## Shutting Down the Scene

- Save the file.
- Confirm that no Osnaps are currently active, disable any that are.
- Hide any edit points that are currently displayed.
- Unlock any currently locked objects -- type **UNLOCK** at the command line and press **Enter**.
- Open the Edit Layers Dialogue box and locate the layer entitled: SCENE START UP. Make it the currently active layer by clicking in the "check" field -- a check mark should appear in the column, when it has press **APPLY**. Once done, the layer entitled: SCENE START UP should now have become the active layer and should be **ON**.
- Turn OFF all the layers with the exception of the following: SCENE START UP and photopoints.
- All other layers should be **OFF** -- press **OK** to Exit.
- Perform a Zoom Extents All.
- **S A V E Y O U R W O R K..!**

---

RETURN to the Top of page -- [Click Here](#)

Go to the NEXT PAGE

Written by Joseph R. Saltzman.

Co-produced in association with Steven Ståhlberg

©1998-1999 Cinemagic Productions Limited. All Rights Reserved.

Duplication of this document including images and text by any means is expressly forbidden without prior written consent of Cinemagic Productions Limited.

Web Site: <http://www.cmagic.co.uk> Telephone: +44 (0)1753 733 190 Fax: +44 (0)1753 736 619 email: [cmagic@cmagic.co.uk](mailto:cmagic@cmagic.co.uk)

**RETURN** to previous page -- [Click Here](#)

**GOTO** the **NEXT LESSON**



## BLENDING IN USING 3D STUDIO MAX R2.5





---

### Contents:

- [Scene Setup](#)
- [Basic Considerations](#)
- [Export / Import](#)
- [Getting it out](#)
- [Getting it in](#)
- [What's In a Name?](#)
- [Material Assignment](#)
- [Lights, Camera...](#)
- [Material Assignment II](#)
- [Don' t Flip Out!](#)
- [Mapping the Iris](#)
- [Your Assignment Is...](#)
- [Smoke & Mirrors](#)
- [How it works](#)
- [Nose Blending](#)
- [Shadowy Character](#)

- [The Result](#)
  - [It's a Wrap](#)
  - [The Last Word](#)
- 

## Scene Setup

- If you've not done so already start a Rhinoceros session by **Double Clicking** on the desktop icon  the application will begin.
  - Choose File, Open from the menu bar and Double Click on **START\_B.3DM** in the file list, it will load and open.
  - Confirm at the Lower Status Bar the currently active layer is entitled SCENE START UP. If it is active proceed to the next step, if its not then make it active by Left Clicking on the layer box, highlighting the correct layer and clicking on it.
  - Again, at the Layers Box on the Lower Status Bar this time Right Click on the box, the Edit Layers Dialogue box will open. Confirm the following switches have been enabled or disabled:
    - The Layer entitled: Nu\_headsurf\_smooth\_2 should be ON.
    - The Layer entitled: Nose Surface Final should be ON.
    - The Layer entitled SCENE START UP should be ON.
    - All other layers should be set to OFF.
  - When you've finished making your changes ( if any ) click on OK.
  - Confirm that the grid display in the viewports has been disabled, if not turn it off now.
  - Confirm that no Osnaps are currently enabled, if any are disable them.
  - Confirm that no edit points are currently displayed, if any are hide them.
  - Zoom out all the viewports by selecting the Zoom Extents/Zoom Extents All Views icon  or by typing **ZoomExtentsAll** at the command line and pressing ENTER.
-

# Basic Considerations

In the previous chapters you learned one possible method for creating blending surface fillets for the eyelid and nose. Yes, you've created the surface geometry for these blends but that is only half the story as the real power behind this technique lies in the application of the transparency maps. As I mentioned earlier, this mapping needs to be performed outside of Rhinoceros within your favourite rendering and animation package in order for it to be most effective.

For the purposes of this demonstration we will use 3D Studio MAX R2.5 but don't worry if you're not using MAX as most other applications will have similar functionality. The fact is, in terms of basic functionality almost all 3D packages are very much the same be they high end or low end. That said, be aware that although most rendering / animation packages worth their salt will have the ability to do this sort of mapping easily, not all will call it by the same name. For example, in Avid Softimage|3D this is known as *transparency mapping* whilst in 3D Studio MAX it is called *opacity mapping*; essentially different names for the same thing!

So how does this work then?

It's easy! We will begin by exporting our model from Rhinoceros and importing it into a rendering and animation package, in this case 3D Studio MAX R2.5. Once that has been done we will apply a basic surface material along with ramped transparency maps (opacity maps) to the blending surface.

---

## Export / Import

When you've completed your model and are ready to render it within a package other than Rhinoceros (which can't do transparency mapping) the very first thing that needs to be done is the export of the model. Fortunately, exporting the model from Rhinoceros and then importing into 3D Studio MAX R2.5 is simple and painless because of the excellent Rhinoceros 3DM file import plug-in for 3DS MAX 2.5. This plug-in reads polygon mesh and NURBS geometry from a Rhino 3DM file directly into MAX R2.5 making the job dead easy.

Before doing any of this we strongly recommend that you read the comprehensive help file included with Rhinoceros, just look in the help index under 3D Studio file exchange. It is very important that you take the time to read and understand the information contained within the help file on this topic. Despite the fact that the 3DM file import plug-in for 3DS MAX 2.5 does make the transfer of files between these packages very easy the process is by no means perfect (what is?) there are still several very important issues you should be aware of.

I'm not going to go into the details here as that information can be found in Rhino's help but suffice to say that a large percentage of the problems that you could encounter have to do with trims and trimming. When it comes to the transfer of files between applications trims are a big problem. As a point of fact, it doesn't matter if you're using Softimage|3D or MAX -- trims are bound to cause you headaches. Now aren't you glad that we've avoided using them? Not only will our model animate faster and more easily but moving it between applications is greatly simplified.

## Getting it out:

Right then, our next step is to export our model geometry from Rhinoceros -- let's do that now.

- Install the 3DM file import plug-in for 3DS MAX 2.5 as per the instructions within the Rhinoceros help file (you can find the plug-in on your Rhino CD-ROM).
- Open the Edit Layers dialogue box and turn on the layers containing only the SURFACE geometry that you wish to export.
- In Any Viewport, Frame select all the object you wish export -- they should highlight.
- From the File Menu choose Export Selected... a second or two later the Export Selected dialogue box will appear. Choose a folder to save the geometry in. We recommend that you save your geometry inside your 3dsmax2.5/Meshes folder (this will make it easy to find later) but any folder will do. Then type in a new name for your geometry file or leave it as is (the default name). Lastly, make sure that you are saving the file as a Rhino 3D Models type (\*.3DM). Once done, press the Save key -- a few moments later the dialogue box will disappear and you should see something resembling the following prompt at the command line: Saved E:\3DSMAX2.5\Meshes\blendtest.3dm.
- Press the Esc key to deselect any currently highlighted objects.
- With your file now saved out to MAX you can now quit your Rhinoceros session by choosing Exit from the File Menu. You will be asked whether you'd like to save your changes. We recommend that you don't just in case you accidentally moved a piece of geometry while selecting the objects earlier. Besides, all you did was choose the objects you wanted to export and you can always do that again later. Still, it is entirely up to you, but we do suggest that if you do decide to save the file that you name it something else.

## Getting it in:

Now that we've exported our geometry from Rhinoceros let's bring the file into MAX and see what we have.

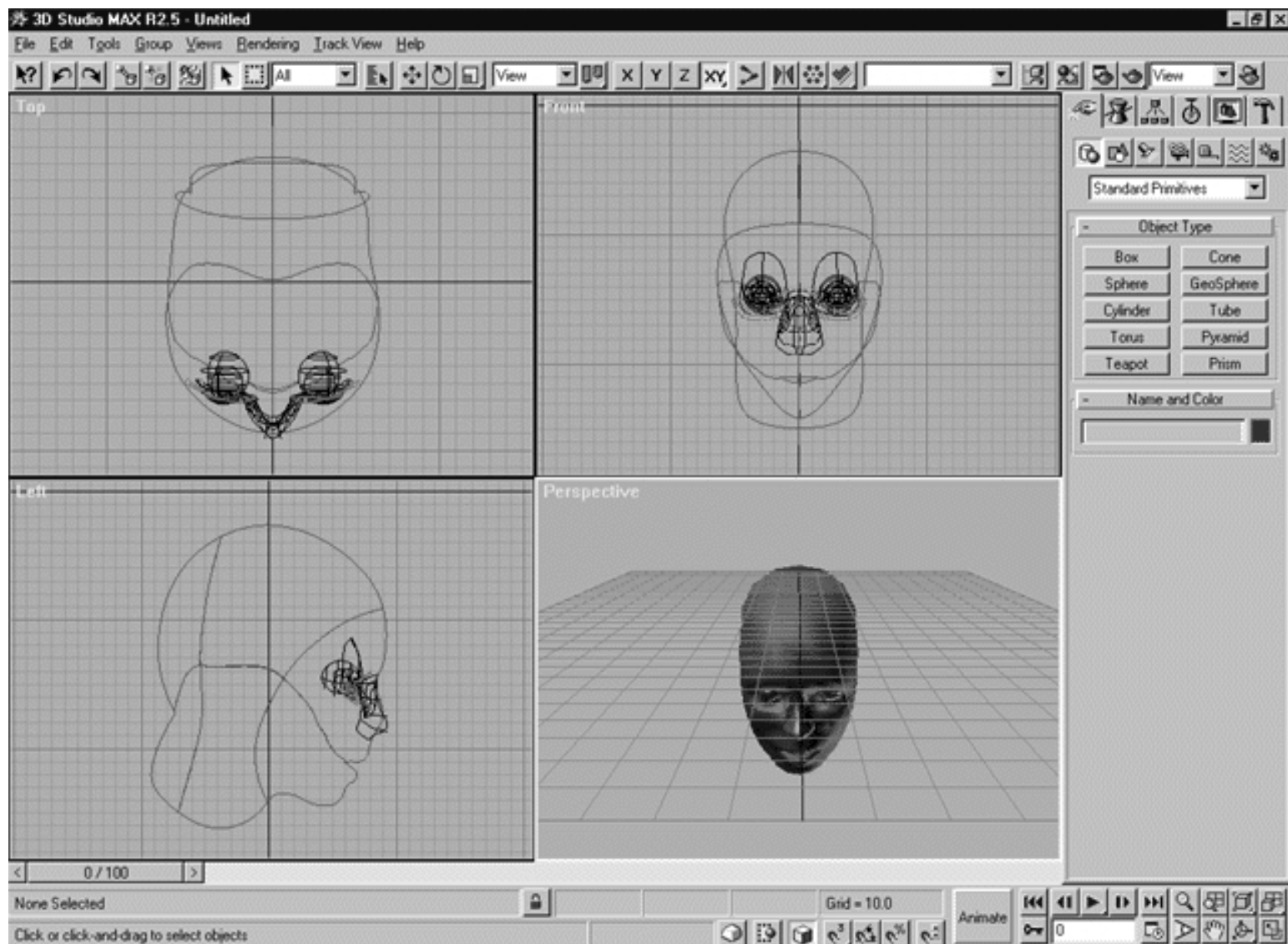
- Start a 3D Studio MAX R2.5 session.
- From the File menu choose Import...a second or two later the Select File to Import dialogue box will open. Locate your Rhino 3D Models (\*.3DM) file and press Open.
- You may be presented with the following dialogue box, see the screenshot below:



*The MAX Attempt Trimming dialogue box*



- When and if presented with the Attempt Trimming dialogue box, press NO as choosing yes may cause problems (and we don't need problems).
- A few seconds later the geometry of your model should appear within MAX's viewports and your monitor should resemble the following screenshot:



*This screenshot shows the 3D Studio MAX R2.5 interface with the Rhinoceros model geometry now successfully imported.*

Take a close look at the previous screenshot, clearly it tells us a few things among them are the following: Observe that the various pieces of the model are in different colours, this is normal. MAX has used the layer colours as a basis for assigning basic material colours. You may recall that inside Rhinoceros the layer containing our head surfaces was red so MAX has just used a red material on the surface for the time being. This is no big deal, we are going to assign new materials to all the surface objects anyway so their initial colours are irrelevant. Something else that you might notice immediately is that the head doesn't seem to contain the same number of isoparms as it did inside Rhinoceros there are far fewer of them, in fact it really looks kind of weird. Again, this is nothing to worry about the number of isoparms that are displayed within the Viewport are variable within MAX (as they are with most applications). All the isoparms are actually still contained within the model, you just can't see them at the moment because MAX has decided not to show them all. This is actually a good thing because the fewer isoparms that are displayed within the Viewport the more responsive your display will be overall.

Still, if this really bothers you and you can't live without seeing all the isoparms you always have the options of resetting the display parameter within MAX.

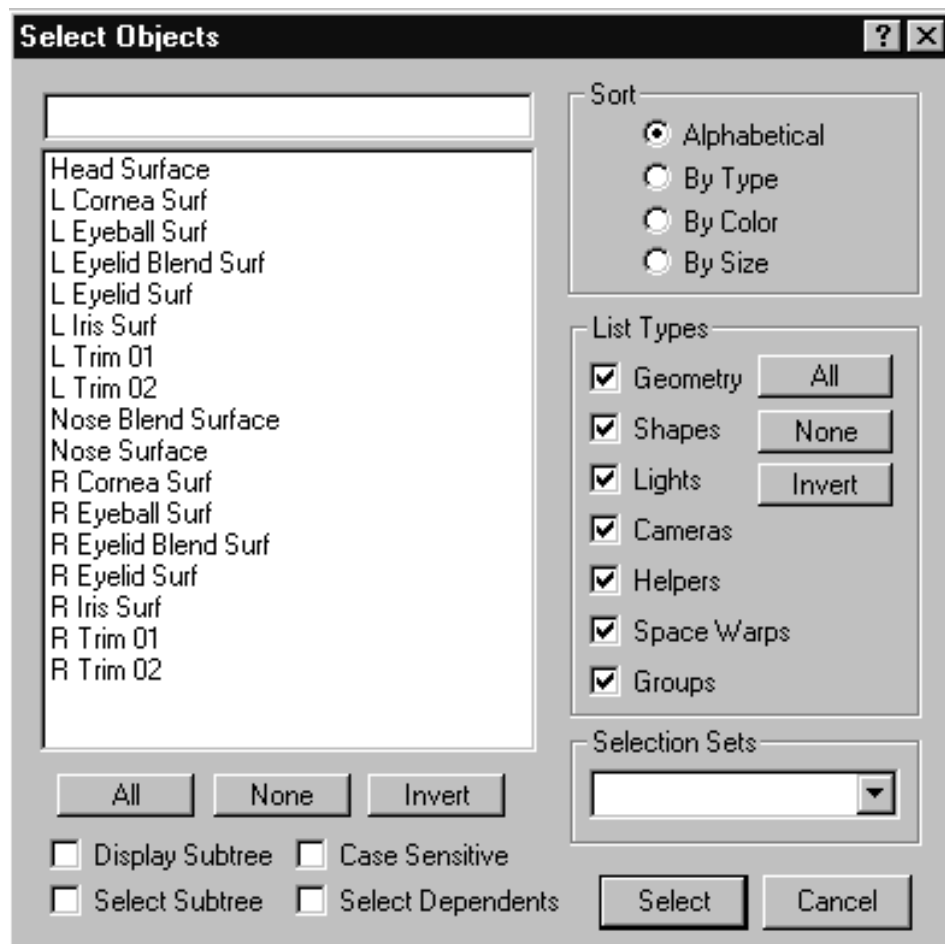
---

## What's In A Name?

Before do anything else, I recommend that you take the time to rename all the surface objects to something useful. It's easy to be lazy and to skip this procedure but if you do it will really slow you down later on. For example, move your cursor into the Front Viewport and click on one of the isoparms making up the head surface. Now look at MAX's create panel, you'll notice that under the Name and Colour menu roll-out something like "Rhino NURBS 001" (your results may differ) is listed as the objects name. Well, as far as names are concerned this is about as useful to us as a chocolate teapot. We need to rename all of the surface objects to something just a bit more obvious and sensible, which is easy, just do the following...

- Make sure you're in Select Object mode and if you've not done so already select the head surface by moving your cursor into any Viewport and clicking on one of the isoparms comprising it -- you'll know it has been selected when the isoparms highlight (white).
- Go to the Name and Colour menu roll-out found on the create panel, highlight the current name listed in the field with your mouse (something like Rhino NURBS 001) and retype the name: **Head Surface** and press Enter. Once done, the surface object will now have been renamed.
- Repeat this procedure for ALL the surface objects in the scene, renaming each one with something useful. Here are just a few examples: Nose Surface, Nose Blend Surface, R Eyeball Surf, R Cornea Surf, etc. -- you get the idea.

Right then, I've just gone and selected each object in my scene and assigned each a new name. A quick look at MAX's select by name dialogue will give you an idea of just what I've done...



*This shows the Select Object dialogue box. Notice that I've replaced all the old object names with new more meaningful ones.*

- When you've finished, save your scene. From the menu bar choose Save, a moment later the Save File As dialogue box will appear. Choose a new name for the file and press the Save key. The file has now been saved as a native \*.MAX file.

Tip -- When working with MAX it is good practice to save save your files often whist working. Neglect doing this at your own peril and don't say I didn't warn you if something goes horribly wrong!

## Material Assignment


Thus far we've made a good start of things and have managed to successfully import our geometry and rename all the objects within our scene to something a bit more meaningful. We can now set about assigning the individual components of our head with something that looks a bit more "like" human skin. At this stage we are not going to pay too much attention to materials themselves or texturing of the head model per se. The object of this particular exercise is to show you an example of how blending is accomplished within MAX (or a similar application for that matter) and for this purpose only a very simple skin shader is required to do the job. Remember this is a head/face modelling tutorial not a texturing and mapping tutorial. But don't panic, we intend to cover these topics in greater depth within future editions of the series.

Let's begin...

- Open MAX's material editor, click on the first slot to make it active. Locate the "Type" button and click on the button (it will say Standard).

- Once done, the Material/Map Browser dialogue will open. In the "Browse From" field select the Mtl Library radio button.
- From the list select the material entitled: **Human Skin (basic)** and press the OK button to complete the operation.

*\* Note -- We've created this material shader for you and it is included on the Supermodels CD-ROM, look for it in the maxmap folder.*

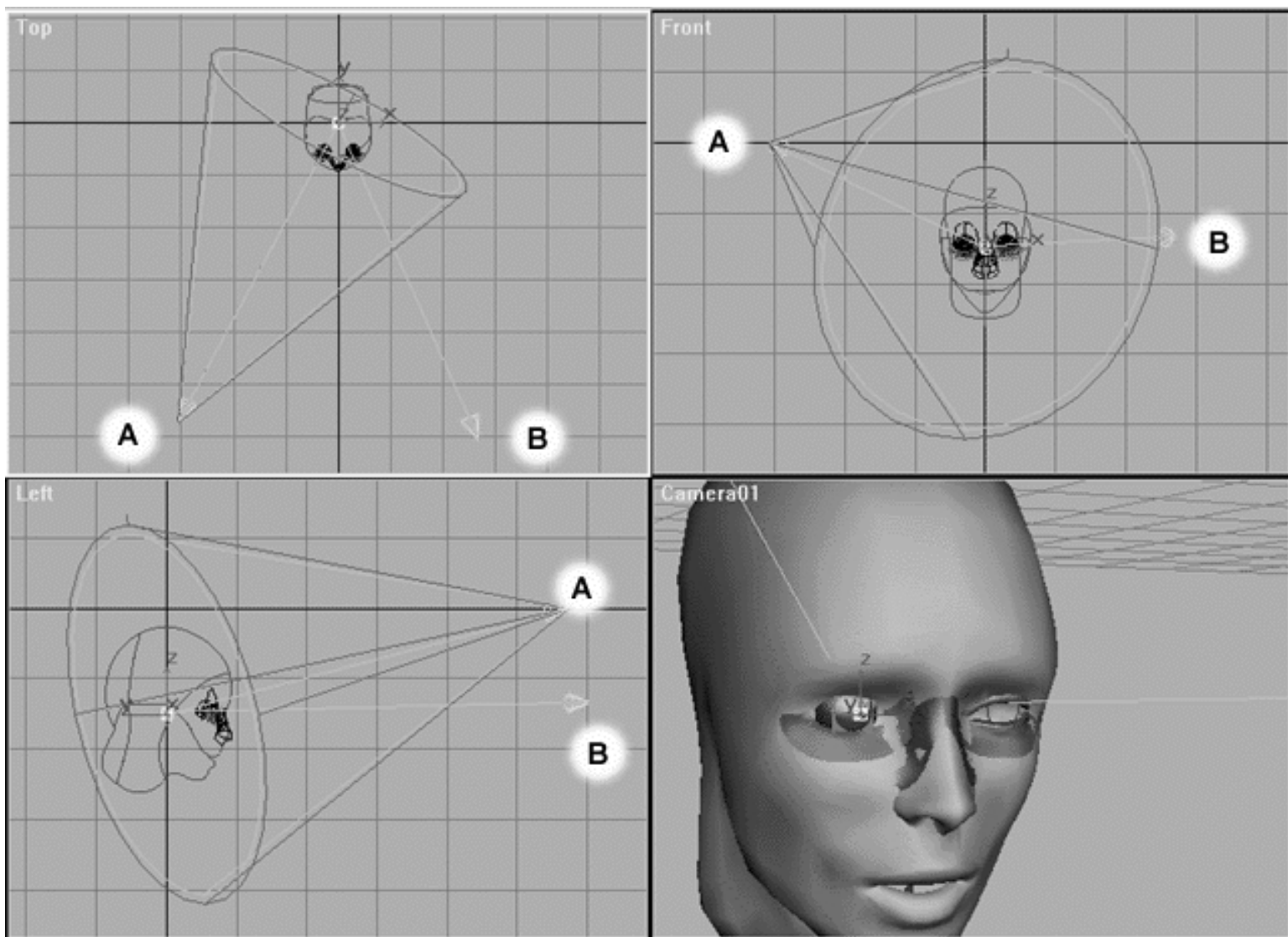
- A new pinkish skin like material should appear within the first slot.
- With the material editor still open and with MAX in select object mode, in any Viewport click on the head surface isoparms -- they will highlight (white).
- Return to the material editor and click on the Assign Material to Selection icon  you will notice that head surface in the shaded Viewport has now changed to a pinkish colour to reflect the new material assignment.
- Save the scene.

---

## Lights, Camera...

At the moment MAX is using it's default lighting setup to illuminate the scene which really isn't ideal. For more control you really should think about setting up a few spot lights one that will act as a *key* and the other as a *fill*. Again, I'm not going to delve into advanced lighting setup or techniques within this edition of the tutorial as this is something that we be covered in greater detail in future.

The following screenshot shows one possible lighting setup that will offer more flexibility and greater control -- try to create something like this...



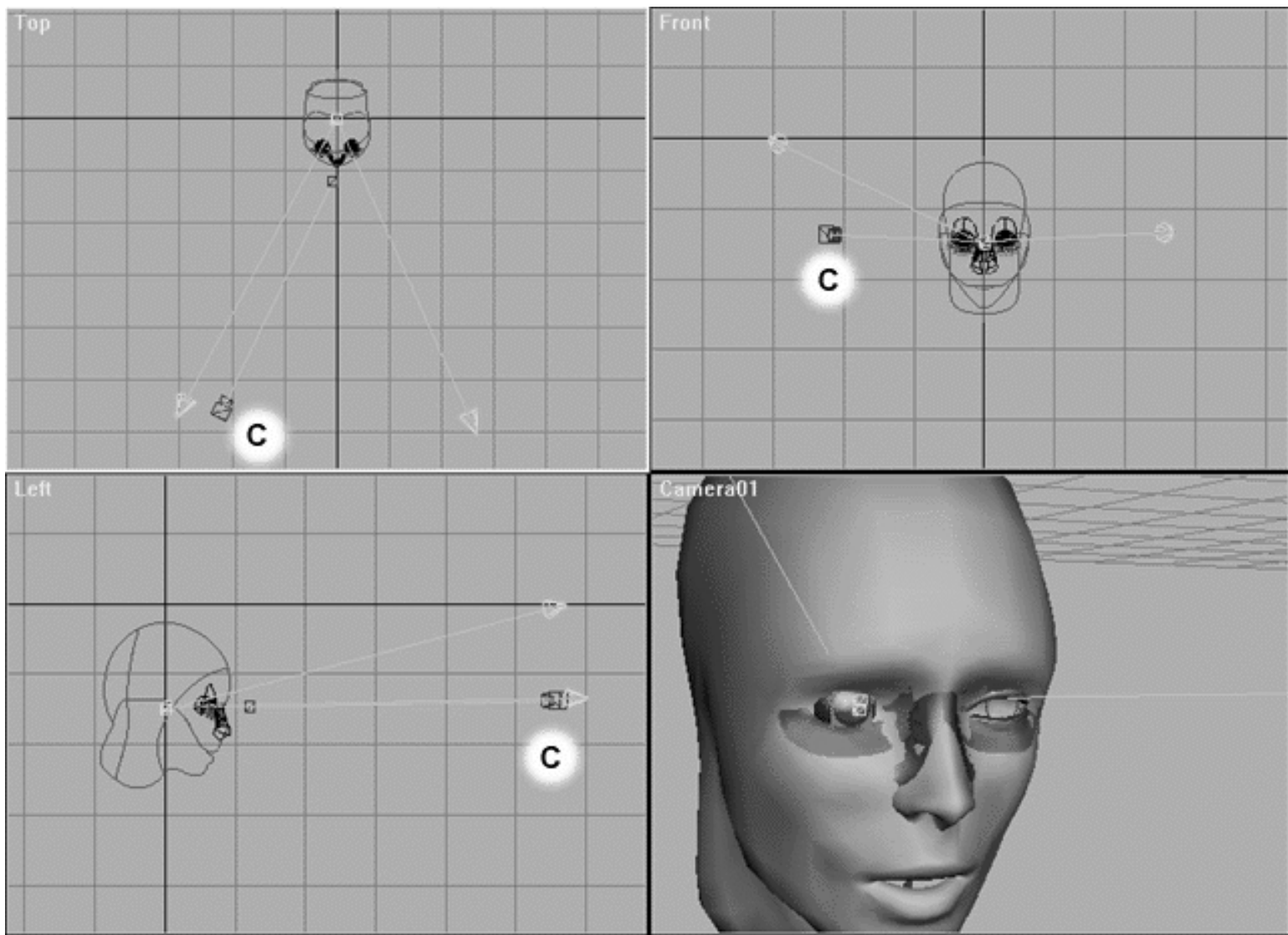
*This All Viewport screenshot shows a few "target" type spotlights have now been placed in the scene. The spotlight nearest to the letter (A) represents the key light (the main light source) and the spotlight nearest to the letter (B) represents the fill light (a secondary light source) used to partially fill in or soften the areas of shadow created by the key light.*

Again, there is no need for great precision at this point in time all you are trying to do is put a fairly even light source that can be readily edited depending on the particular situation.

Do keep in mind that the fill light should NOT be as bright as the key -- be careful not to wash out your scene with too much light!

Once you've have managed to set up a few lights then next item on your list should be to set up a camera.

The following screenshot shows one possible camera setup that will offer more flexibility and greater control -- try to create something like this...



*This All Viewport screenshot shows that a new camera (Camera01) has now been placed in the scene. Observe that it has been placed within close proximity to the key light, yet it is lower and at nearly the same height as the fill light.*

As you can see from the previous screenshot, I've set up a target camera with its body located near the key light and its interest near the bridge of the nose. The lens is set currently to 85mm (as in the previous screenshot) however you can easily toggle between different focal lengths by first selecting the camera and then changing the parameters found on the Modify tab, then look for the section entitled: Stock Lenses.

When you've completed setting up the lights and the camera hide them from view as they are only cluttering up the viewports at the moment. To hide the objects, choose the Display tab and locate the section entitled: Hide by Category. Once done, place a tick mark next to Lights and Cameras as you do they will disappear from view.

So let's review what we've accomplished so far...

- Imported the model
- Renamed the objects
- Assigned a new material to the head surface
- Created some new lights

- Created a camera

Jolly good!

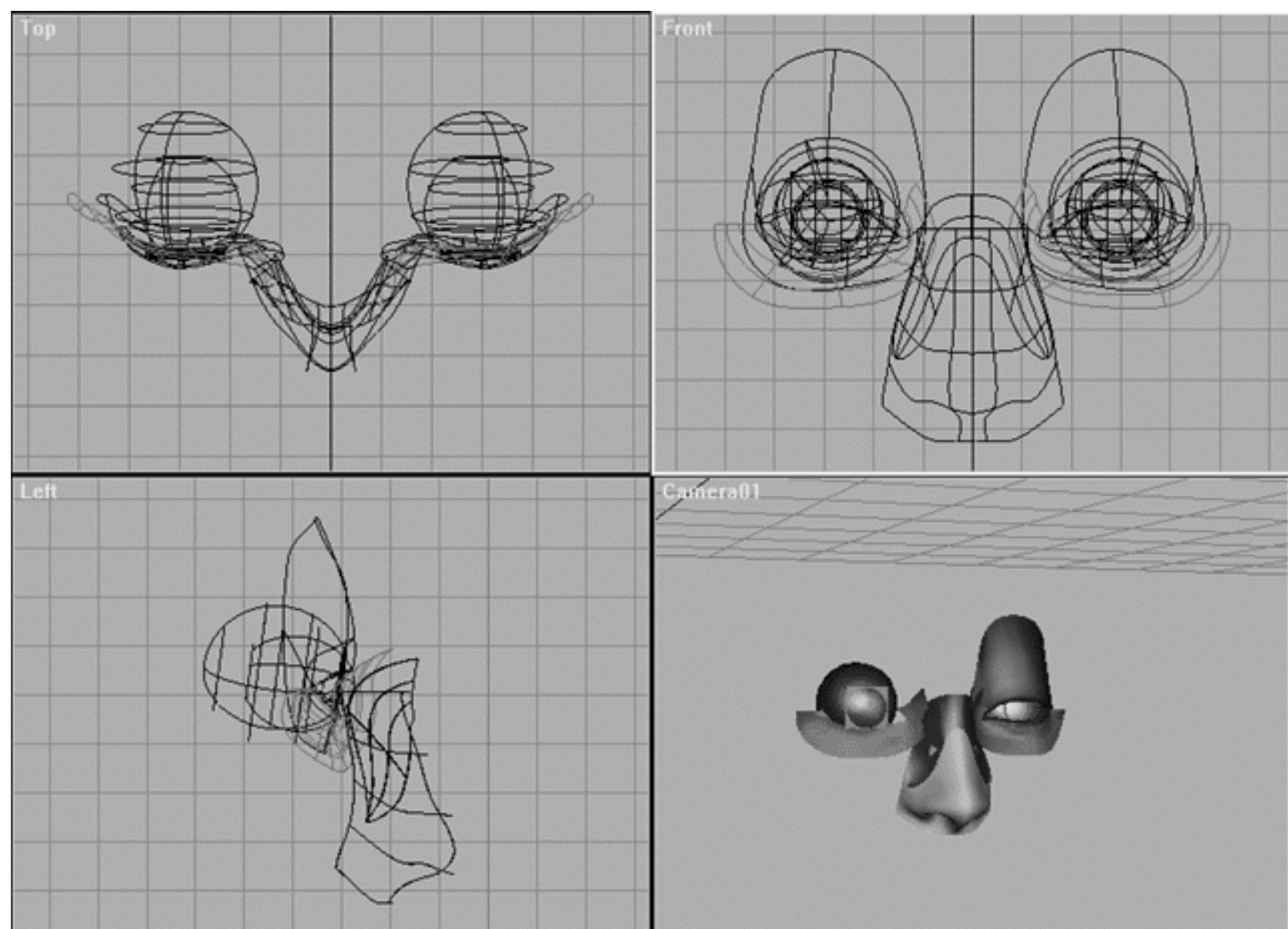
## Material Assignment II

We now will return once again to the Materials Editor -- the fun is about to begin!

Earlier on in the lesson we applied a skin (shader) material to the head surface itself, we will now concentrate on applying materials to all the other objects in the scene as well.

- With MAX in the object select mode, click on the carefully click on the head surface in any viewport. Once done, click on the display tab and from the hide menu roll-out choose the hide selected button by pressing it. Once you've done this you should notice the head surface disappear from the viewports.

Take a close look at the object in the viewport, notice anything strange? You very well might as it's is quite possible that some of the objects seem to be missing as in the following screenshot:





*This All Viewport screenshot shows the result of hiding the head surface object. Observe that although in the Top, Front and Left views we can see the right eyelid surface in the Camera01 view it seems to have gone missing -- what's that all about? In addition there seems to be a strange square like planar object cutting through the cornea surface -- why? \*Note -- Just in case you're wondering, be aware that I've also put a skin material on the nose surface but yours would not have been applied yet.*

---

## Don't Flip Out!

Please don't "flip out" because the eyelid surface object is still really there, you just can't see it. The reason it can't be seen in the shaded view is because the normals of the surface have become flipped. In order for us to see the object we will have to invert the normals which is a simple to do within MAX once you know how. Normals that become flipped is something that commonly happens when importing or exporting between packages, it's not a big deal and certainly nothing you should worry about. A good rule of thumb is that you should check for a possible occurrence of normal flipping first whenever an object seems to have mysteriously disappeared from view.

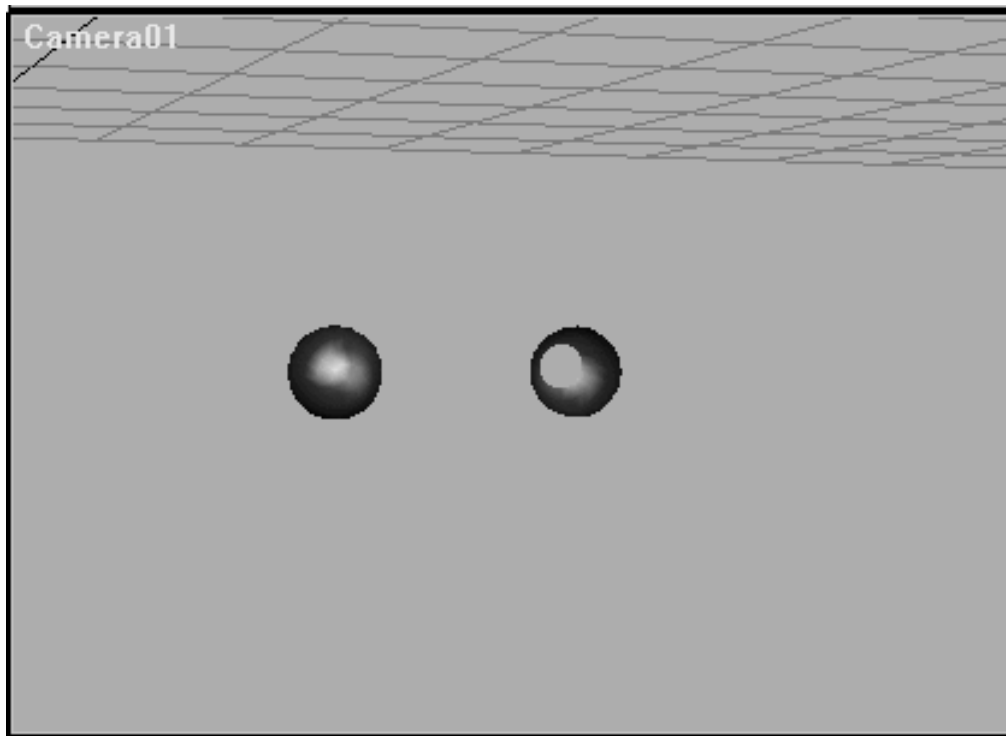
In respect to the square planar object that seems to be cutting through cornea, that is what has become of the patch we created within Rhinoceros to act as our iris surface. But wait a minute that patch was round when we created it, not square -- wasn't it? Yes, it was round, but remember that when you create a patch within Rhinoceros you are also creating a trimmed surface (gasp!). Now you will recall that when we first began the process of importing the geometry earlier in this lesson MAX asked us if we wanted it to try to attempt trimming, but we said NO. We could have answered YES and MAX could have tried to do the trim, thus giving us a round patch, so why did we say no. The reason is because MAX might have been able to do it, then again it might not have. In the event that MAX could do the trim it is quite likely that it would have added a great deal of unwanted and unneeded computational overhead to our file. In our experience trims can be very unreliable and can possibly cause everything from strange errors to crashes and for this reason we still maintain that they are best avoided.

The simple and most effective solution is just to create an object within MAX that will do the same job.

Right then, let's tidy up a bit...

- Temporarily hide the following objects: Eyelid surfaces, eyelid blending surfaces, nose surface, nose blending surface, left & right eyeball, and the left & right planar iris surface.
- Select the right cornea surface then from the edit menu choose clone. The Clone Options dialogue box will appear, when it does locate the object section and select the copy radio button, then, name the object something like: R Iris Surface and press OK.
- With the object still highlighted activate the front viewport by clicking anywhere within it. Next, from the toolbar choose the Select and Uniform Scale tool and then be sure to set the transform manager controls to use the **Selection Centre** and scale the object to 95% -- the highlighted sphere object should shrink slightly.
- Once done repeat the procedure on the left cornea surface.
- Now that you've created a two new iris surfaces return to object selection mode.

- In Any Viewport, select the following objects: right iris surface, left iris surface, right cornea surface, left cornea surface.
- You should now see a few circular curves (roughly 4) remaining within the viewports. These are the remaining trim curves which are no longer needed, select and delete them -- bye!
- No objects should now be visible -- but not for long!
- Go to MAX's display tab again, locate the hide section and press the button entitled: Unhide by Name...
- From the list select the Right and Left Iris surface and press the Unhide button -- 2 spheres should now be visible in the viewports.
- Perform a Zoom Extents All.
- Do both of the spheres appear to be solid -- or do they look like the following screenshot?




*This Camera01 screenshot shows that both right and left iris spheres are now visible. Observe that one of the spheres seems to have a hole in it!*

As you can see from the screenshot above, one of the spheres seems have a hole in it -- not quite what we are after. Again, this is being caused by flipped normals. This is easy enough to fix, so let's do it.


- With MAX in select object mode, go to the Camera01 viewport and click on the iris surface that seems to have a hole in it -- a bounding box should appear around the object.
- Click on the Modify tab, locate the Modifier Stack section and press the Sub-Object button and choose Surface from the drop down list.
- Now click on the object again -- this time it should highlight in **red**.

- Return to the Modify tab, look just below the Modifier Stack and locate the section entitled: Surface Common near the bottom you will see a check box entitled: Flip Normals, once done, put a tick in it.
- The normals are now facing in the correct direction, you should now see two solid looking spheres within the Camera01 viewport.
- Again, return to the Modifier Stack section and press the Sub-Object button to toggle it off.

Let's assign a simple material to both spheres.

- Open the Materials Editor and click the 2nd slot to make it active. Locate the materials type: field and click on the button entitled: Standard.
- The Material/Map Browser button will open. Locate the Browse From section and activate the Mtl Library radio button.
- In the list, find the material entitled: White Plastic (standard), highlight it and then press OK.
- Once done, the new material should appear in the 2nd slot.
- Next, in any viewport select the **left iris surface** -- it will highlight.
- Return to the materials editor and select the Assign Material to Selection icon  -- the object will turn white in the shaded viewport.

The **left iris surface** now has a white plastic material applied to it.

- Now select the **right iris surface** -- it will highlight.
- Again, return to the materials editor and select the Assign Material to Selection icon  -- the object will turn white in the shaded viewport.


The **right iris surface** now has a white plastic material applied to it.

- Save the scene.
- Select the left and right iris surfaces and temporarily hide them using the display tab panel.


The **left and right iris surfaces** have now been temporarily hidden.

- Still at the display tab panel, locate the Unhide by Name... button and press it.
- From the list select the left & right cornea surfaces and press the unhide button.

The **left & right cornea surfaces** have now been unhidden.

- Observe the objects in the shaded Camera01 viewport, can you see them -- do they look completely solid? If not, flip the normals using the same procedure as outlined previously.
- Once done, we can now apply a new material.
- Open the Materials Editor (if you've not done so already) and select the 3rd slot to make it active. Locate the materials type: field and click on the button entitled: Standard.
- The Material/Map Browser button will open. Locate the Browse From section and activate the Mtl Library radio button.
- In the list, find the material entitled: Glass (standard), highlight it and then press OK.
- Once done, the new material should appear in the 3rd slot.
- Next, in any viewport select the left cornea surface -- it will highlight.
- Return to the materials editor and select the Assign Material to Selection icon  -- the object will look like a spherical swarm of bees in the shaded viewport.

The **left cornea surface** now has a glass material applied to it.

- Now select the right cornea surface -- it will highlight.
- Again, return to the materials editor and select the Assign Material to Selection icon  -- the object will look like a spherical swarm of bees in the shaded viewport.

The **right cornea surface** now has a glass material applied to it.


- Save the scene.
- Select the left and right cornea surfaces and temporarily hide them using the display tab panel.

The **left & right cornea surfaces** have now been temporarily hidden.


- Still at the display tab panel, locate the Unhide by Name... button and press it.
- From the list select the left & right eyeball surfaces and press the unhide button.

The **left & right eyeball surfaces** have now been unhidden.

- Observe the objects in the shaded Camera01 viewport, can you see them -- do they look completely solid? If not, flip the normals using the same procedure as outlined previously.
- Once done, we can now apply a new material.

- Next, in any viewport select the left eyeball surface -- it will highlight.
- This time, open the Materials Editor (if you've not done so already) and select the 2nd slot to make it active -- this slot has already been assigned as white plastic.
- Return to the materials editor and select the Assign Material to Selection icon  -- the object will turn white in the shaded viewport.

The **left eyeball surface** now has a white plastic material applied to it.

- Next, in any viewport select the right eyeball surface -- it will highlight.
- Again, return to the materials editor and select the Assign Material to Selection icon  -- the object will turn white in the shaded viewport.

The **right eyeball surface** now has a white plastic material applied to it.

- Save the scene.
- Go to the display tab and hide all the objects -- when done, nothing should be visible within the viewports.

We've now managed to put some basic materials onto all of the major eye components but we can still take things one step further -- let's do it.

---


## Mapping the Iris

I think it's very helpful to have something to look at other than a plain white lump on the front of the eyeball. One way to solve this dilemma is to put a texture map of an actual iris on the surface in question, hence the reason we named the object the "iris surface" in the first place! To do this you will first have to create such a texture map within your favourite photo editing / paint application, something like Adobe Photoshop is ideal. You can create such an image by using bits and pieces of real photographs of the human iris or just paint something that looks like one -- be creative. The image that you create doesn't have to be very large, about 200 x 200 pixels should be more than adequate.

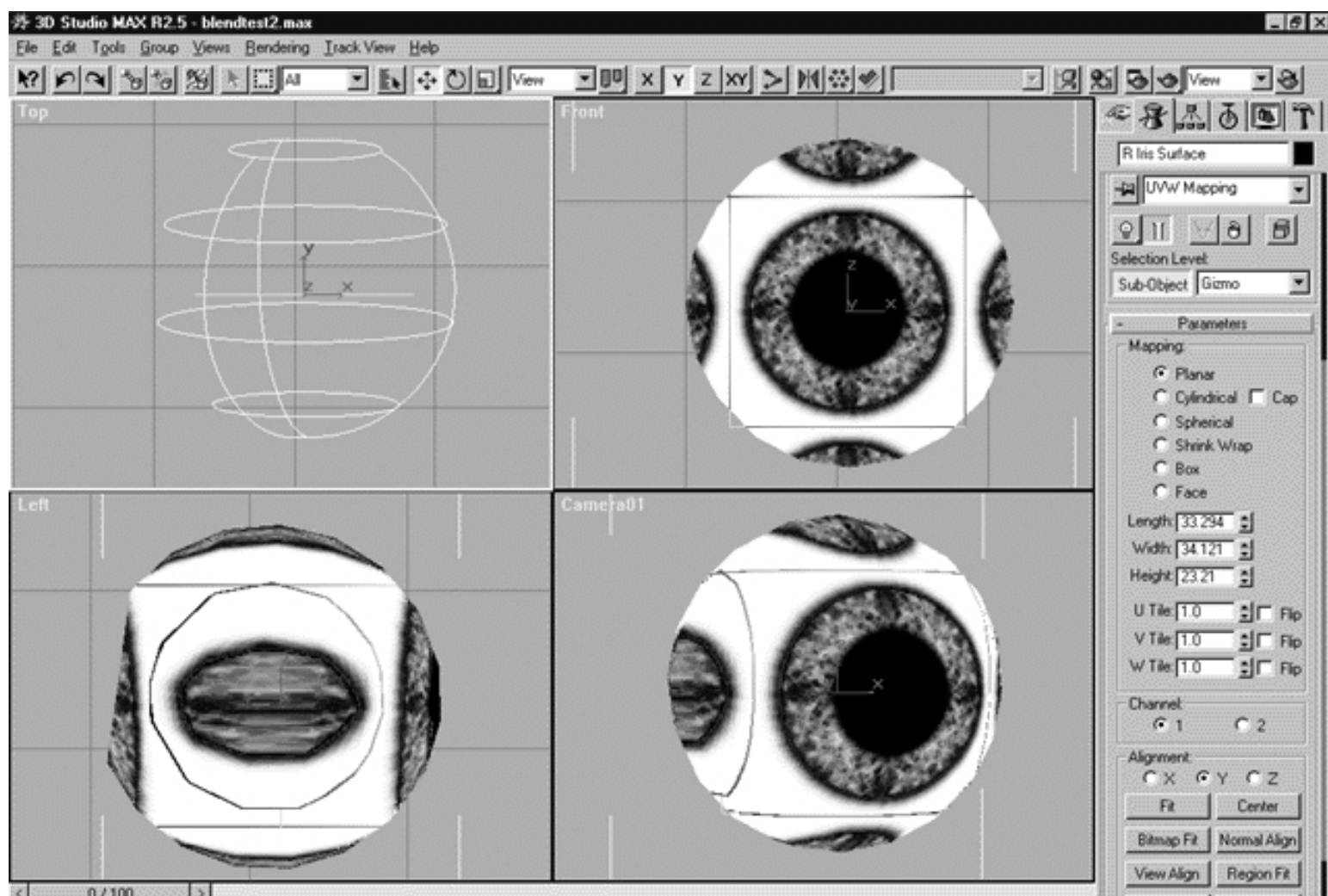
*\* Note -- We've created just such texture map for you and it is included on the Supermodels CD-ROM, look for it in the maxmap folder!*

Before you do anything else perform the following...

- Go to MAX's display tab and locate the hide section, then press the Unhide by Name... button.
- Select the right iris surface and press unhide, it should now be the only object visible.

- Open the Materials Editor and click on the 8th slot to make it active. Locate the materials type: field and click on the button entitled: Standard.
- The Material/Map Browser button will open. Locate the Browse From section and activate the Mtl Library radio button.
- In the list, find the material entitled: White Plastic (standard), highlight it and then press OK.
- Once done, the new material should appear in the 8th slot.
- Scroll down through the materials editor until you locate the section entitled: Maps. Locate the diffuse check box and put a tick in it. Once done, click on the diffuse map button (it will say "none" on it). The Material/Map Browser will open. Locate the Browse From section and enable the radio button entitled: New. Next, in the list highlight Bitmap and then press OK to complete the operation.
- Once again, return to the Materials Editor and locate the section entitled: Bitmap Parameters, just below this you will see a field entitled: Bitmap click on the square button like object.
- The Select Bitmap Image File dialogue box will open, select the image entitled: **eyeclr.bmp** and press OK. Once done, a new image will appear in the 8th slot.
- Select the iris surface object -- it will highlight, then return to the materials editor and select the Assign Material to Selection icon 
- MAX will respond by issuing the Assigning Material dialogue box. It will say that a material with the same name already exists in the scene, Do you want to...replace or rename it?
- Choose the rename option and type in a new name like: **irismapmat** and then press OK to complete the operation.
- Return to the materials editor and activate the Show Map in Viewport icon.
- Locate the coordinates section and untick the following check boxes: Show Map on Back (off), Tile U (off), Tile V (off).
- With the object selected, go the Modify Tab and locate the section entitled modifiers. Select the UVW mapping modifier and then in the Modifier Stack press the Sub Object button and choose Gizmo from the drop down box.
- Make sure that the Front Viewport is active and return to the Modify Tab and locate the section entitled: Alignment. Once found, make certain that the radio button is set to Y.
- With the Front Viewport hot and the sub object gizmo selected from the toolbar choose the Select and Uniform Scale icon.
- Move your cursor onto the gizmo when you do the icon will change indicating that you may now scale the gizmo.

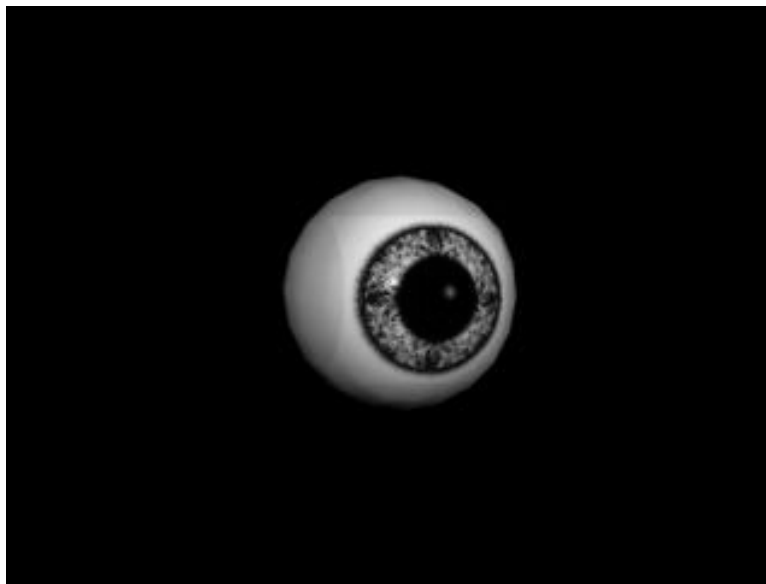
- Click and drag your cursor downward as you do you'll notice that the image of the iris will shrink in the shaded viewport, keep going until you can see mirror images starting to appear at the top and sides, then stop.
- You should also turn on the shaded view for your Top and Left viewports as well, this will make your life much easier in terms of positioning the mapping gizmo.
- You will undoubtedly need to move the gizmo along the X axis and also the Y axis too. Just take your time and keep tweaking the map until it is sitting on front of the eye correctly.
- When you've finished moving the mapping gizmo into place your shaded viewports should look roughly something like the following screenshot.



*This All Viewport screenshot shows the result of scaling and moving the UVW Mapping Sub-Object Gizmo.*

- Make the Camera01 viewport active (just click it with the mouse) and then perform a Quick Render (production). Once done, your monitor should resemble the following screenshot.



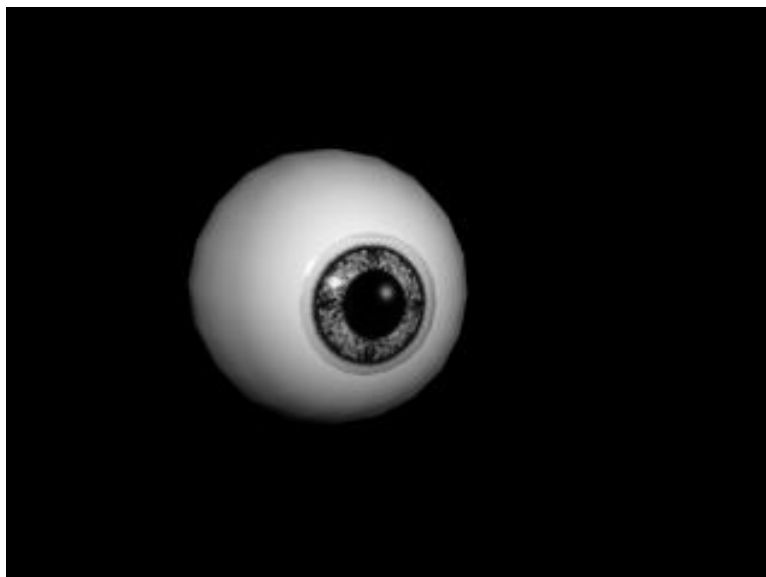


*This screenshot shows a Quick Render of the Camera01 viewport, the image map can be seen clearly on the front of the object.*

If you look closely you can see that the edges of the map against the white surface of the object. You really needn't worry about this because only the iris itself will be seen through the hole in the eyeball surface. However, if you really want to make sure that the edge of the map can't be seen then this can be easily accomplished by using an alpha mask. Alpha masks, maps, shaders and other materials & texture related issues will be covered in depth in the next edition of this series of tutorials.

Once you feel satisfied with the general size and positioning of the iris image map on the object, you should then do the following:

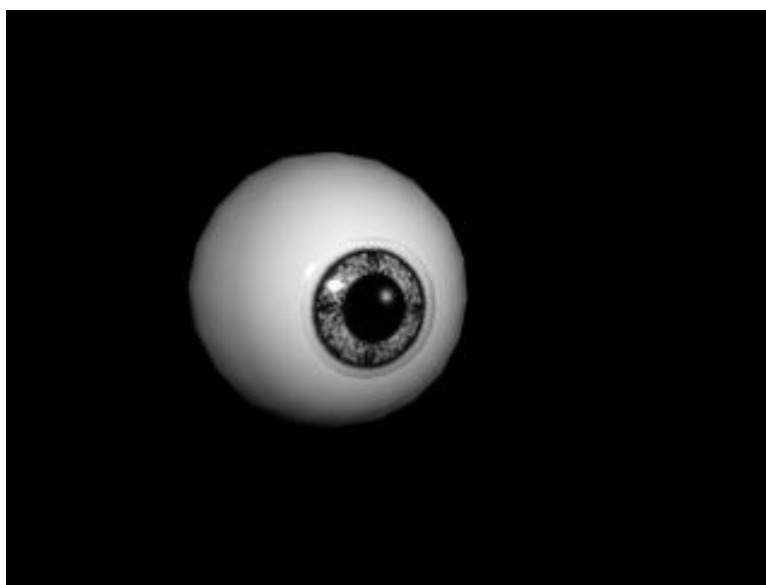
- Go to MAX's display tab and locate the hide section, then press the Unhide by Name... button.
- Select the following: right cornea surface & and right eyeball surface and press unhide, these objects will become visible.
- Make the Camera01 viewport active (just click it with the mouse) and then perform a Quick Render (production). Once done, your monitor should resemble the following screenshot.



*This Camera01 screenshot shows the result of having now made the eyeball and cornea surface visible. The iris is now showing through the hole in the front of the eyeball surface. The glass like cornea surface is also in front of the iris surface and as you can see the edges of the iris image map can no longer be seen.*

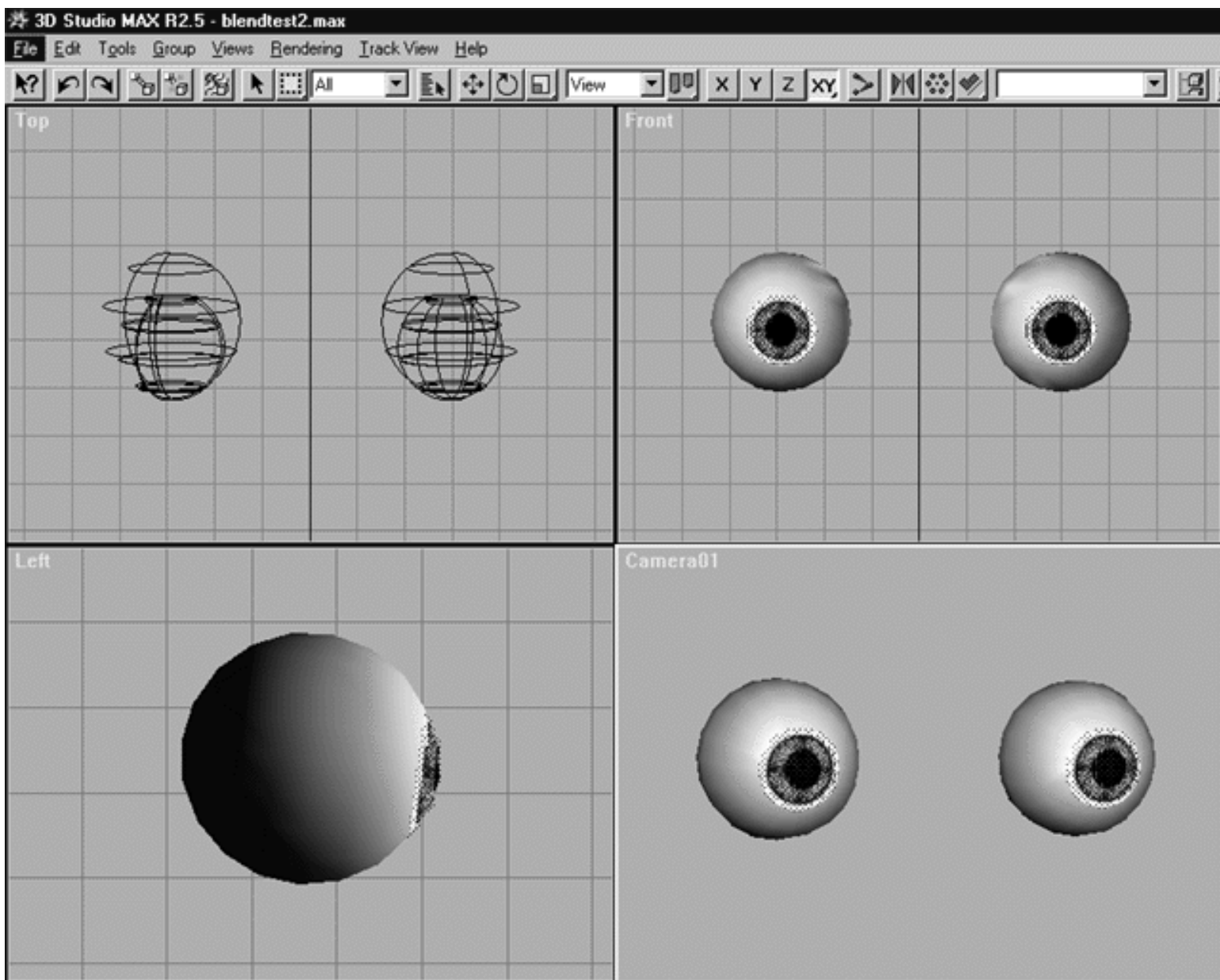
It is a good idea to also perform quick renders of the front and left viewports as well. Check that all the constituent elements of the eye are placed correctly and that the scale and proportion of everything seems spot on. It's quite likely that you will need to adjust the iris map yet again in respect to the maps scale and position.

*\*Top Tip--In the materials editor, locate the slot containing the glass material that has been applied to the cornea surfaces. Locate the Extended Parameters roll out and find the section entitled: Opacity. Once done, check the "Type:" radio button has been set to additive. This will brighten the surfaces behind the cornea and in produce an iris surface that looks much brighter as in the following screenshot:*



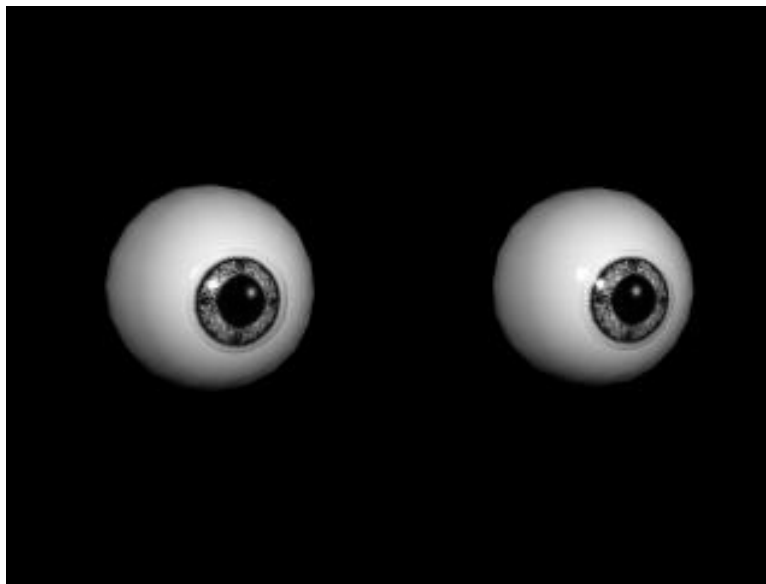
*This Camera01 screenshot shows the result of having now set the glass material's opacity type to additive, notice how much brighter the iris surface is compared with the previous screenshot.*

When at last you feel satisfied with the look of the eyeball, save your work and then repeat the entire mapping procedure for the eyeball on the opposite side of the head. Once you've finished your monitor should resemble the screenshot below:



*This All Viewport screenshot show the result of having now applied image maps to both iris surfaces. The constituent elements of both eyeballs (i.e., eyeball surface, cornea surface and iris surface) are clearly visible. The eyeballs are now complete.*

When rendered, you monitor should resemble the following screenshot:



*This screenshot shows a quick render of the Camera01 viewport -- the completed eyeballs.*

Don't forget to save your scene and make a back up copy of your file -- you've done a lot of work so far, protect it!

---

## Your Assignment Is...

With the eyeballs out of the way we can now concentrate on sorting out and assigning materials to the remaining objects in the scene. However, before we go much further you may wish to consider frame selecting both eyeballs and creating a selection group. MAX has some very nice selection capabilities that can make life much easier, so why not take advantage of it. To create a selection group just do the following:

- In the Top Viewport with MAX in selection mode, drag a frame around all the objects in the scene -- they will highlight.
- From the Group menu choose Group, the Group dialogue will appear.
- In the field entitled: "Group name:" type something like Both Eyeballs and then press OK.
- Once a group has been created, it would be a very good idea to freeze the group so that none of the objects are unintentionally disturbed. To do this, go to the Display tab and locate the section entitled: Freeze. Once done, with the group currently selected press the button entitled: Freeze Selected. Notice that both objects will turn a dark grey colour in the viewports, don't worry this is normal and only indicates that the objects have been frozen. Despite the appearance of the objects in the viewport you can rest assured that they will render correctly.

Now let's turn our attention to the next object on our list -- the eyelid surfaces.

- Return to the Display tab and locate the section entitled: Hide. Once done, press the Unhide by Name... button. In the Unhide Objects dialogue box highlight the left & right eyelid surfaces and press the Unhide button.

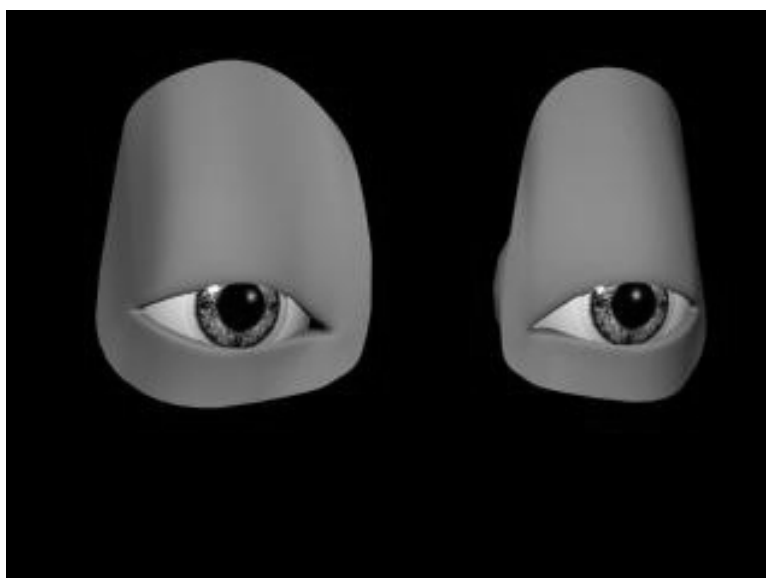
- Look at your shaded viewports, are both of the objects now visible? In my case, I can see one of the surfaces in the shaded view (but it looks kind of dark) however the other eyelid surface does not show up. This would be an excellent time to perform a quick render, let's do that now...



*This screenshot of the Camera01 viewport shows that although both eyelid surfaces have been unhidden only one of them seems to be rendering ( not correctly).*


By now you should know exactly what the root of the problem is -- that's right, you guessed it -- abnormal normals!

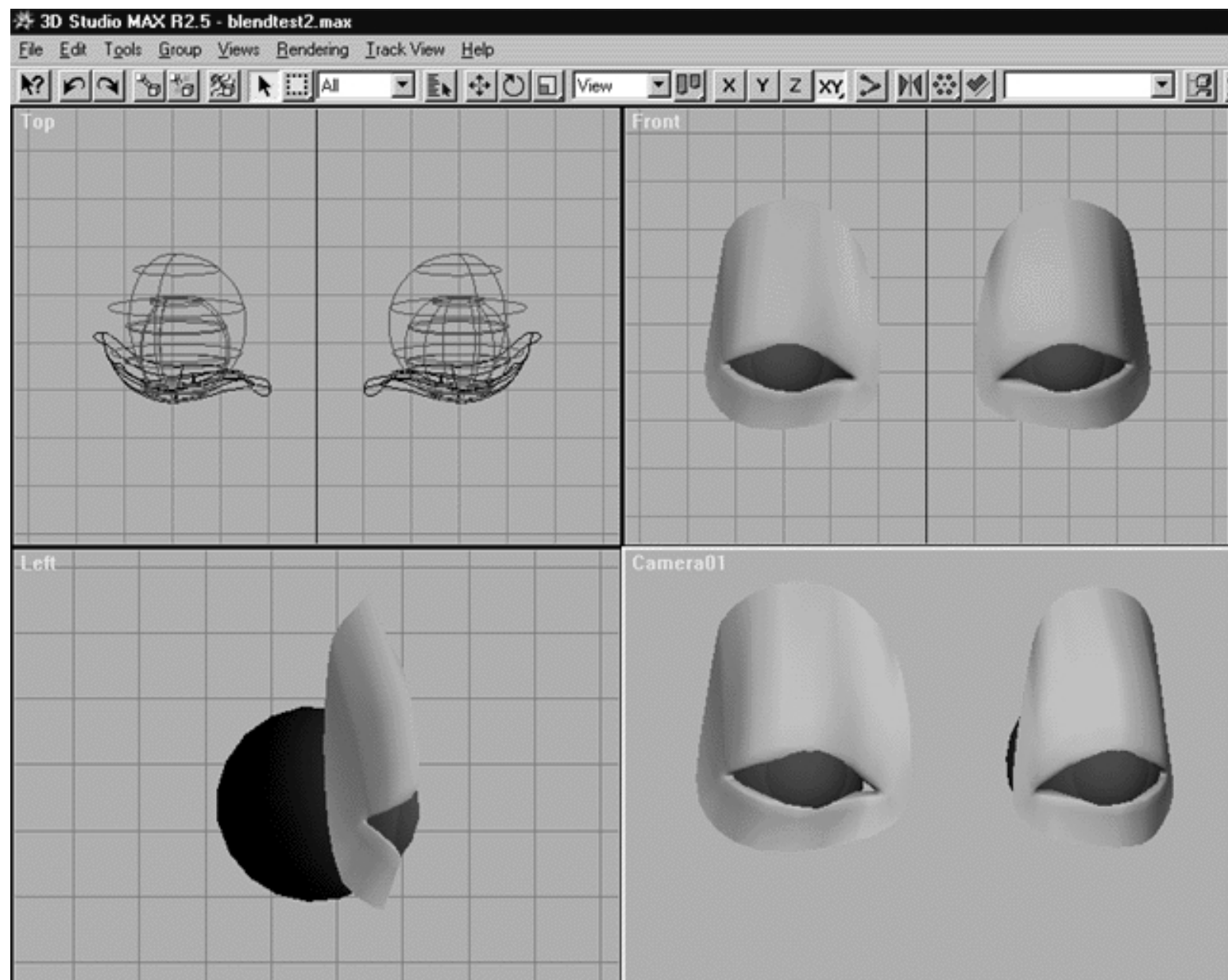
- With MAX in object selection mode, in the Top Viewport select the wireframe of the non-rendering eyelid surface object -- it will highlight.
- Flip the normals using the same procedure as outlined earlier in this lesson -- if you don't remember how to do it, to review -- [click here](#).
- When finished your monitor should resemble the following screenshot:



*This screenshot of the Camera01 viewport shows the result of now having flipped the normals, both eyelid surfaces are now visible. \*Note --I've also assigned a temporary material to the eyelid surfaces for purposes of this example only.*

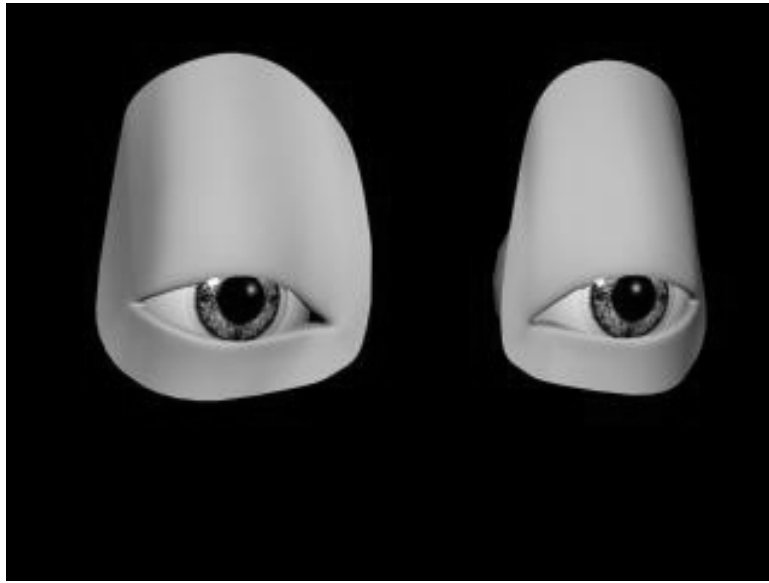
With both eyelid surfaces now visible, we can now assign a more realistic skin like material to them.

- Open the Materials Editor and click the 1st slot to make it active the material name should be listed as: Human Skin (basic).
- With MAX in the selection mode, in any viewport click on one of the eyelid surfaces to select it -- it will highlight.
- Again, return to the materials editor and select the Assign Material to Selection icon  -- the object will turn skin colour in the shaded viewport.
- Once done, repeat the procedure with the other eyelid surface. When you have finished your monitor should resemble the following screenshot:



*This All Viewport screenshot shows the result of assigning the Human Skin (basic) material to both eyelid surfaces.*

Let's do a quick render to see if everything looks alright...



*This screenshot shows a quick render of the Camera01 viewport -- the skin material has been successfully applied to the eyelid surfaces.*

Now let's move on to some of the other objects...

- Go to MAX's display tab and unhide the head surface. Once done, freeze the head surface.
- Next, select both eyelid surfaces -- If you fancy, now would be a great time to make them a group. Once done, freeze the eyelid surfaces so that they are not accidentally disturbed.

Next, allow me to perform a quick render -- let's see what we have now...




*This screenshot shows a quick render of the Camera01 Viewport. As you can see, the head and the eyelid surfaces have had the same skin material applied to them and the components can now be seen in place.*

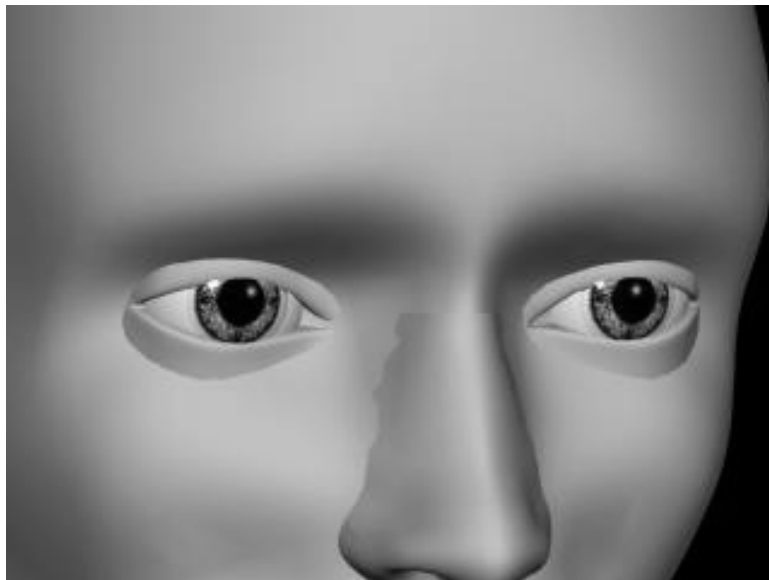


Next up, let's make the nose surface visible...

- Go to MAX's display tab and unhide the nose surface. Once done, freeze the nose surface.

Now we need to assign the skin material to the nose surface...

- With MAX in the selection mode, in any viewport click on the nose surface to select it -- it will highlight.
- Open the Materials Editor and click the 1st slot to make it active the material name should be listed as: Human Skin (basic).
- Select the Assign Material to Selection icon  -- the object will turn skin colour in the shaded viewport.
- Perform a quick render of the Camera01 Viewport -- your monitor should resemble the following screenshot:



*This screenshot shows a quick render of the Camera01 Viewport, the nose surface is now visible.*

- Lastly, with MAX in the selection mode, in any view select the nose surface. Then, go to the display tab and freeze the nose surface.
- Save the scene.

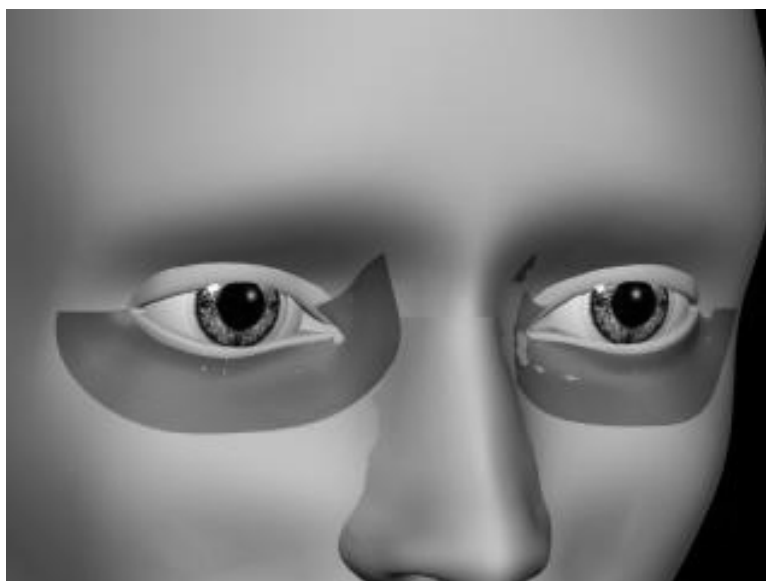
---

## Smoke and Mirrors

Now at long last we can complete the magic of this illusion with the help of transparency / opacity mapping on the eyelid and nose blends.

- Go to MAX's display tab and unhide the both eyelid blending surfaces.

- Perform a quick render of the Camera01 viewport, your results should look something like the following screenshot:



*This screenshot shows a quick render of the Camera01 Viewport, both eyelid blending surfaces are now visible.*

Upon careful inspection of the eyelid blending surfaces you may notice areas where bits of the underlying head or eyelid surfaces is popping through. This is quite normal and to be expected. To cure this, we will need to move the eyelid blending surfaces just a hair above that of the head surface. The eyelid blending surfaces should never be in contact with the head or eyelid surfaces, rather, just hovering ever so slightly above.

Since it would be impossible to move the surface such a small amount by hand, we will use MAX's Transform Type-In tool to move the surface by very precise amounts.

- In the Top View place MAX into the object selection mode and then pick the right eyelid blending surface with your mouse -- it will highlight.
- Next, put MAX into the Select and Move mode.
- Then from the Tools menu choose Transform Type In... the Move Transform Type-In dialogue box will open.
- Locate the section entitled: Absolute: World and in the Y: field type -0.5 and press Enter -- you should notice the eyelid blending surface lift away from the head surface, just a bit.
- Once done, repeat the procedure on the opposite eyelid blending surface.
- Save the scene.
- When you've finished perform a quick render of the Camera01 viewport, your monitor should look something like this...




*This screenshot shows a quick render of the Camera01 Viewport. Observe that none of the underlying head or eyelid surfaces now seem to be poking through the blend -- jolly good!*

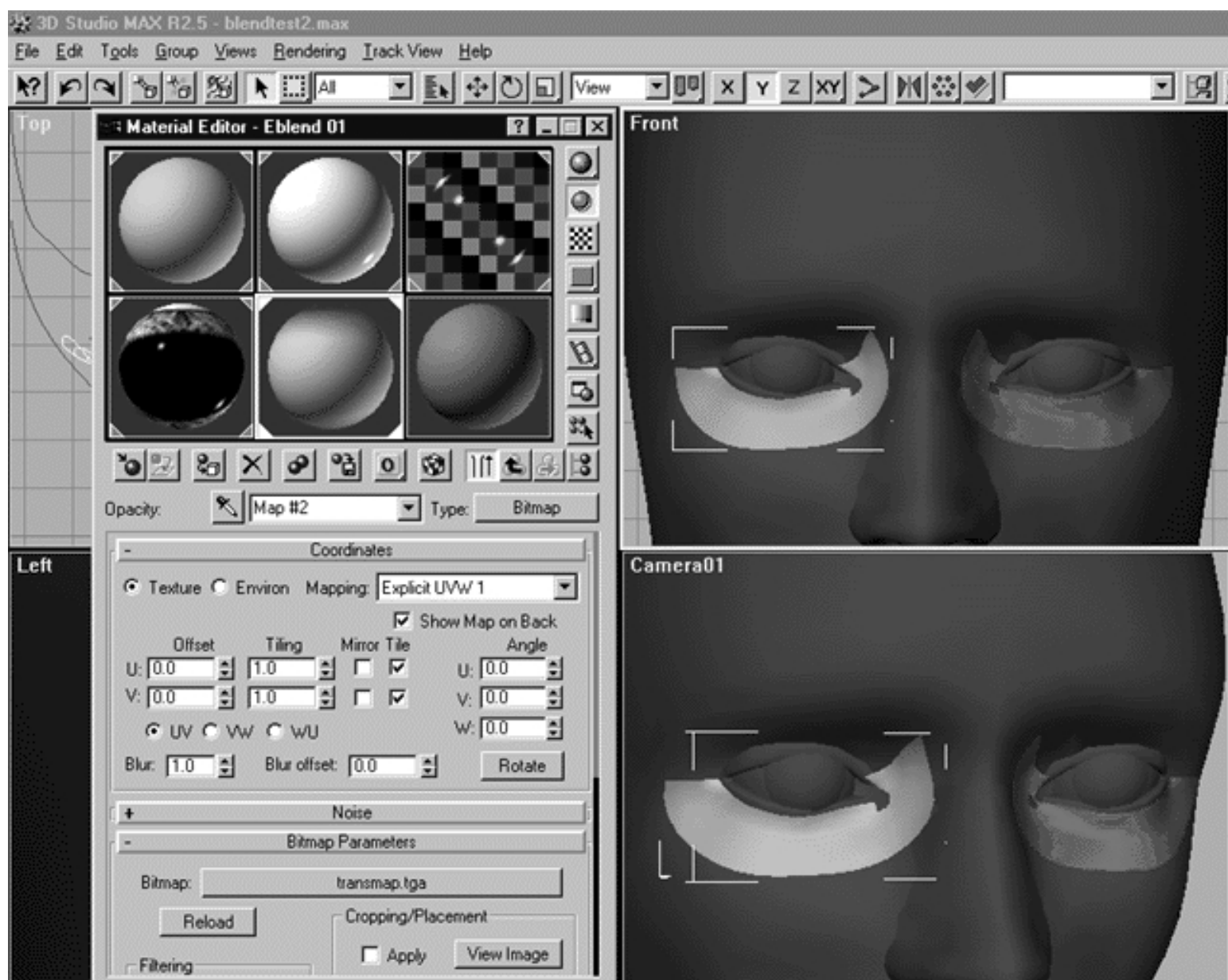
Now we need to create a special material shader specifically for the eyelid blends, let's do that now...

- Open the Materials Editor and click on the 1st slot to make it active -- the material name should be listed as: Human Skin (basic).
- Now copy the material from the 1st slot to the 8th slot. To do this, click on the material in the 1st slot, then whilst continuing to hold down the mouse key drag the material into the 8th slot and then release the key. The copied material will now appear in the 8th slot.
- Next we've got to make some special changes to the material. Scroll downward in the materials editor until you've located the section entitled: Maps. When you've done so put a tick mark in the small box alongside of the field entitled: Opacity -- this will enable it. Next locate the opacity map slot (it's to the far right of the box you've just ticked and is labelled: None) and click on it.
- The Material/Map Browser dialogue box will open. In the section entitled: "Browse From:" the "New" radio button should be enabled.
- From the list, highlight "Bitmap" and then press OK to complete the operation.
- You will be automatically returned to the Materials Editor. Locate the section entitled: Bitmap Parameters, just below it you should see the Bitmap slot (it says "Bitmap:" and has a rectangular box along side it) click on the box with your mouse.
- The Select Bitmap Image File dialogue box will appear, locate the image file entitled: **transmap.tga**


*\* Note -- We've created this image map for you and it is included on the Supermodels CD-ROM, look for it in the maxmap folder.*

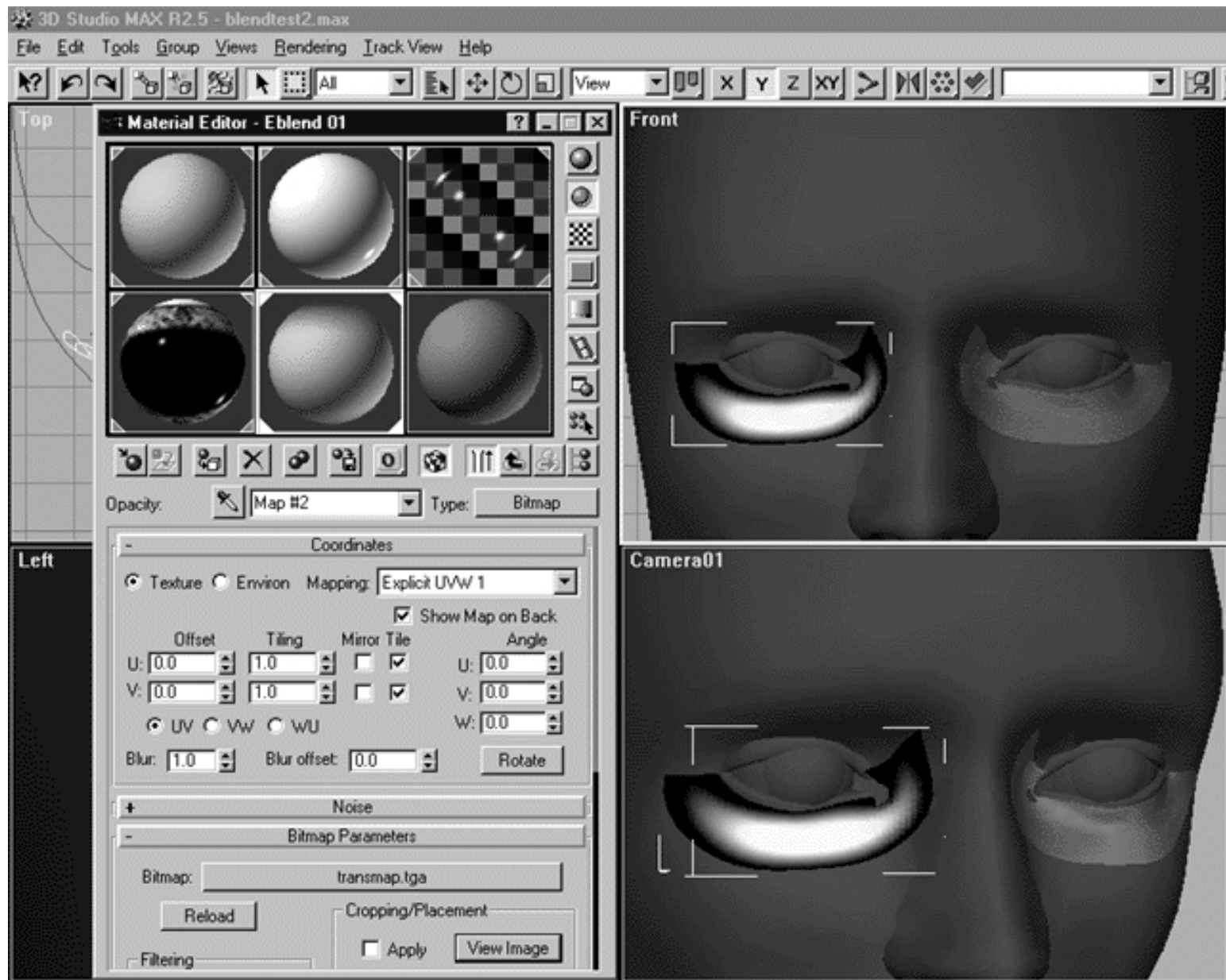
- Click on the Go to Parent icon in the Materials Editor.

- Click on the 8th slot (just to be sure it's active). Next rename the material, change it from Human Skin (basic) to **Eblend 01**. To do this just look for the field containing the material's name, highlight the old name and then type in a the new one (i.e. Eblend 01) and press Enter to commit the change.
- Next, in the Materials Editor locate the section entitled: Basic Parameters and locate the field entitled: Opacity. Just to the right side of the value spinner you should notice a little square box with a "M" on it -- click on the M.
- Make sure that the right eyelid blend surface is currently selected, if it is not then select it now -- it should be highlighted.
- Return to the Materials Editor and select the Assign Material to Selection icon  by clicking on it. When you've done so, the eyelid blend surface should turn a skin like colour in the shaded viewport.
- Your monitor should now resemble the following screenshot:



*This screenshot shows the result of having assigned the new Eblend 01 material to the right eyelid blending surface.*

- Return to the Materials Editor and select the Show Map in Viewport icon  by clicking on it.
- You should notice a change in your shaded viewport, the eyeblend surface will have turned black at the edges with a white streak down the centre.
- Your viewport should now look something like this...



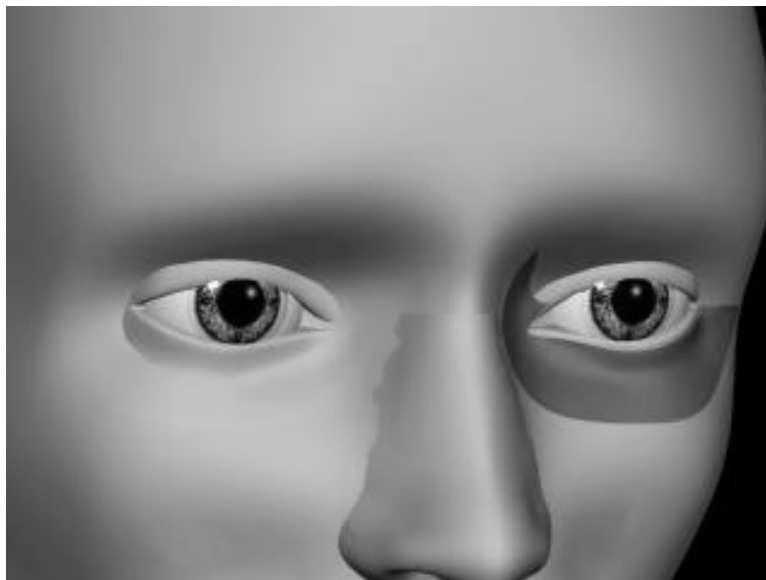
*This screenshot shows the result of pressing the Show Maps in Viewport icon located within the Materials Editor.*

Just about now your eyelid blending surface will look like the back of a skunk in the shaded viewport, but what is that supposed to mean? Well, what this visual cue is telling you is that everything in pure white is solid or opaque whereas everything in pure black is transparent. In other words, the opacity of the skin material applied to the eyelid blending surface is now being determined by the **transmap.tga** bitmap image.

Let's do a quick shaded render of the Camera01 viewport to get a better idea of what is going on...

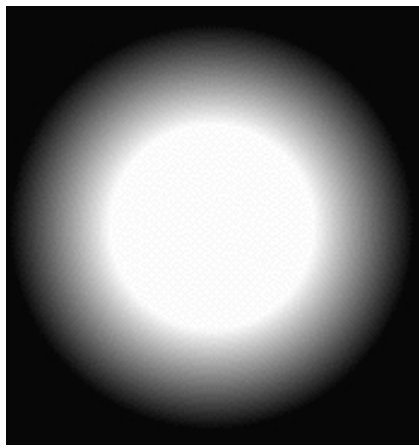


**Before:** This screenshot shows the area prior to the blending surface being applied -- notice the hard edge on the lower eyelid between it and the head surface.



**After:** This screenshot shows the area after the blending surface has been applied to the right eyelid -- notice how much softer the edge on the lower eyelid between it and the head surface has now become. Obviously, it still is not perfect and requires a bit more work but the difference is clear to see.

To better understand how we can further improve the blend we first need to take a look at how this effect is actually being created in the first place, to do that we need to have at the **transmap.tga** image.



*This screenshot shows the transmap.tga image file*

## How it works:

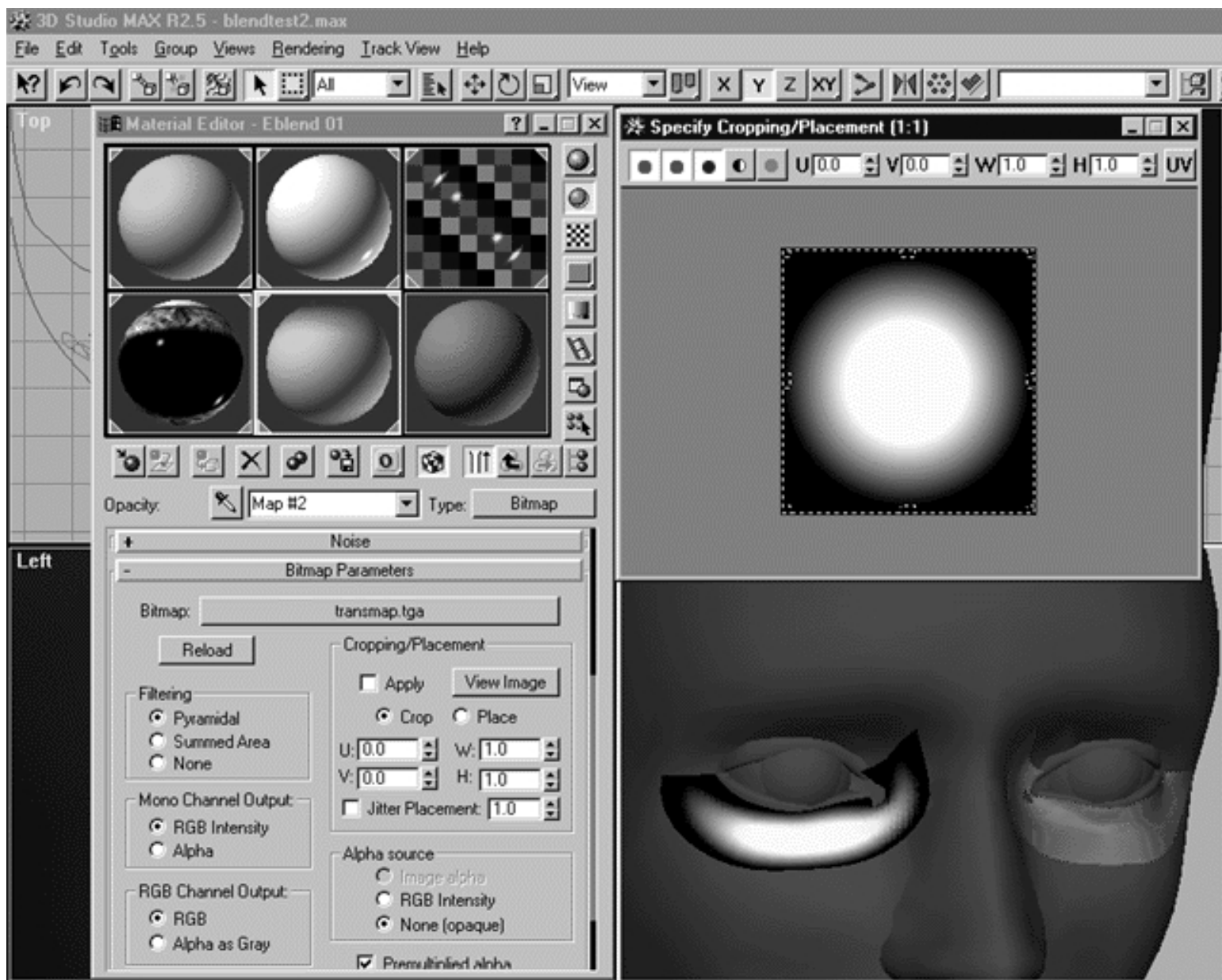
When we said earlier on in this tutorial that we will create blends for our model by means of ramped transparency / opacity maps this is essentially what we were referring to. A ramped image map simply contains a gradient of some description, in this case radial but many often linear. This type of map can be easily produced within a good photo editing application such as Adobe Photoshop. The tonality of the image varies from that of pure white in the centre to black at the edges. The image need not be large in order to be effective, what is most important is the quality gradient itself. When producing maps of this type some experimentation is called for, you'll need to try number of gradients with different rates of falloff until you hit on the one that seems to work best for you.

The reason this effect works is because MAX interprets varying tonality within this map (i.e., light to dark) and then applies it to the material selection in question. So MAX reads this ramped image and says to itself, "Okay, everything in the middle of the object should be opaque but as we move toward the edges the material should become increasingly transparent". MAX bases the location of this transparency on the UV mapping values applied to the object, so it is possible to alter the location of this transparency effect on the object itself (within reason).

Right then, now that you understand that the location of the effect can be changed we can set about improving the quality of the blend yet further.

- Return to the Materials Editor and locate the section entitled: Bitmap Parameters.
- Find the section entitled: Cropping/Placement and press the View Image button the Specify Cropping/Placement window will open.
- Your monitor should resemble the following screenshot:





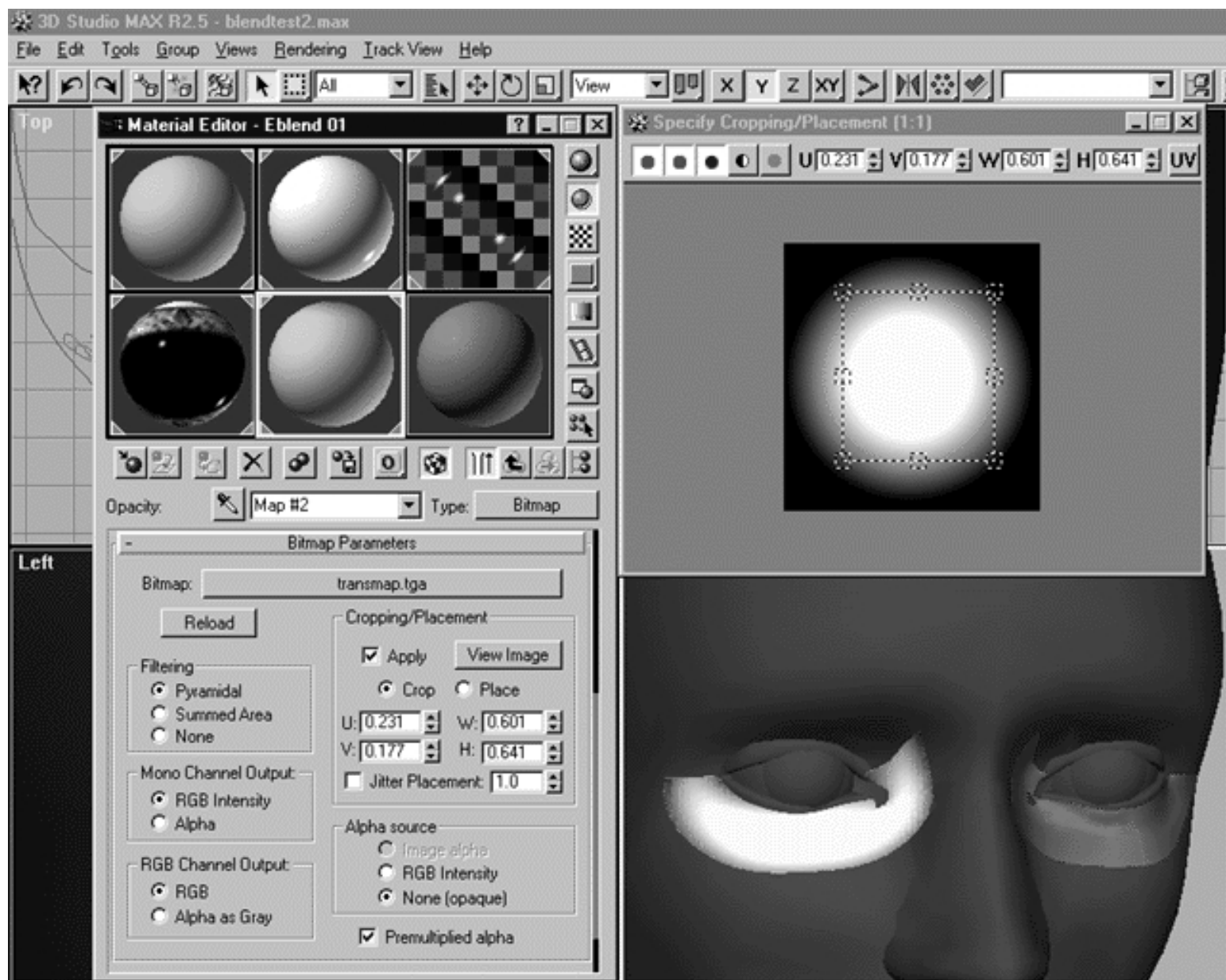
*This screenshot shows the following: The Materials Editor (notice cropping/placement section), The Specify Cropping/Placement window and the shaded Camera01 viewport.*

Right then, looking at the shaded viewport it's obvious we need to extend the opaque areas of the image outward toward the edges of the blending surface. As things stand, the transparency at the edges is far too wide and is allowing us to see too much of the eyelid surface below. But how can we alter this without creating a new map?

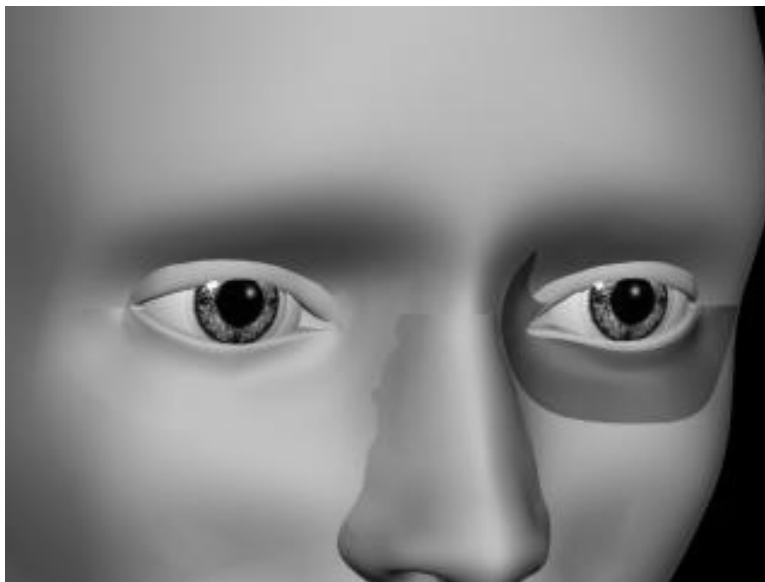
Changes such as this are easy to fix in MAX (within reason) and to do so we will use the Specify Cropping/Placement window.

- Return to the Materials Editor, locate the section entitled Cropping Placement and put a tick in the Apply box.
- Now have a look at the Specify Cropping/Placement window you will notice that there is a dashed line surrounding the image with little boxes placed at the top, sides and corners.

- Select one of the boxes at either side by clicking on it with your mouse, then whilst holding down the key move the cursor slowly inward toward the centre of the image and observe the changes in the shaded viewport as you do. You will notice that as you move the cropping controls inward the amount of opacity at the edges will also change. The more inward you move the more opaque the object will become at the edges. Keep in mind that you don't want the object to be totally opaque at the edge, it should be transparent enough to create a blur -- so don't go overboard.
- Repeat the procedure, this time selecting one of the cropping controls at either the top or the bottom.
- When you feel satisfied your monitor should resemble the following screenshot:




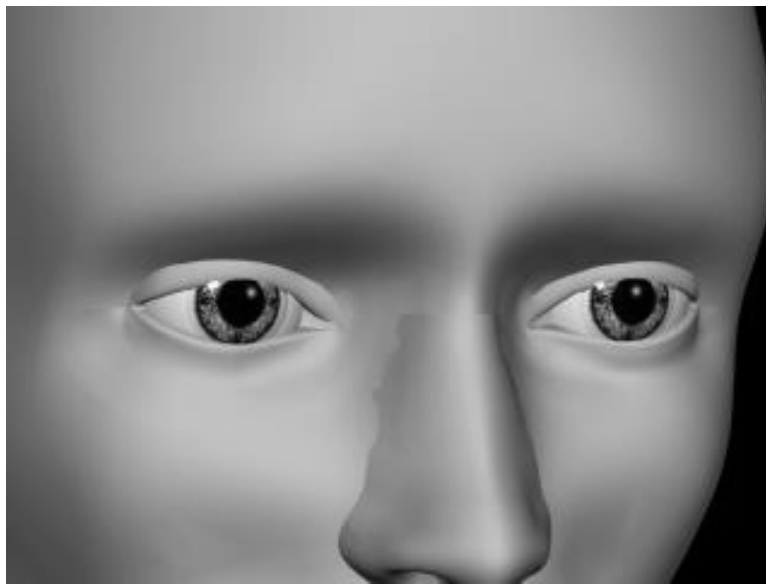
*This screenshot shows that as the cropping control boxes have been moved inward within the Specify Cropping/Placement dialogue box the changes in the amount of opacity / transparency have been telegraphed to the shaded Camera01 viewport. Notice how much less black is now seen at the edges of the surface blending object.*



*This quick render of the Camera01 viewport shows the result of have adjusted the opacity / transparency map, notice how much better the blend is now -- the seam at the intersection of the lower eyelid & head surface has been effectively negated.*

With the opacity / transparency map now correctly applied to the blending surface of the right eye, we can turn our attention to sorting out the left eye's blending surface. Thankfully, this process will be much easier now as you've already done all the hard work.

- Return to the Materials Editor and begin by copying the Eblend 01 material. To do this, select the Eblend 01 material slot and then drag it to an unused slot, in this case slot # 4 -- you've now copied the material.
- We now need to rename the copy of the Eblend 01 material now in the 4th slot to something else, in this case name the copied material: **Eblend 02**. To do this just locate the name field within the materials editor, and type in the new name, once done press Enter to complete the operation.
- We can now apply the Eblend 02 material to the eyelid blending surface of the left eye. To do this, with MAX in select object mode in the Front Viewport carefully select the eyelid blending surface by clicking on it -- it will highlight.
- Return to the Materials Editor, make certain that the Eblend 02 material slot is hot, if not click on it with your mouse. Now with the left eye's blending surface still highlighted select the Assign Material to Selection icon  by clicking on it. When you've done so, the eyelid blend surface should look like the mirror image of the right eye's blending surface in the shaded viewport.
- When you've finished your monitor should resemble the screenshot below.



*This quick render of the Camera01 viewport shows the result of having applied the adjusted the opacity / transparency maps to the eyelid blending surfaces of both eyes.*

So why didn't we just apply the same material to both eyes? The reason we did not choose to use the same material is because of the need to retain independent control over the characteristics of both eyelid blends. In other words, if we had used the same material any changes that we may make to the mapping or material parameters of the blend in future would be telegraphed to the other eyeblend as well, this is not ideal. The need may arise to make further adjustments and you will want to have complete control over placement and all other material related parameters.

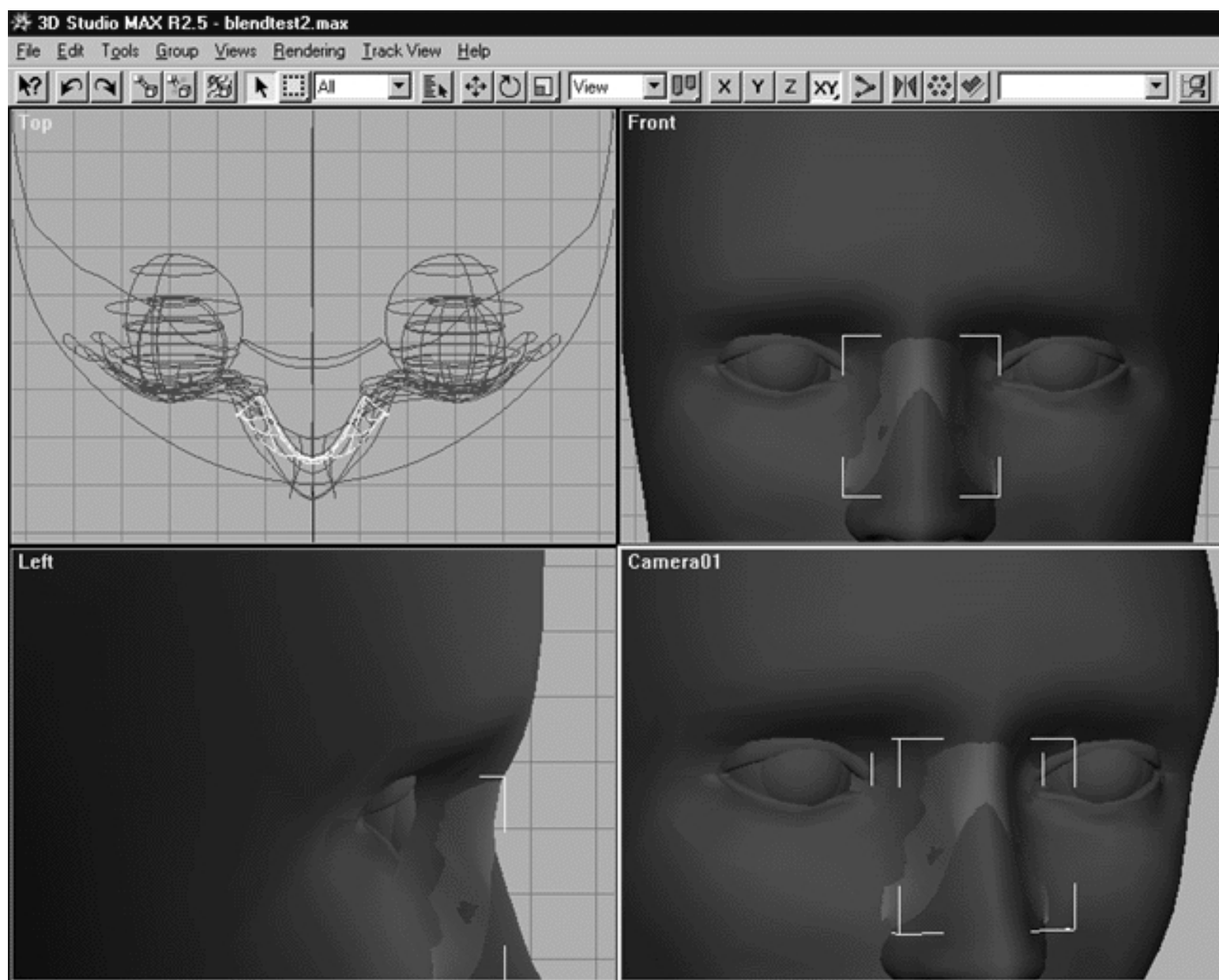
- Perform a quick render and check your work.
- When you feel satisfied with the quality of the blends that you have achieved, carefully select both eyelid blending surfaces and freeze them.
- Lastly, save the scene!

---

## Nose Blending

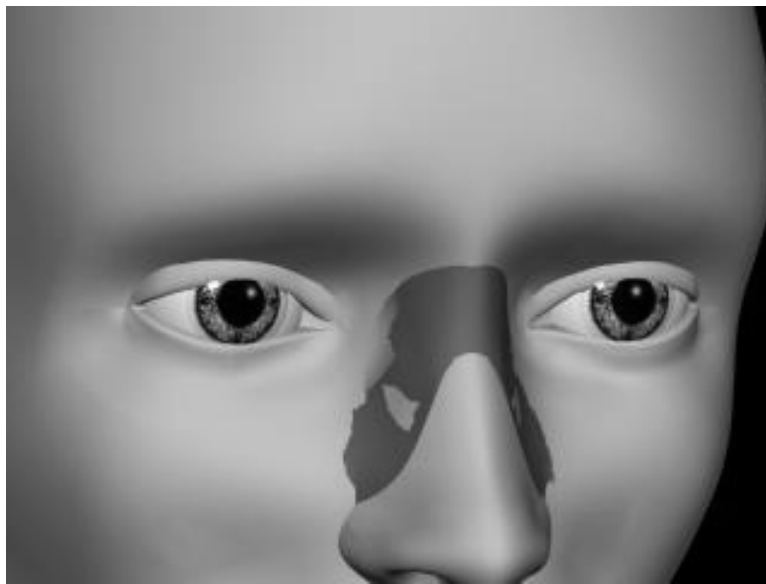
Now that the eye blends have been completed the next step is turn our attention to the nose blending surfaces, let's crack on...

- Go the display tab, locate the section entitled: Hide and then press on the button entitled: Unhide by Name...
- When the Unhide Objects dialogue appears choose Nose Blend Surface from the list and press Unhide. Once done, the nose blending object should become visible within the shaded viewport.
- Your screenshot should roughly resemble the following screenshot:



This screenshot shows that the nose blending surface has now been unhidden and has become visible within the shaded viewport.

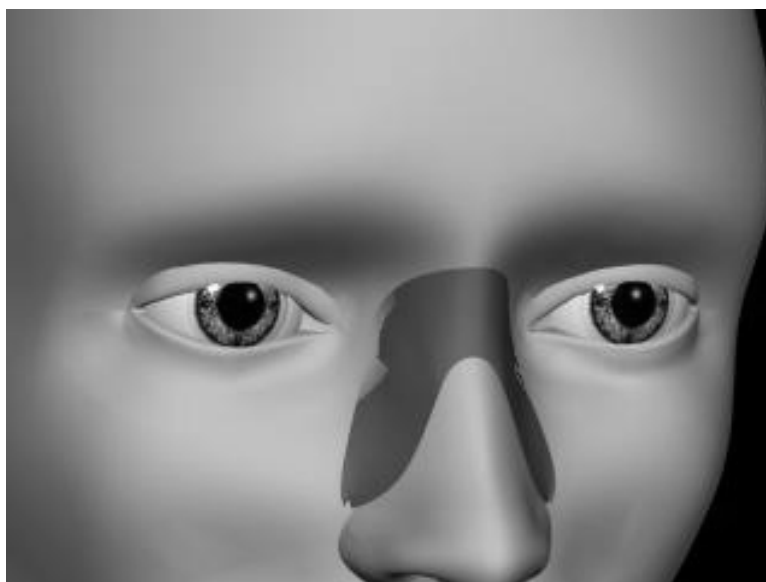
- Next, perform a quick render of the Camera01 viewport and examine the results.
- It is possible that your results may resemble the following screenshot:



*This screenshot shows a quick render of the Camera01 viewport -- notice that bits of the underlying head surface are poking through the nose blend.*


As with the eyeblending surfaces earlier, the nose blending surface will need to be moved away from the face -- slightly.

- With MAX in object selection mode, in the Top Viewport carefully click on the nose blending surface -- it will highlight.
- Next, put MAX into the Select and Move mode.
- Then from the Tools menu choose Transform Type In... the Move Transform Type-In dialogue box will open.
- Locate the section entitled: Absolute: World and in the Y: field type -0.5 and press Enter -- you should notice the nose blending surface lift away from the head surface, just a bit.
- Once done, perform a quick render to check your work -- the image may look something like the following screenshot:

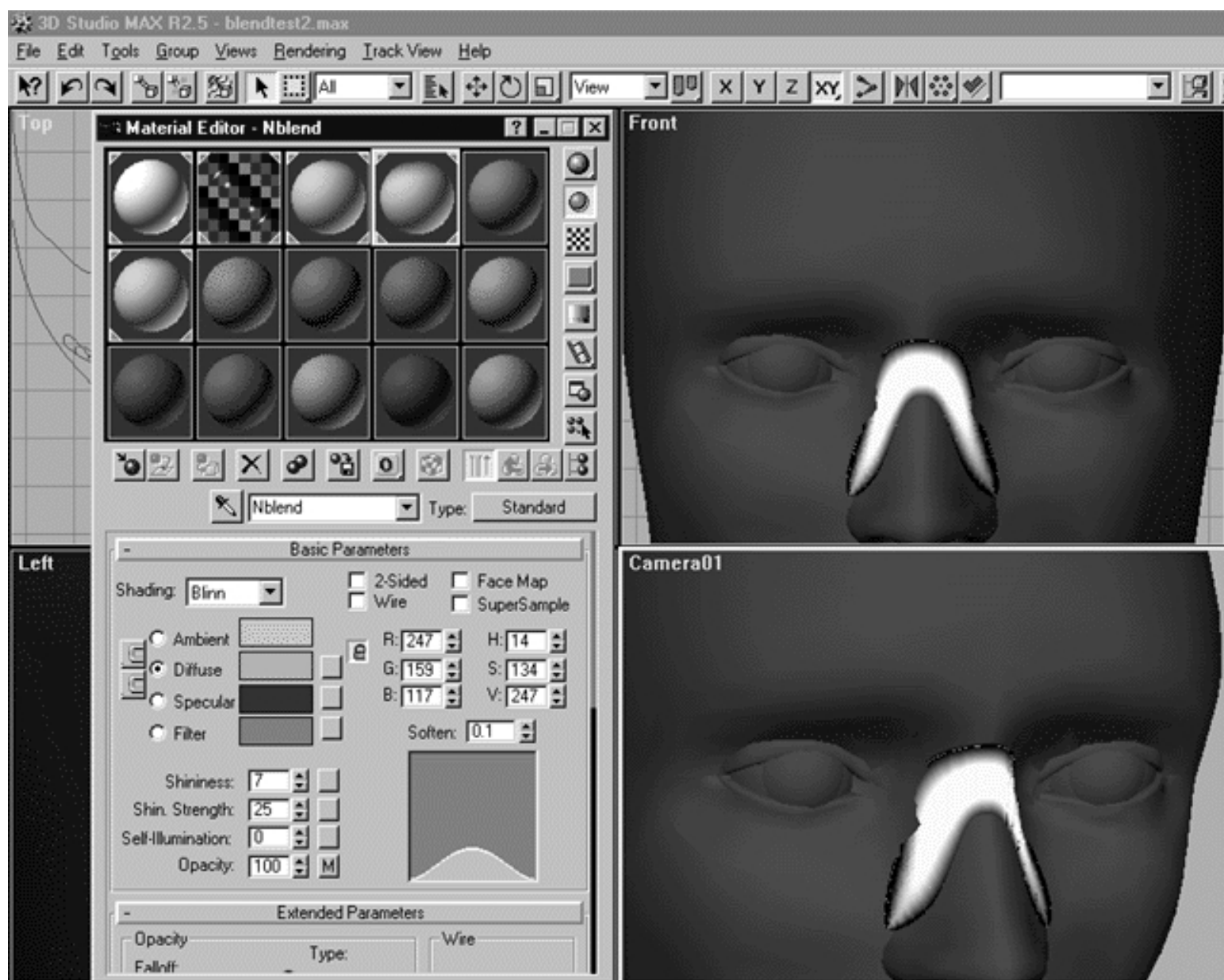


*This screenshot shows a quick render of the Camera01 viewport after having moved the nose blending surface a slight amount away from the head surface using the Transform Type In. Observe that there are no longer large areas of head surface poking through. You will notice that along the edges, especially near the eyeblends some skin areas are showing up. You needn't worry too much about this, it is normal and to be expected. The nose blending surface is just slightly behind that of the eyelid blends and what you are seeing is the nose blend surface showing through the semi transparent outer edge of the eye blend. This should not be a problem once we apply a similar transparency / opacity map to the nose blend. Remember, you can always fine tune the surface within MAX later if you wish and many options remain available.*

We now need to apply custom material to the nose blend -- again this is easy!

- Open the Materials Editor and locate the Eblend 02 material once done click on the slot to make it hot.
- Next, copy the material by dragging it to an empty slot, in this case Slot #5
- We now need to rename the copy of the Eblend 02 material now in the 5th slot to something else, in this case name the copied material: **Nblend**. To do this just locate the name field within the materials editor, and type in the new name, once done press Enter to complete the operation.
- Now apply the Nblend material to the nose blending surface. To do this, place MAX in select object mode and in the Front Viewport carefully select the nose blending surface by clicking on it -- it will highlight.
- Return to the Materials Editor, make certain that the Nblend material slot is hot, if not click on it with your mouse. Now with the nose blending surface still highlighted select the Assign Material to Selection icon  by clicking on it. When you've done so, the nose blending surface should look similar to the eyelid blending surface earlier. In other words, the surface should be white in the centre and black at the edges.
- Your monitor should now resemble the following screenshot:

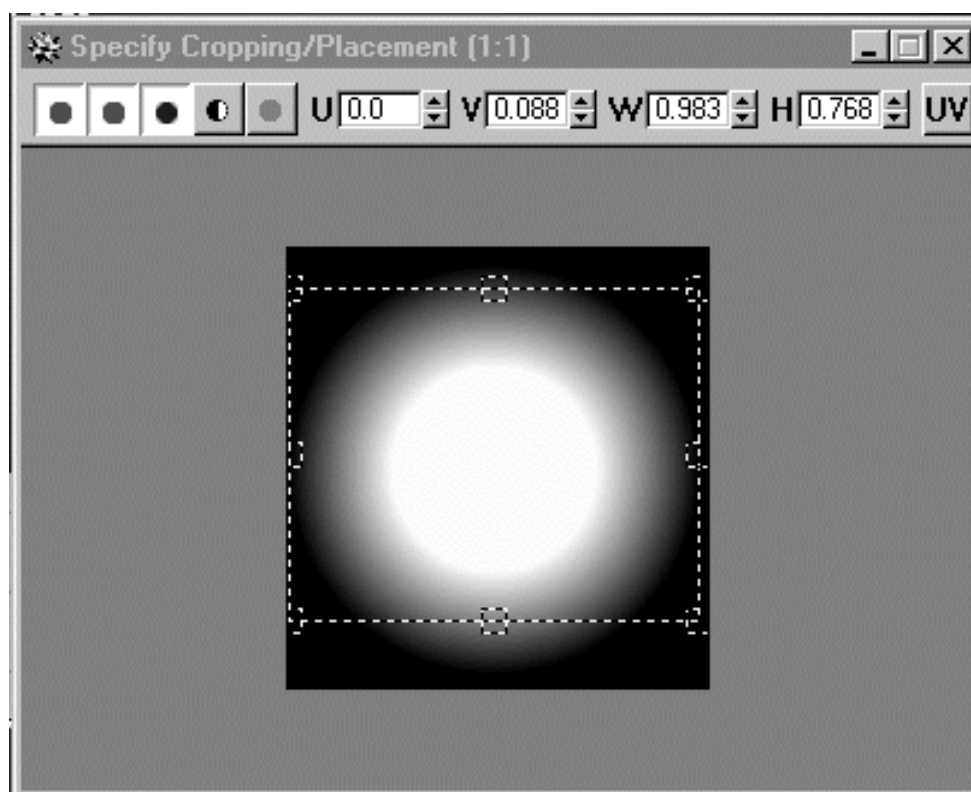




*The above screenshot shows the result of applying the Nblend material to the nose blending surface.*

Of course, the opacity mapping placement and cropping will need to be adjusted to suit this particular blending surface, this is because this material is a copy of the material originally used on the eyeblends.

- In the Materials Editor locate the section entitled: Basic Parameters and locate the field entitled: Opacity. Just to the right side of the value spinner you should notice a little square box with a "M" on it -- click on the M.
- Find the section entitled: Cropping/Placement and press the View Image button the Specify Cropping/Placement window will open.
- Adjust the cropping control handles watching the result in the shaded viewport as you do. The following screenshot is an example of how I've cropped the image map, of course your results may vary:



*This screenshot shows the adjustments that I've made to the cropping the opacity image map.*

\*Tip -- Another very useful adjustment to be aware of can be found in the Coordinates section of the Materials Editor. Locate the fields entitled: Offset, here you should see two value spinners one for the U direction and the other for V. By altering the values in these boxes you can change the overall placement of the image map on the surface of the object (within reason). Don't take my word for it, try it yourself. Try to increment the U direction spinner by clicking on the up arrow key and watch the shaded view as you do so. You'll notice that the map seems to move downward a bit, thus creating more of a transparent surface along the upper edge of the blend.

- If you've not done so already close the Specify Cropping/Placement window.
- In the Materials Editor, Set the U direction Offset spinner to a value of: 0.04
- Once done, do a quick render of the Camera01 viewport to check the results as in the following screenshot.



*This screenshot show the result of applying the custom material & image map to the nose blending surface. The nose has now been successfully blended into the head surface!*

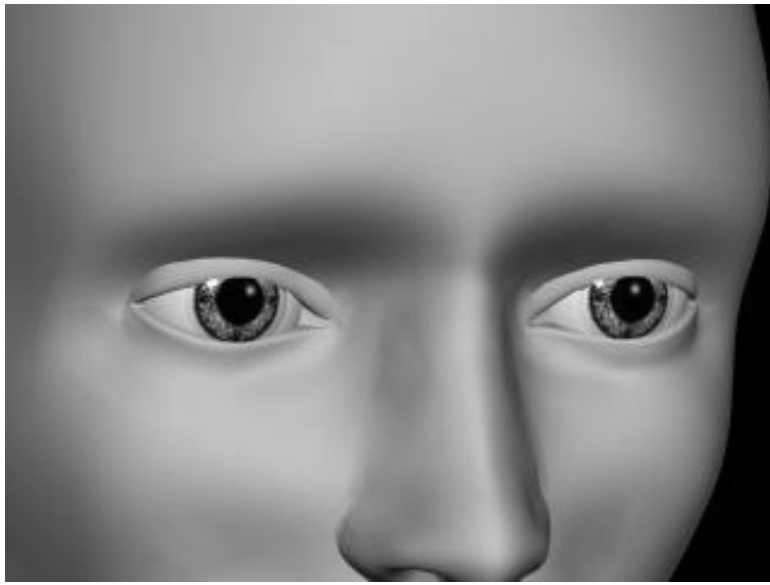
- If you feel it necessary, continue to tweak the transparency / opacity maps until you feel satisfied.
- Once done, in any viewport carefully select the nose blending surface. Next proceed to the Display tab, locate the Freeze section and click on the button entitled: Freeze Selected.
- Lastly, be certain to save the scene.

---

## Shadowy Character

Before we can consider the job of blending complete there are a few minor details to sort out. At the moment the all of the blending surfaces will cast shadows, this is something that we do not want to have happen. To make sure that the blends to not cast any shadows we need to make an easy minor adjustment as follows:

- Temporarily go to the Display tab, locate the Freeze section and click on the button entitled: Unfreeze All.
- Next, with MAX in select object mode, select the right eyelid blending surface by carefully clicking on it in any viewport with the mouse -- it will highlight.
- Then, Right Click the mouse, and from the pop up menu select: Properties.
- Locate the General tab and look for the section entitled: Rendering Control.
- Once done, untick the box entitled: Cast Shadows -- once done, press OK to complete the operation.
- Repeat this procedure with the left eyelid blending surface and the nose blending surface.
- When you've finished, save the file and then do a quick render of the Camera01 viewport. Your results should look something like the following screenshot:

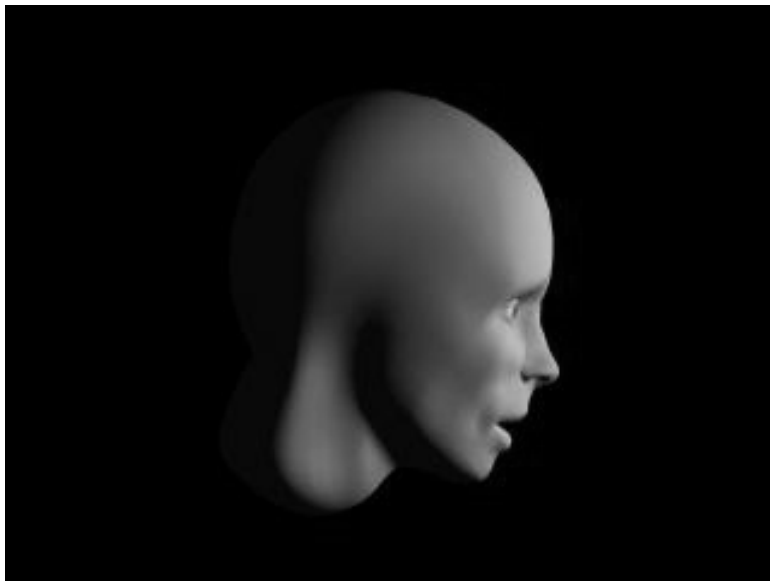


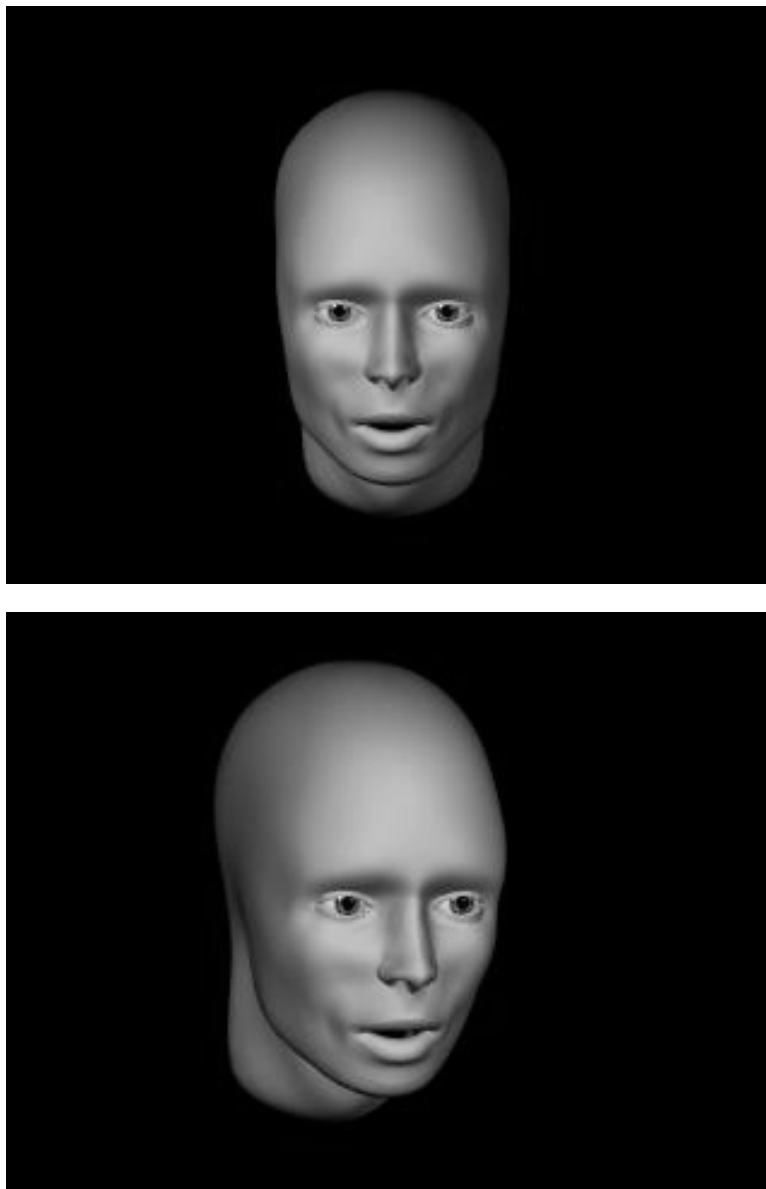
*This screenshot shows the final result. The eyelids and the nose have now been successfully blended into the head surface.*

Congratulations! ..You have now learned how to successfully blend objects using only transparency / opacity material and mapping techniques.

---

## The Result





Keep in mind that you can take things further still, now that blending (the largest hurdle) has been successfully accomplished. At the moment our character "Rhinette" has no eyebrows, eyelashes or make up for that matter and the simple addition of all these things mentioned will vastly improve the overall degree of her realism. Spending your time further refining the lighting setup and the complexity of the skin material shader will also prove invaluable and is well worth the added effort. Once again, these are all areas that we will be investigating in future editions of this tutorial.

---

## It's a Wrap!

Congratulations you have now reached the end of this tutorial, if you've made it this far you should feel very proud of yourself -- you've come a very long way indeed. In this the final chapter, you have learned how to create the illusion of seamless blends using ramped transparency / opacity maps.

Do not underestimate the power of this technique, it is simple yet very effective and has many advantages over the creation of actual geometric blends. Many artists don't give mapping a second thought and in our view might really miss out by doing so. Yes, this is a very basic even elemental technique, however, it is the very simplicity of it that makes it so effective. In terms of the overall possible creative uses for mapping in computer graphics this is only the tip of the iceberg. However, what should be remembered is that because simple mapping such as this is possible in a plethora of software applications, low and high end, ultimately your choices overall are greatly expanded.

In this chapter you've seen how this type of mapping can be done with 3D Studio MAX R2.5 but the same effect could be achieved with Softimage|3D, Lightwave, or nearly any other similar software application.

---

## The Last Word

Having worked your way through this tutorial you've witnessed first hand what a truly important and powerful software application Rhinoceros is. Clearly, it is obvious that Rhino opens up an entire new sphere of creativity to you, where nearly anything you can dream of is possible to visualise -- wow!

This tutorial is only the first step in a long process of learning and we fully expect that you will use the methods and techniques we've shown to go far beyond anything we've done here, so experiment! This is a very exciting time to be involved in computer graphics a time when you can now possess tools on your desktop that can make it possible for what is imagined in the mind to become a reality. Rhinoceros is one such tool and we hope that we've provided you with few ideas to kick start your thinking and use it to its ultimate potential.

We sincerely hope you've enjoyed reading and participating in this tutorial as much as we've enjoyed putting it together. It's taken us a long time to write and compile this document and we thank everyone who waited patiently for it. We think it's been time well spent and we hope you will agree that it has been a worthwhile effort for all concerned.

This is a perpetual training product that will continue to grow and evolve over time and there IS much more to come! It's still early days for Rhinette and we've many secrets still to reveal -- so please stay with us.

In future editions, we will be looking in depth at topics such as texturing and mapping the model. For those of you wanting to take the Rhinette to an even higher level of sophistication, we will also be showing you how to give the current basic model a full beauty makeover!

We thank you for taking the time to read and participate in this tutorial. We sincerely appreciate your custom and the support of our products and we look forward to publishing the next edition.

Meanwhile, if there are any other topics that you'd like to see us cover, ideas that you have or products that you'd like to see us produce then please do let us know about them. To contact us by e-mail, just -- [Click Here](#).

Till next time then,

From everyone on the Cinemagic team -- Happy modelling!

Joseph Richard Saltzman, Managing Director  
Cinemagic Productions Limited  
London, UK

---

RETURN to the Top of page -- [Click Here](#)

Go to the NEXT PAGE

Written by Joseph R. Saltzman.

Co-produced in association with Steven Ståhlberg

©1998-1999 Cinemagic Productions Limited. All Rights Reserved.

Duplication of this document including images and text by any means is expressly forbidden without prior written consent of Cinemagic Productions Limited.

Web Site: <http://www.cmagic.co.uk> Telephone: +44 (0)1753 733 190 Fax: +44 (0)1753 736 619 email: [cmagic@cmagic.co.uk](mailto:cmagic@cmagic.co.uk)