

Basic Modeling in Electric Image Modeler

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Droid Project

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For those new to this series, or myself I ask that you read my [Introduction](#) document so that you get a feeling for who I am and where I am coming from. For those that already read it, lets get started.

Prerequisites:

- A desire to learn
- Electric Image 2.9.2 or greater
- Modeler 1.1+
- About 2-3 hours to kill



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For the first series of articles, I am going to take you through a project from start to finish. This will include modeling, texturing, and then finally some animation. Our first project is to create a worker droid robot. One thing that is vitally important to producing good 3D work is the ability to create a back-story to your scene or characters. If you know something about the scene you are creating, or the character you are drawing, you will find yourself adding details and features that are cohesive and help tell the story. Without a good understanding of who this droid is, you will be making design decision that have no cohesiveness.

In our case, “Max” is a little worker droid that has been in service for many years on a freighter ship. He is definitely older technology, but he is hanging in there. He’s a bit dinged up, and hasn’t been maintained very well. He has 2 fully articulated arms with clamp like hands, and he levitates, so he has no “legs” to speak of. He “sees” via a centrally located camera that can pivot up and down as well as swivel a bit. His body is flanked with two spotlights that help him navigate in the dark halls of the ship.

OK, let's fire up the Modeler and get started!

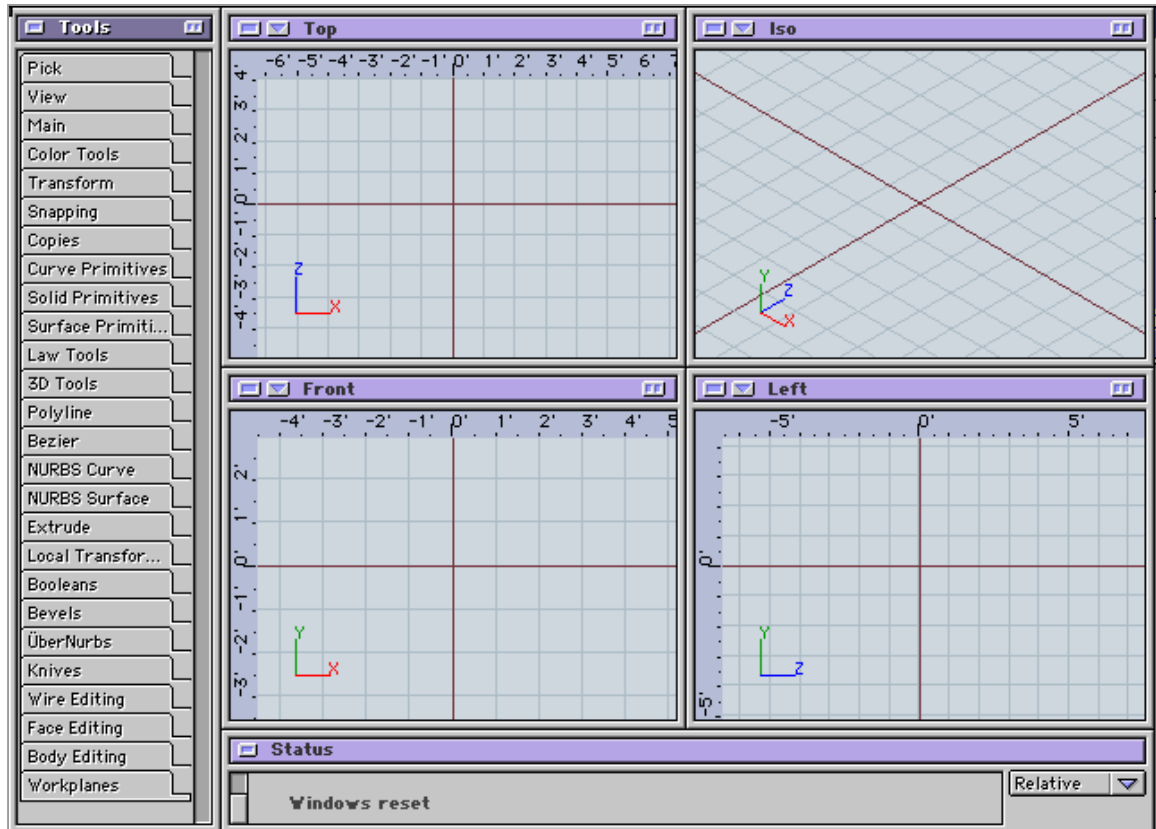
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Project Setup

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Window and document set-up can be very personal, so I leave your screen layout up to you. I will however recommend a few things that I think makes using Modeler a little easier:

- Use **Display As Simple Wireframe**. This speeds up screen re-draws, and usually offers enough detail to get things done. You can always quickly switch to shaded view to see how things are progressing.
- I almost always use grid snapping. Nuff said.
- Learn your keyboard shortcuts. I will try and mention them throughout the text, but you can really move around quickly if you get used to these.
 - **Cmd/Ctrl-P** = Pick Tool
 - **Cmd/Ctrl-M** = Move Tool
 - **Cmd/Ctrl-R** = Rotate Tool
 - **Cmd/Ctrl-Space** = Zoom Tool
 - **X, Y, Z** = Constrain tool to that axis



The object we are creating will be approximately 3 feet in diameter. With that in mind, I have my **Document Preferences** set as illustrated.

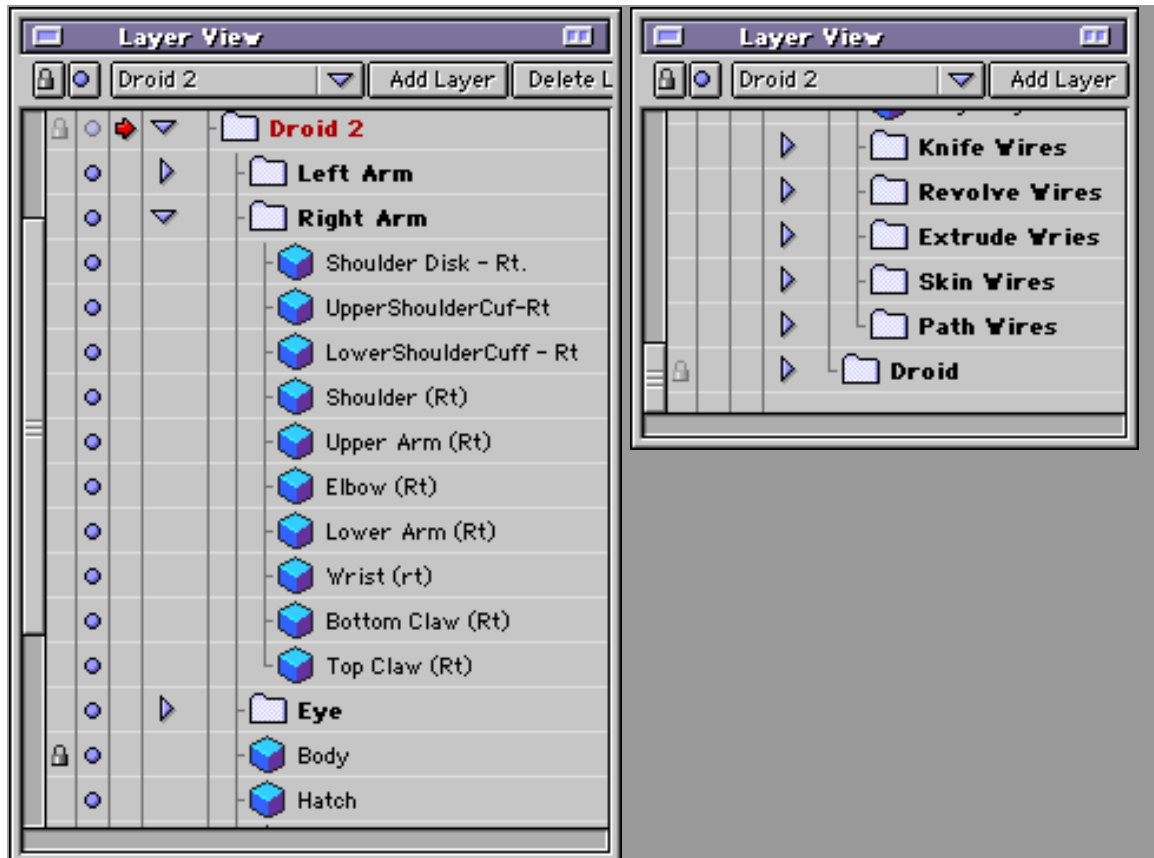
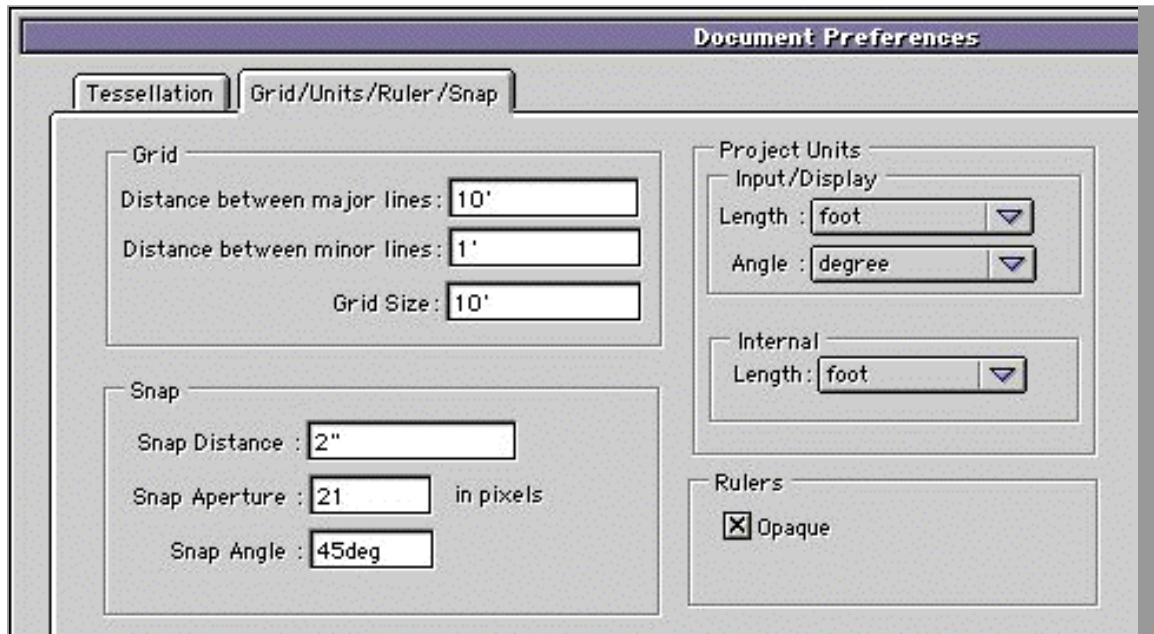
The Tessellation setting is for exporting your model in the polygonal .FACT file format. If you are using Modeler 3.0, you can set-up "per-object" tessellation settings. This is very useful to optimize polygon count while keeping model quality as high as possible. In Modeler 1.0, and the 1.+ that comes with the 3D Toolkit, you only have document level tessellation settings.

This can be a real problem if you have some very small detailed objects along with larger, less detailed ones. You crank up the tessellation to get the detail on the smaller objects, but then your larger less detailed objects get loaded down with a ton of polys that aren't really needed.

OK, I'm only going to say this once. **NAME YOUR OBJECTS!** Ok, I might be saying this more than once. I can't stress how much this will help you down the road when you have 137 extruded objects in your model and you can't figure out which is which.

Also, keep your Project window organized and learn to use layers. As you will notice in the second image, I created separate layers (folders) for all of my construction objects. How you organize these isn't as important as the fact that you save all of those wires, etc. Believe me, you will most likely need to re-generate some objects later in the modeling process, and having those original primitives will save you a ton of work.

The more you work with Modeler, the more comfortable it will feel, and you will develop your own



style.

Well, now that we have some of the basics out of the way, let's get onto the modeling ;-)

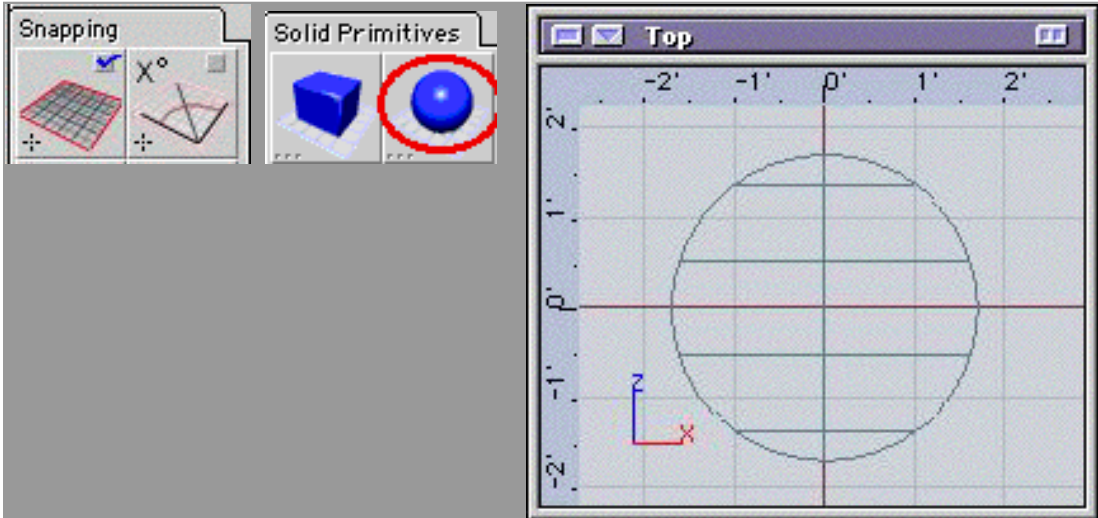
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Basic Body

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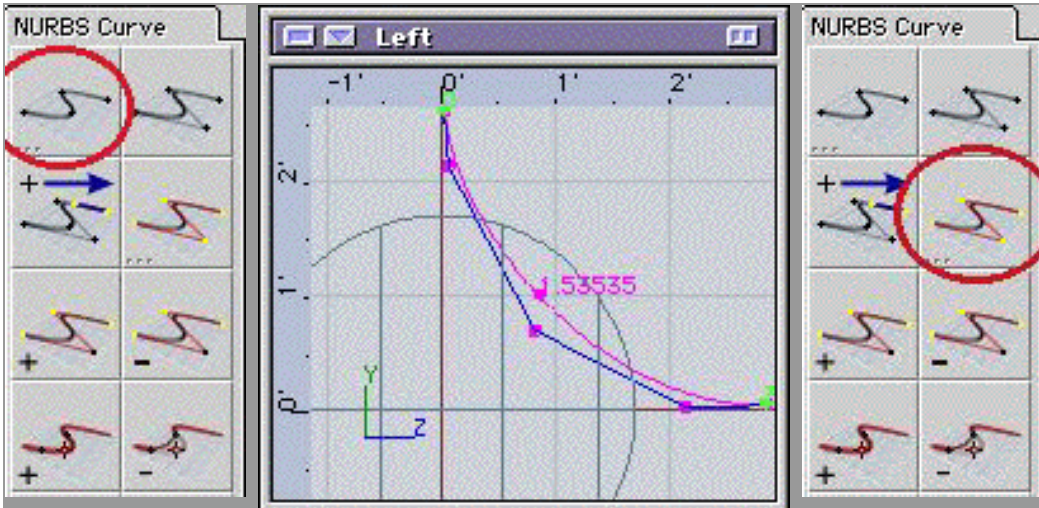
Well, let's get going, we'll start with a basic sphere.

- Make sure **Grid Snapping** is turned on.
- Select the **Sphere** in the **3D Primitives** toolbar
- In the **Top** view, click on the origin (0,0,0) and drag out a sphere approximately 3 feet in diameter.



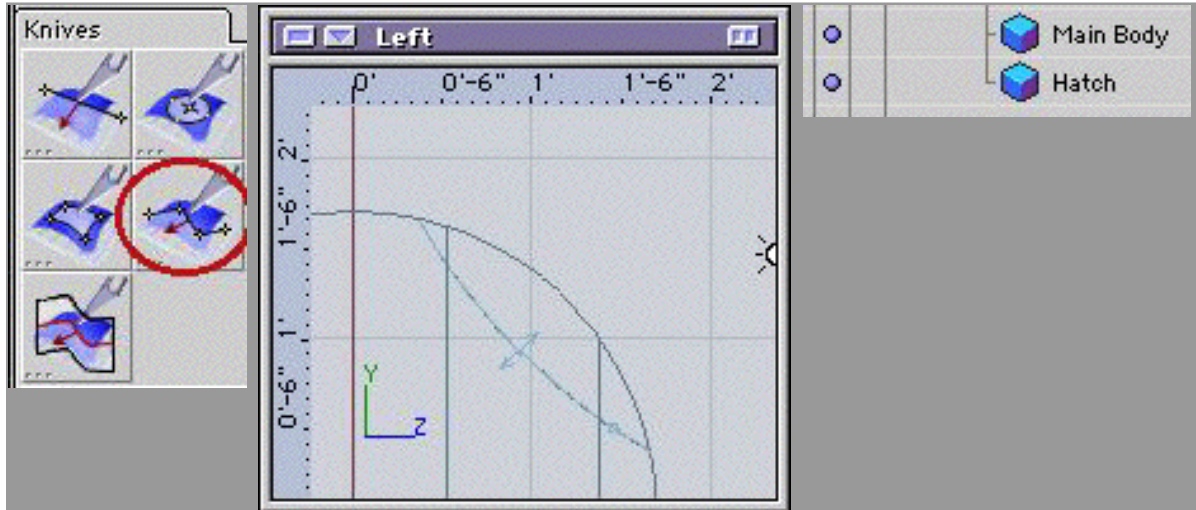
Now, let's add a little access hatch on the back of the droids head.

- Select the **Create New NURBS Curve From Knots** from the **NURBS Curve** palette.
- In the **Left** view, create a curve as shown in the graphic. This was just 5 simple clicks of the mouse.
- Once the basic curve is created, use the **NURB edit tool** to modify the curve and drag knots around till you are happy with



the basic shape.

- Open the **Knives** palette, and select the **Wire Knife** tool.
- Click on the **Body** object, and then the **NURB wire**.
- You should now have two separate objects, the **Body** and the **Hatch**.

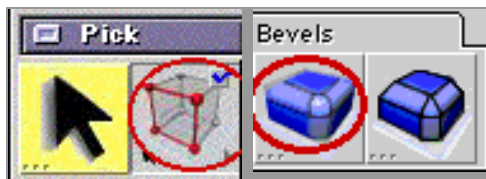


OK, now is where I should preach about properly naming your objects. The problem is that I know many of you won't listen to me, so I'll only say it once. **Manage your object names!!**

Open the **Layers** view (Ctrl/Cmnd-L) , click on the two separate sphere parts, and name them something meaningful to you. I am going to make the base assumption that you will be naming your object after creating them, so I will not expressly ask you to do this.

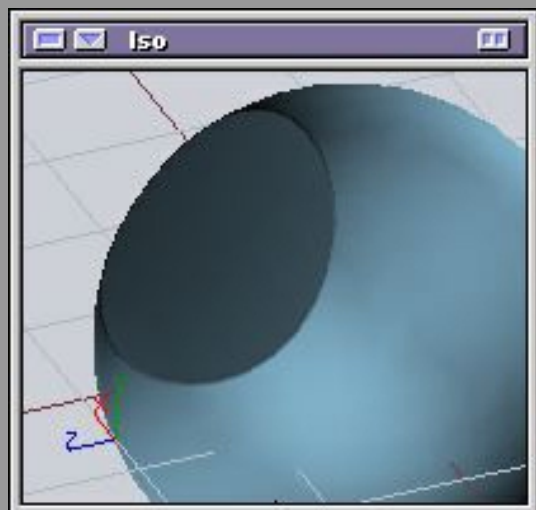
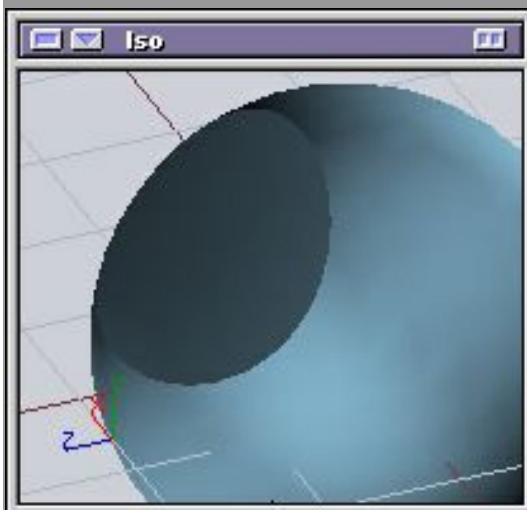
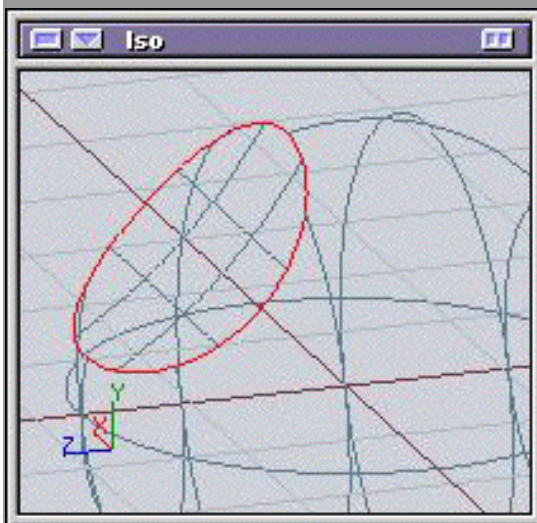
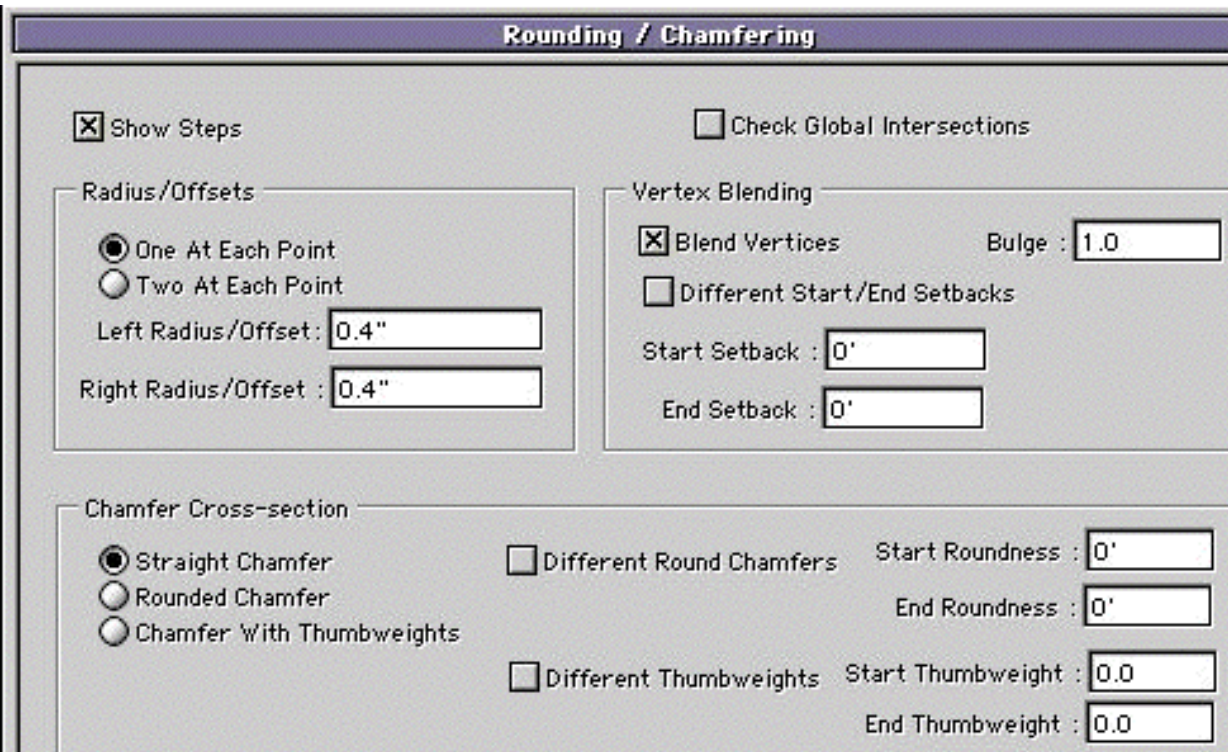
Now, to make this hatch look like it is really a separate piece of the body, we are going to bevel the edges of the body and hatch to create a "seam" between them.

- In the **Layers** window, **Hide** the Hatch object, so that it is not being displayed in your scene.



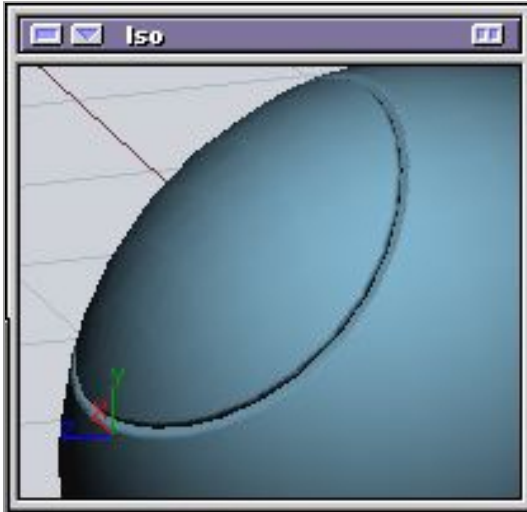
Do this by clicking on the little circle in the first column of the object list next to the Hatch object.

- Set the **Pick Tool** to **Loop**
- Double click the **Bevel Tool** and check the properties.
- Click OK, and move to your **Iso** view. Set the view to **Simple Wireframe** and rotate the view so that you can see the cutout portion where you cut off the hatch.
- Select the edge of the sliced portion.
- Double click in any empty area of the view. This should create a nice small rounded edge on the body.



- Open the **Layers** palette again, and **Hide** the **Body** object, and **Un-Hide** the **Hatch** object.
- Rotate around your **Iso** view, until you can see the wire loop on the bottom of the hatch object.
- Repeat the steps as above, set the **Pick Filter**, select the **Bevel Tool**, click on the wire loop, and double click an empty space.
- **Un-hide** both objects in the **Layer** window, and change the **Iso** view to Smooth Shaded.

You should see something similar to the picture on the right. This is a general purpose technique for creating seams within objects. In our case, we want the hatch to be maintained as a separate object. If for whatever reason, we needed these to be a single object, you could **Boolean Add** them together.



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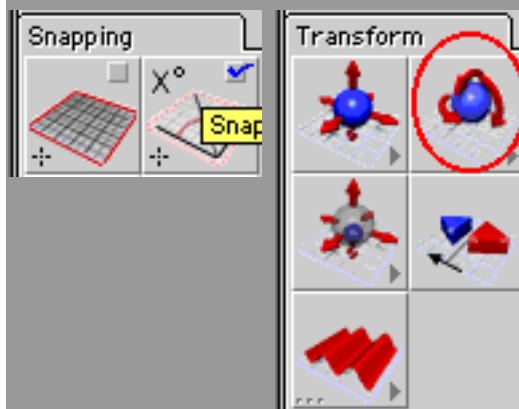
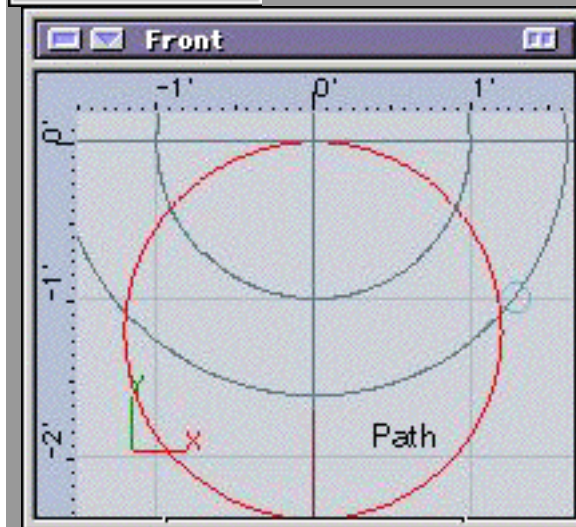
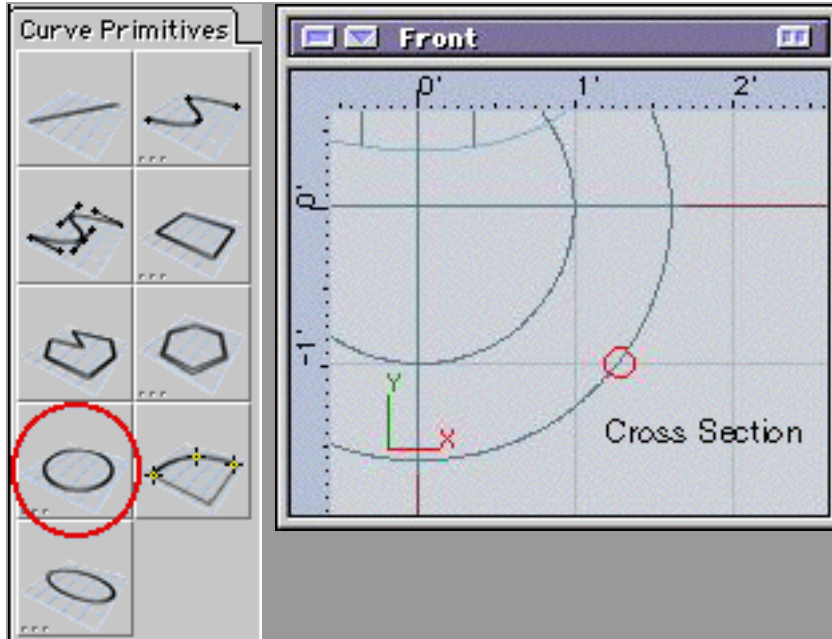
Body Details I

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As I mentioned in the intro, details are important to a character. For our little droid, we are going to add some objects that protrude from his body and give him some detail.

First, we'll start with the simple ring that goes around the bottom of the droid, effectively separating him into upper and lower body pieces.

- Turn **Grid Snapping** on and select the **Circle** from the **Curve Primitives** palette
- In the **Front View**, draw a small circle as shown at right. This will be the cross section that will be extruded along a circular path to create the ring.
- Using the same tool, and in the same view, draw a circle that will act as the path for the extrusion, as shown at right.
- Make sure the **Angle Snap** is turned on.
- Press **Cmnd/Ctrl-R** to select the **Rotate Tool**
- Hold down the '**X**' key to constrain the rotation to the X-axis
- Click anywhere in the **Front View** and drag the mouse. The circular path should rotate along the x-axis, snapping every 45 degrees. Stop when the circle is perpendicular to the view.
- In the **3D Tools** palette, double click the **Sweep** tool

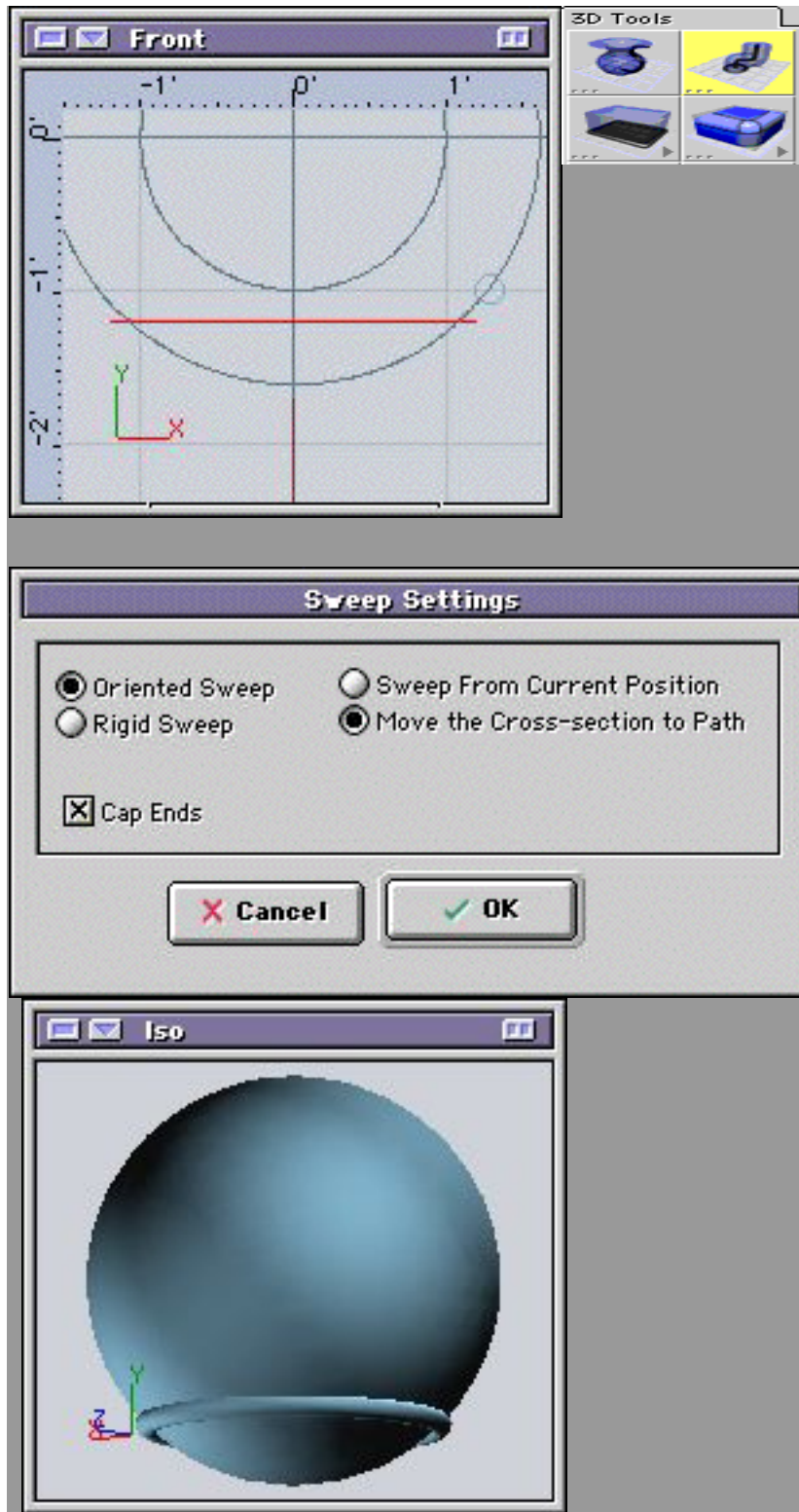


and check the settings. Pay particular attention to the setting "**Move the Cross-section to the Path.**" In our case, we drew the path in the correct location, and so we wanted the cross section to move.

- Click OK, and first click on the smaller cross section, and then click on the larger path circle. EIM will now extrude the small CS along the circular path and create a ring around the body.

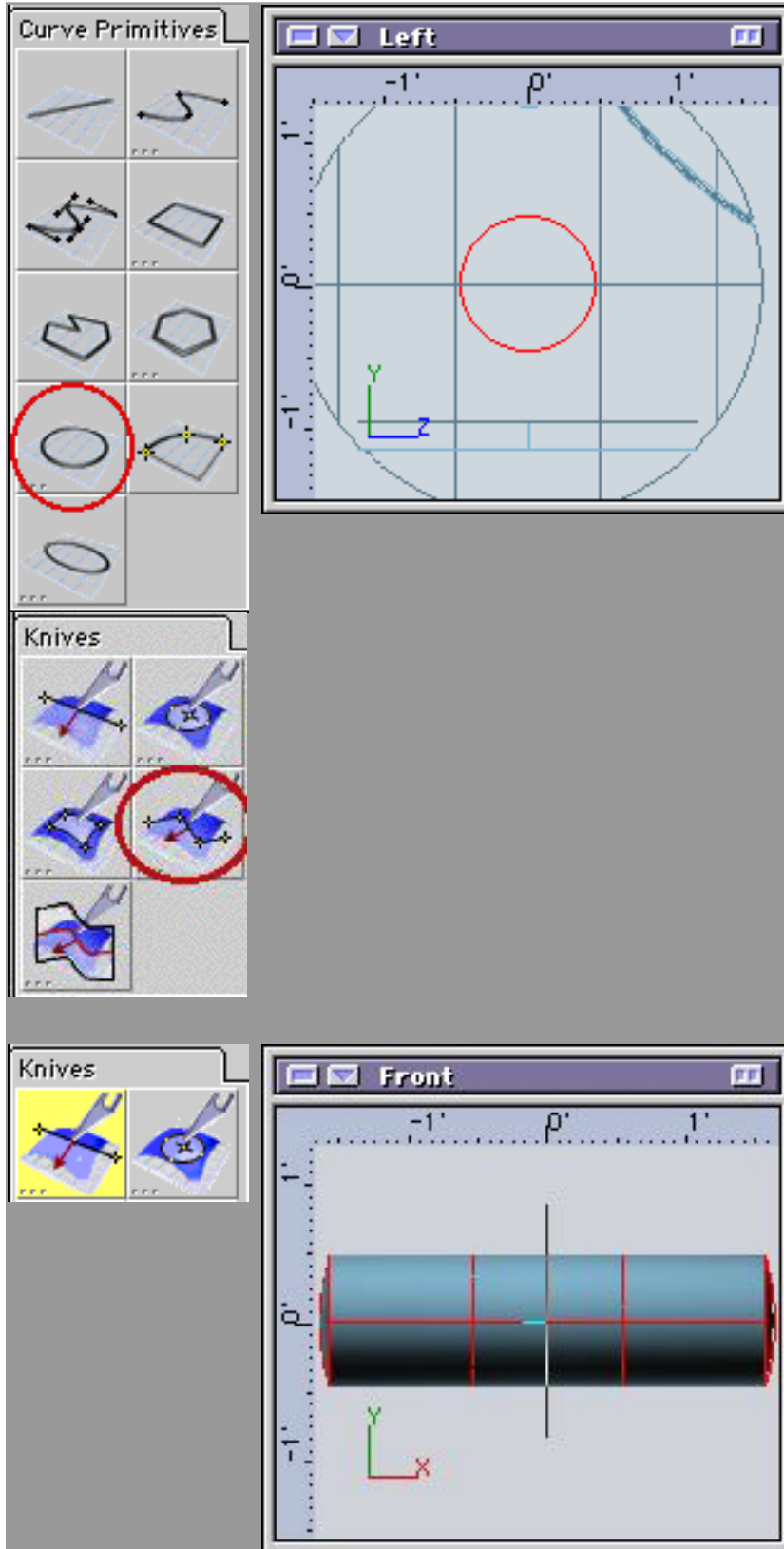
Feel free to reposition the ring if you wish.

Since we are going to be shading this ring differently from the body, we'll keep it as a separate object.



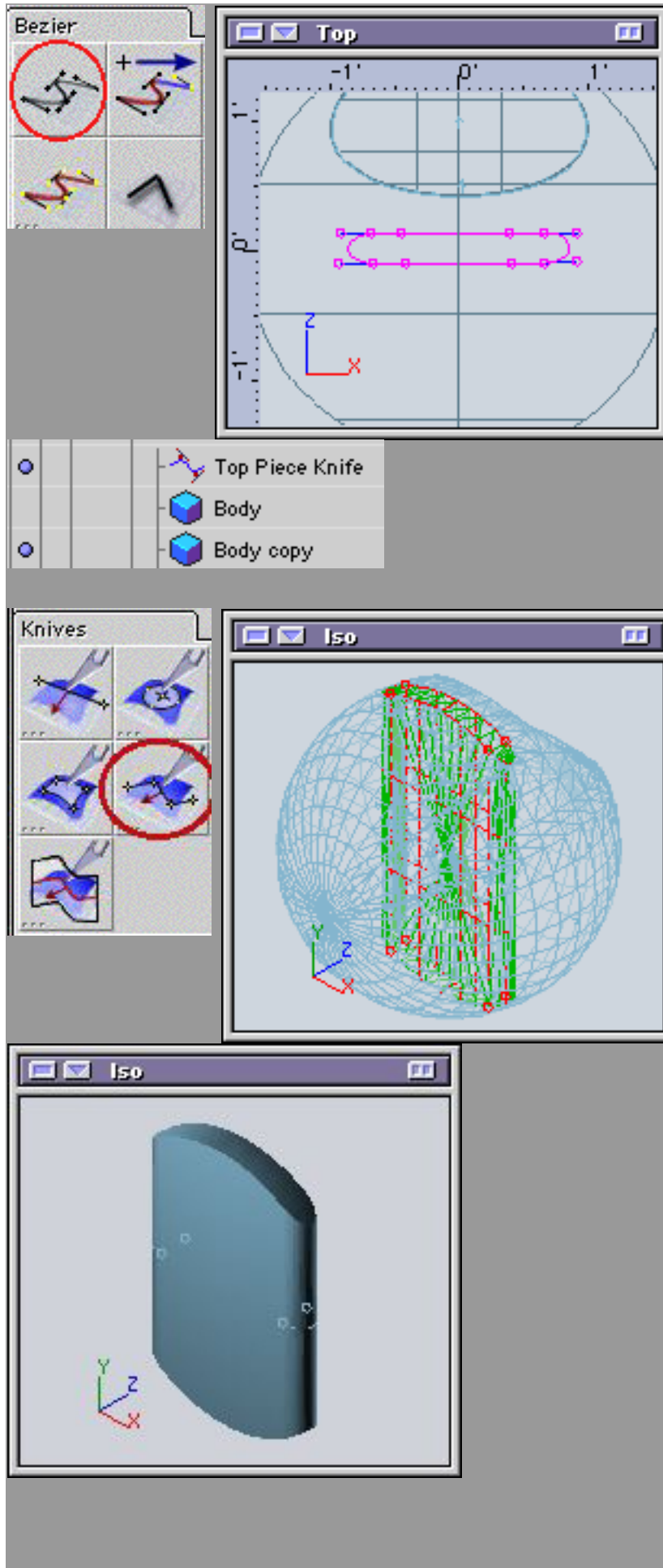
We'll be adding the arms and shoulder in the next few steps, but to prepare for those, let's create a cylinder that runs through the center of the droid that will rotate with the shoulders.

- In the **Left View**, with **Grid Snapping** on, grab the **Circle Tool** from the **Curve Primitive** palette. Draw a circle as shown.
- In the **Knife Palette**, select the **Wire Knife**. Click on the **Body** and then the new **Circle**.
- This will create a cylinder that runs through the center of the body.
- Now, this is supposed to rotate with each shoulder, so we need to cut it in half, so that the left and right shoulders can rotate independently.
- Hide the **Body** object, grab the **Straight Knife**, and cut the new cylinder in half in the **Front View**.
- Name the new pieces appropriately. I used "**Shoulder Disk - Left**" and "**Shoulder Disk - Rt**".
- These disks will need some beveling, but we'll do a bunch of that a little later. For now, let's move on to some more details.



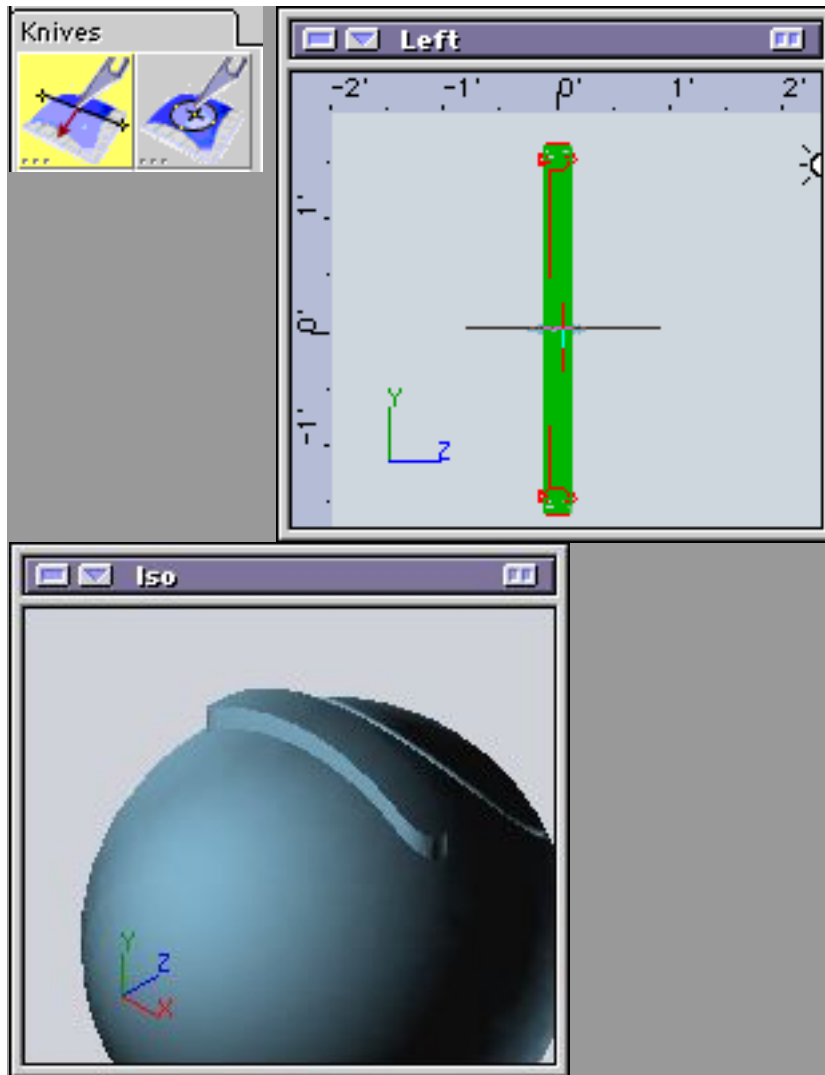
The next piece of detail we will add is the piece that sticks out of the top of the droids head.

- In the **Top View**, zoom in on the body object. You might wanna go ahead and **Hide** the **Hatch** and **Ring** objects to simplify the scene.
- Using the **Bezier Tool**, create a bezier wire on the body as shown in graphic. If you keep gird snapping on, you might need to set the snapping distance in the Preferences to a small number to get accurate editing. *Note:* This wire will be drawn on the $Y=0$ axis, thus in the middle of the object. This does not matter, as knives will cut through the whole object anyway.
- In the **Layers Window**, select the **Body** object and press **Cmd/Ctrl-D** (Duplicate).
- While still in the layers Window, turn off the **Body** object as we'll be working with the copy. While you are there, also rename your bezier wire to something useful.
- In the **Knife Palette**, select the **Wire Knife** tool.
- Select the **Body Copy** object and then the bezier wire.
- The resultant shape should look something shown at right.
- In the **Layers Window**, hide the body object, so you can only see the new wire derived object.
- **Delete** the copy of the **Body Object** that you made this new piece from.



- Select the **Straight Knife** tool from the **Knife Palette**, and in the **Left View**, draw a wire about half way through the newly created object.
- Select the bottom portion of the object, and **delete** it.
- Select the top portion of the object, and with the **Move Tool**, move it up along the Y-axis a little bit until it protrudes out of the top of the droid
- In the **Layers Window**, **Unhide** the **Body** object.
- You now should have a little piece sticking out of the top of the body that perfectly matches the curvature of the body.
- Select the **Boolean Add** tool from the **Boolean Palette**. Select the **Body** and the new piece and double click in an empty space. This will create a new single piece of geometry. Make sure you name it!

Note: If you want to texture these extruded pieces differently than the body, you can keep them as separate pieces.



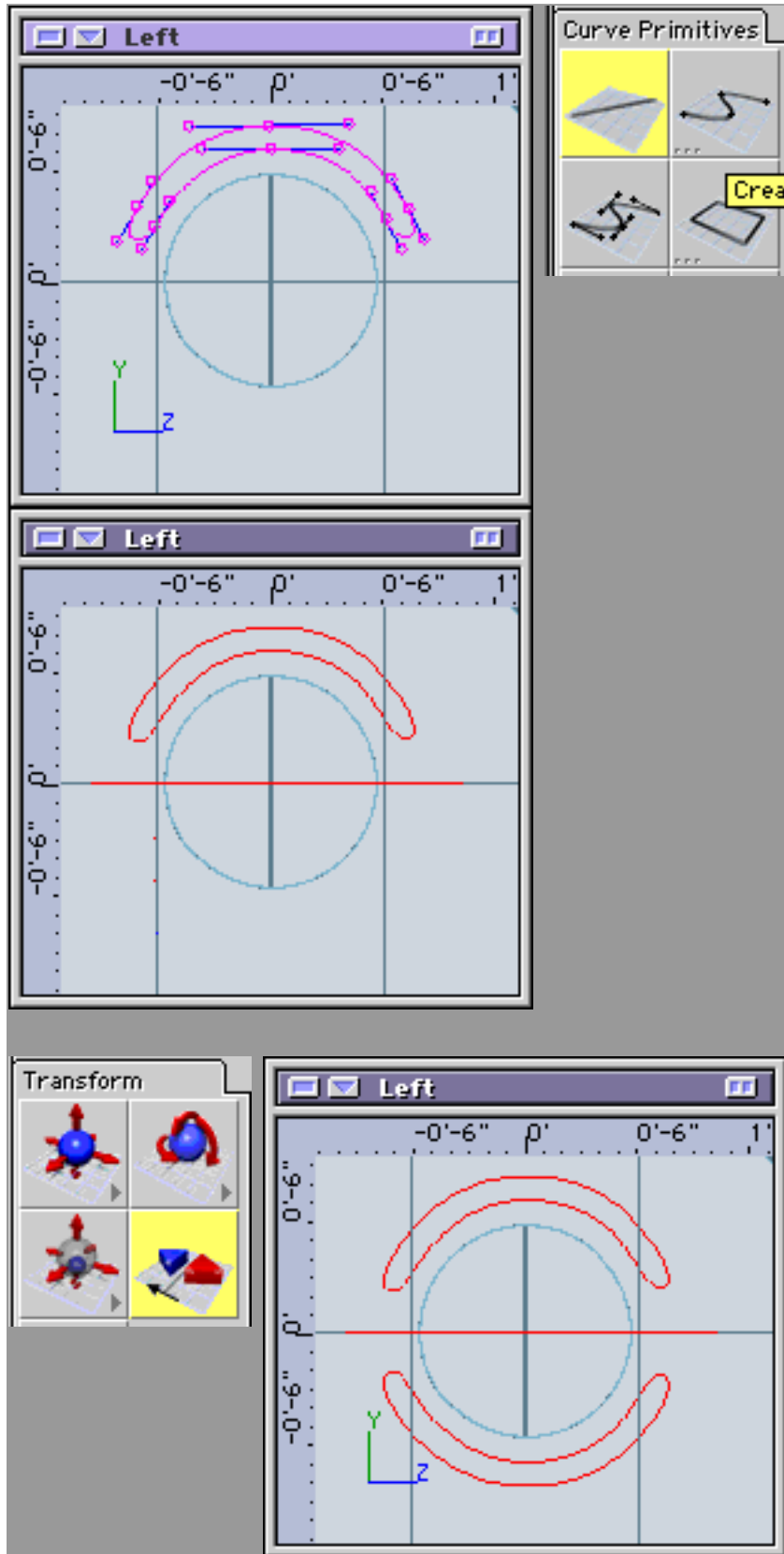
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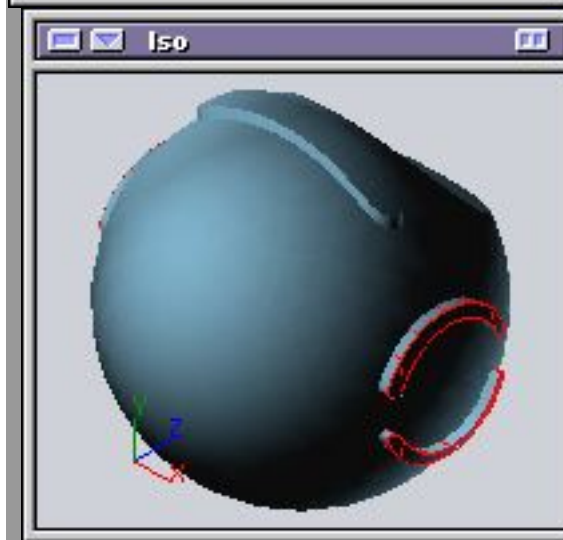
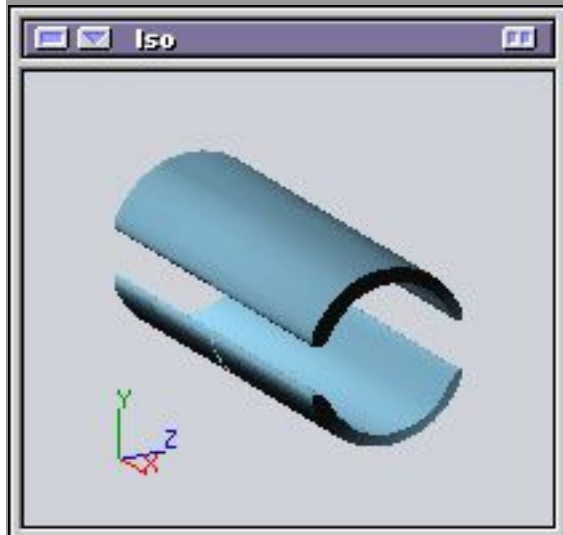
OK, the next step is to create the "cuffs" that appear just above and below the shoulders. The technique is pretty much exactly like the previous one, so I won't go into a lot of detail.

- Using the **Bezier** tool, create an outline in the **Left View** as shown.
- Using the **line Tool** from the **Curve Primitives** palette, draw a line on the Y=0 axis. We will use this as a symmetry line to duplicate the bezier curve.
- Grab the **Reflect Tool** from the **Transform Palette**.
- Select the first bezier curve and double click in some empty space. Then select the symmetry line we created. The bezier curve should be duplicated under the symmetry line.
- Delete or hide the symmetry line.
- Using the **Wire Knife** tool, select the **Body** and then select one of the **Bezier Curves**. This will cut out of the the cuffs. Repeat with the other **bezier** wire.
- Hide the **Body Object**.
- Using the **Straight Knife** tool, cut each of the two new curve object into 2.
- **Do Not Delete** any part of the new objects.
- Un-Hide the **Body Object**.
- Using the Move Tool, move the new "shoulder cuffs" so that they extrude out of the



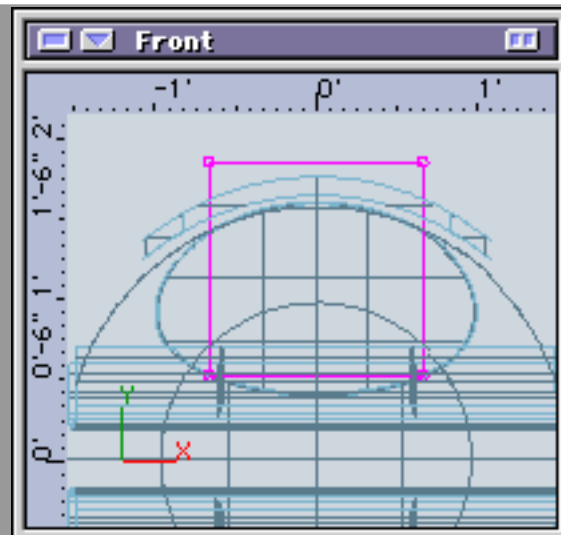
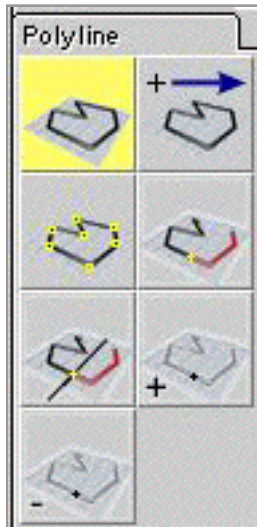
side of the **Body Object**.

- Perform a **Boolean Add** to bring the two "cuffs" and the **Body** together as one object.
- Name your objects and do some clean up with your wires, etc.



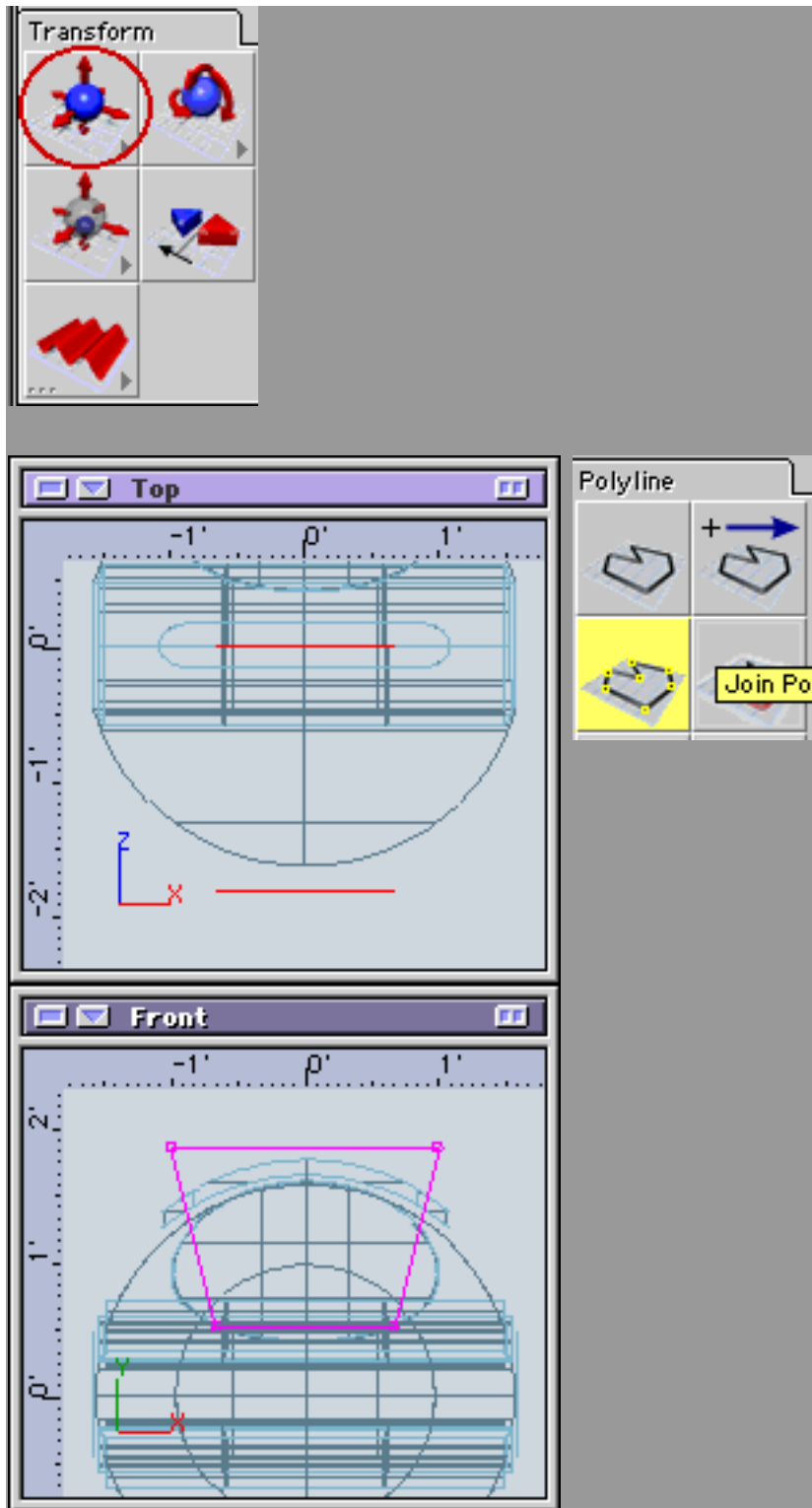
The last major edit to the body will be to create the cutout that will hold the "Eye" camera. We'll do a simple skin object and use that to boolean out the cutout.

- Select the **Front View**.
- Make sure **Grid Snapping** is on.
- Using the **PolyLine Tool**, draw a polygon like shown.
Note: The top of the polygon should extend above the droid, and the bottom should be above the



middle of the droid.

- Position your windows so that you can see the **Top View** and the **Layers Window**.
- Make sure your new polygon is selected, and press **Cmd/Ctrl-D**(duplicate).
- In the **Layers Window**, Make sure only one of the wires is selected and select the **Transform Tool**.
- Hold down the "Z" key and click and drag in the **Top View** to move the second wire away from the body. Make sure it's not touching the body at all.
- **Hide** the first wire, and go to your **Front View**.
- Select the **PolyLine Edit Tool**.
- Widen the top of the polygon a fair amount, and widen the bottom a little bit.
- Double click the **Skin Tool** from the **3D Tools** palette and check the settings.
- Select the first polygon, and then the second, and then double-click any empty space in any window.
- You should get a new piece of geometry as shown.
- Using the **Move Tool**, move the new object to the front of the droid a bit, so that the new object doesn't intersect with the bump out on the top of the droid.
- So far so good, but to create a more unique look, we don't want the back of this cut-out to be perfectly vertical, it should angle back a bit. Since we are going to be using this new object to "cut out" the geometry, we can alter the



object before doing the boolean.

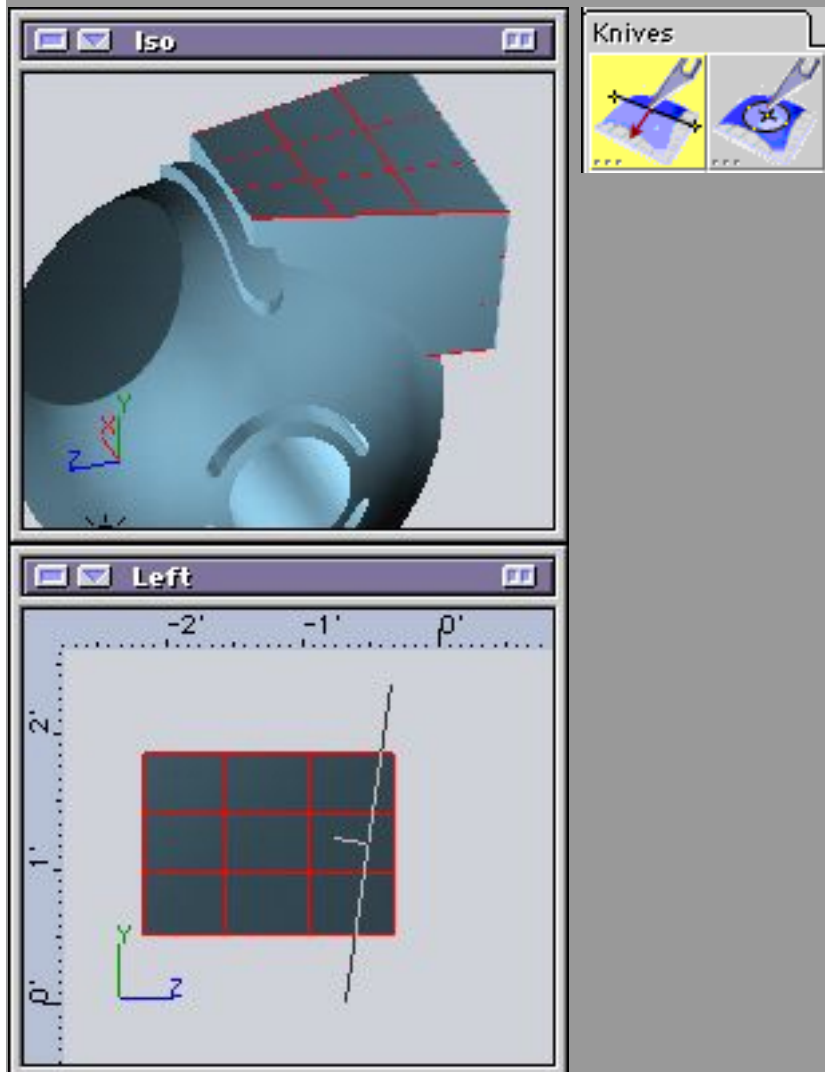
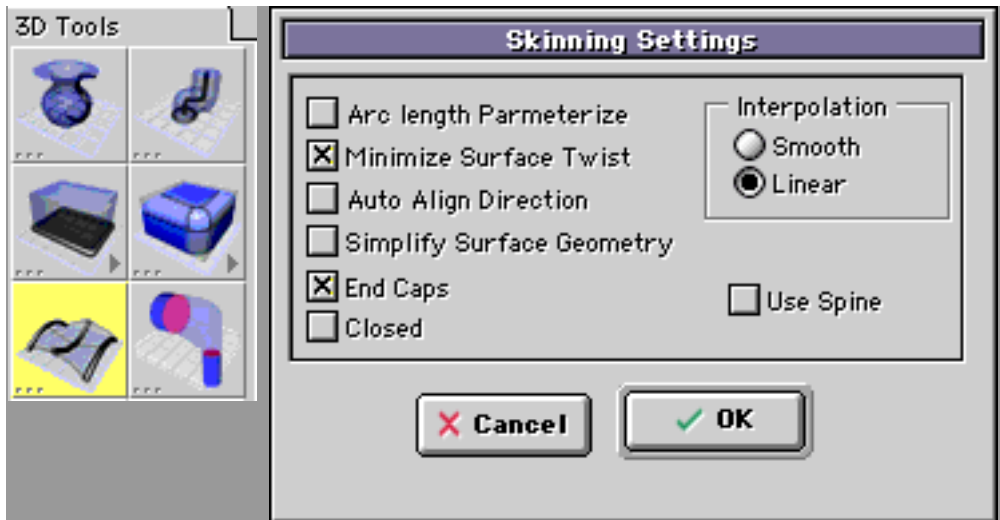
- **Hide** the **Body** and and other objects you like.
- Grab your **Straight Knife** tool and in the **Left View**, cut the back of the skinned object off at a slight angle.
- Rotate your **Iso View**, so that you can see the three edges that will be intersecting the **Body**.
- Set the **Pick Tool** to the **Edge Filter**.
- Double click the **Bevel Tool** and set the Radius to **6"**.
- Click **one** of the three sides of the new object.
- **Double Click** in an empty portion of the window. The selected edge should get beveled.
- Continue to do the other two edge one at a time.

Note 1: Don't try and bevel the entire object at one time. Doing sequential edges, one at a time usually works better.

Note 2: In this case, I beveled the object that will be using to cut out a piece of the body. I could have left this piece with hard edges and then tried to bevel the resulting "interior" edges on the body. This would also work, and many times I have had better luck with that approach. In this case, since these are pretty simple objects, doing the rounding first was easier.

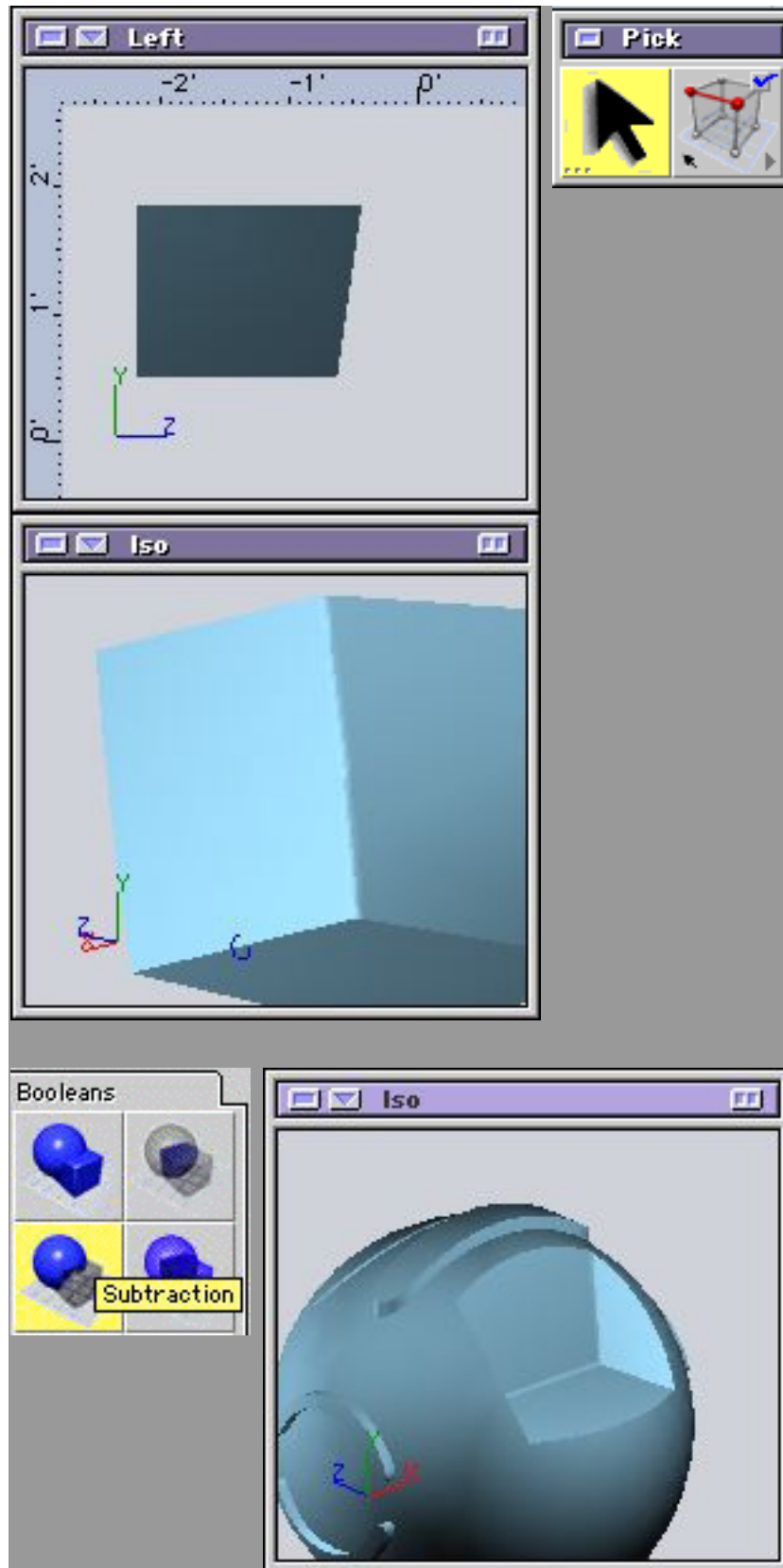
OK, lastly, let's just boolean subtract this piece from the body.

- **Un-Hide** the **Body**
- Select the **Boolean Subtract** tool.
- Click on the **Body** and the



the **Skinned Object**

Not too shabby so far, huh? Just a few more details, and we'll be almost done. Be sure to save often, name your objects and manage your layers.



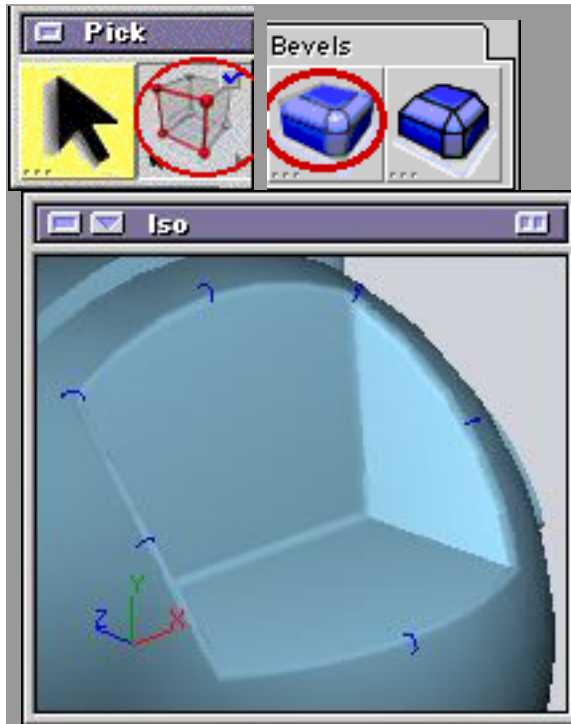
Body Details III

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The last few things I want to do are just some simple rounding. There is nothing in the real world that has perfectly square edges, and it's a real tip-off that something is done in CG if it has perfectly square edges. The Modelers beveling capabilities are really astonishing, and you should take advantage of them whenever possible.

The first thing we will work on is the eye cut-out that we just completed. When we did the cut-out, we rounded the object we used as the boolean subtraction, so the "internal" edges are already rounded, but the edges on the "outside" are not.

- Set the **Pick Filter** to **Loop**
- Double click the **Bevel Tool** and set the **Radius** to **.5"**
- Zoom in in the **Iso** view to see a portion of the cut-out. Click on one of the Edges. The **Loop** of edges that define the outline of the opening should become selected.
- Double click in an empty area. The bevel



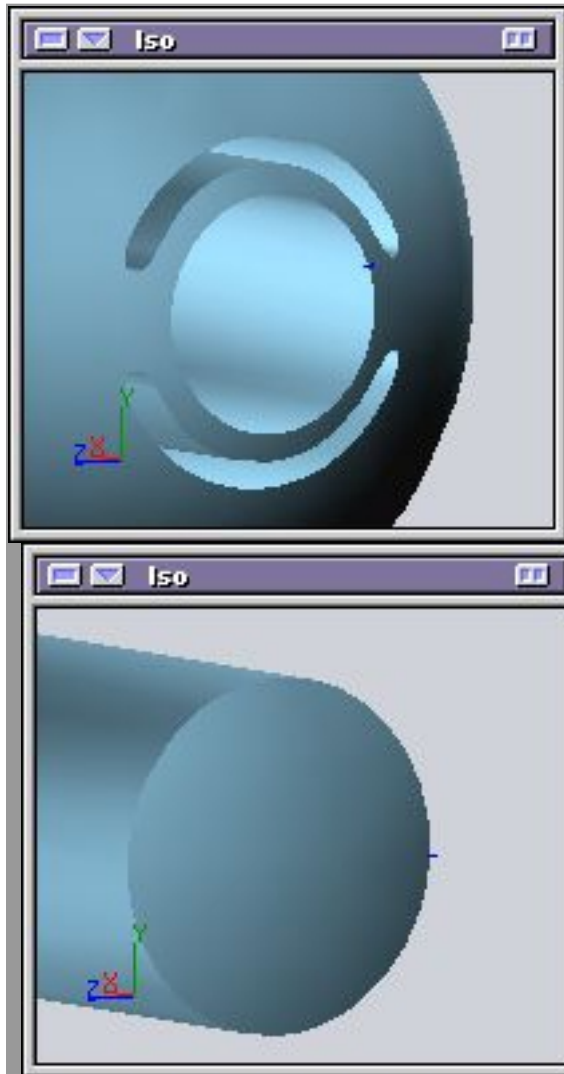
should get calculated and then displayed.

Note: Picking the correct edge can be tricky. If your view is shaded, you can sometime pick a wire behind the one you intended, if you are using wireframe, it's simply too complex to see the wires correctly. Keep glancing at the other view to see what gets selected.

Note 2: If you are having trouble getting the rounding to work, try a different radius.

OK, only a couple more bevels to help finish up the body. First, let's slightly bevel the shoulder disks to help define them.

- Go to the **Left** or **Iso** view.
- Hide everything but the **Body**.
- Set the **Pick Tool** to **Edge**
- Double Click the **Bevel Tool** and set the radius to something like **2"**
- Select the edge that defines the edge of the hole.
- **Double-click** to perform bevel.
- Hide the **Body** and **Un-Hide the Shoulder Disk**.
- Perform the same bevel



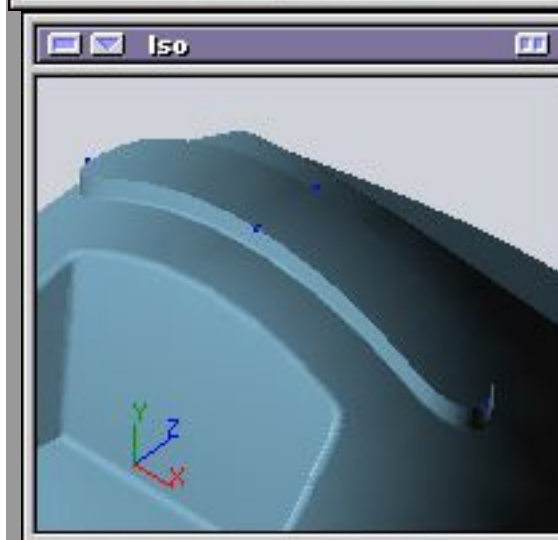
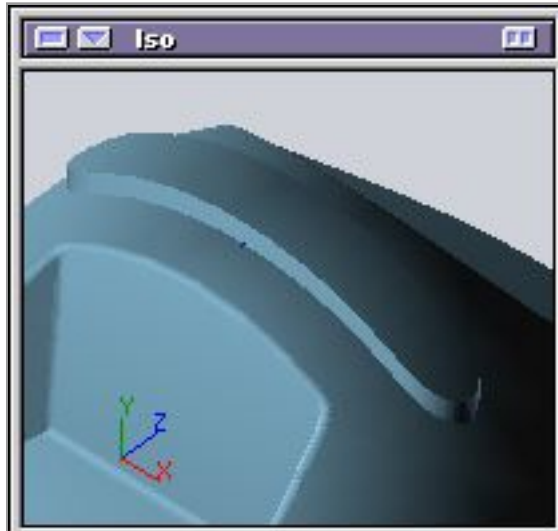
on the disk.

Repeat the same process for the other side of the body.



Now we need to take care of that bump out thing that sticks out of the top of the droid.

- Go to your **Iso** view and navigate around until you are close up on the top of the body.
- Select the **Loop** pick filter.
- Select the **Bevel Tool**.
- Click on the seam where the top "thingy" intersects the body.
- Double click in empty space.



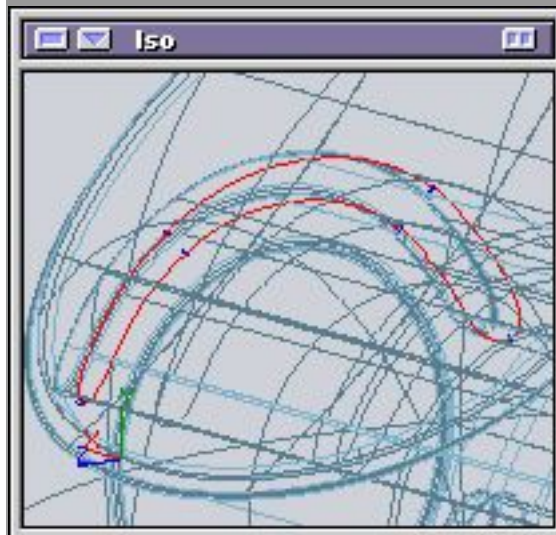
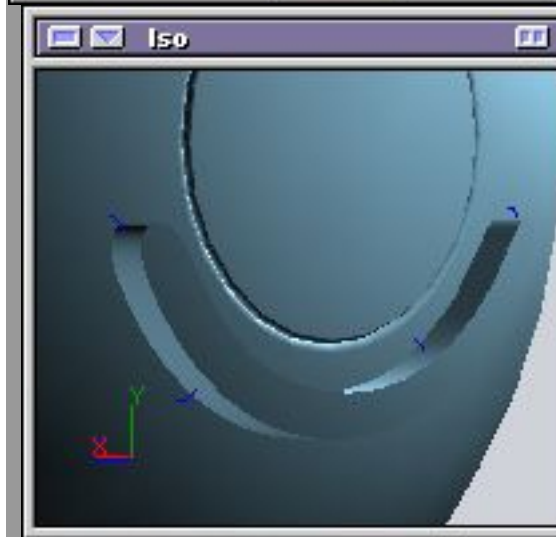
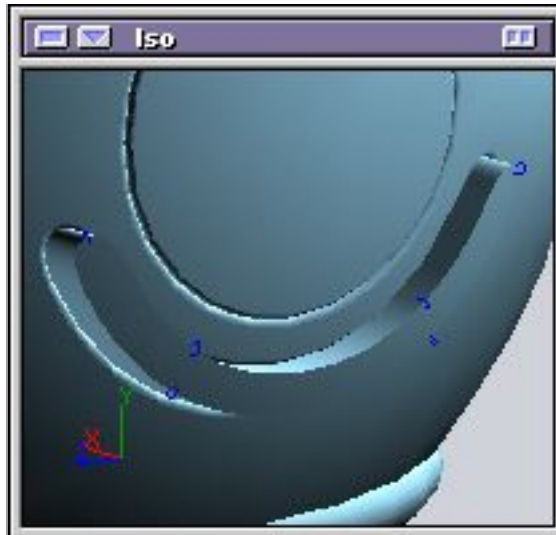
Repeat the same operation for the top of the "thingy".

Well, we need to do the exact same procedure for the four "Shoulder Cuff" pieces. The procedure is the same. Select the Loop Pick Filter, Select the Bevel Tool and select and bevel. This will need to be

done eight times (top and bottom for each of the four cuffs).

Note: I adjusted my bevel dimension to .1" for the bevels that act as a blend into the body. I just thought that .1" looked better. more subtle.

Note 2: As I noted before, picking the correct lops and wires for bevels can be tricky. After you attempt the selection, but before you perform the bevel, glance at the other views and see what wires got selected. See example.



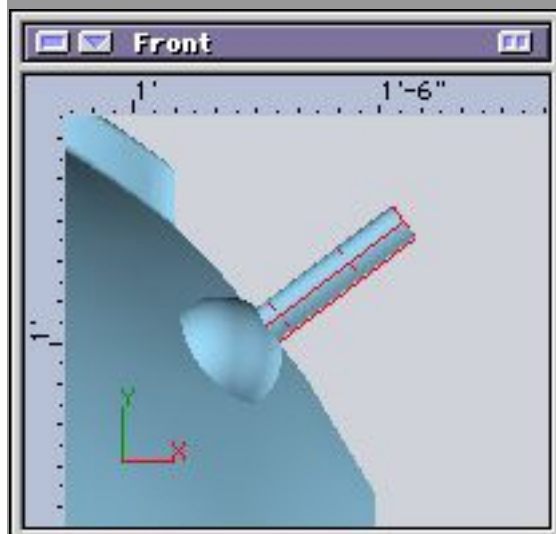
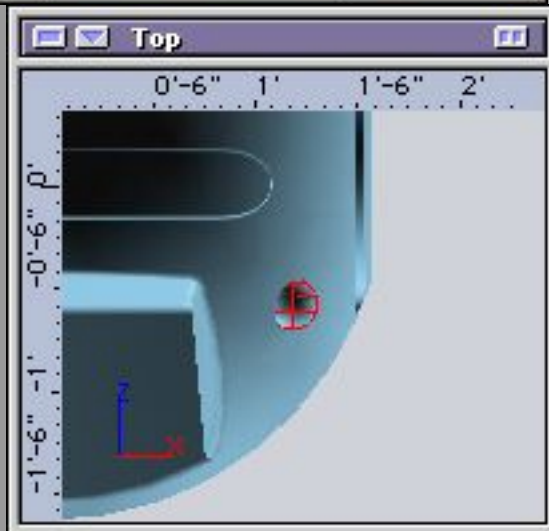
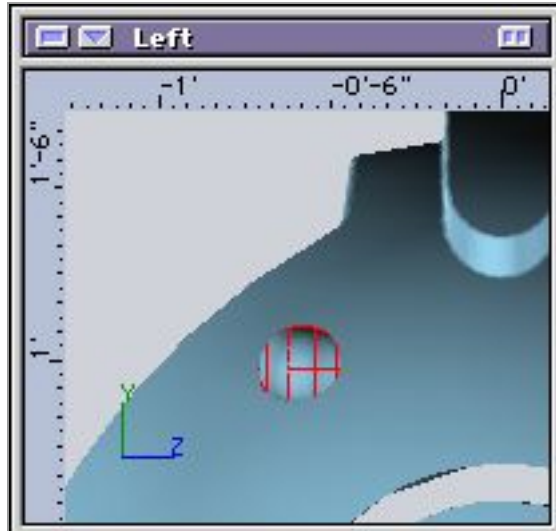
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Lights

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Our droid is not going to be very useful without lights to see what he/she is working on. The light is made up of four separate objects, a sphere, a cylinder and two revolved objects. We'll also use the Reflect tool to duplicate our efforts and create the second light for us.

- In the **Left** or **Front** view, grab the **Sphere** tool from the **3D Primitives** palette. Draw the basic sphere as shown.
- Grab the **Cylinder** tool from the **3D Primitives** palette. Draw a basic cylinder. Use the **Rotate**, **Translate** and **Scale** tools to position it where you like.
- Now, in the **Left View**, using the **Line Tool**, create a line that we will use as the axis of revolution.



- Switch to the **Bezier Curve** tool and draw an outline something like what's shown.
- Use the **Revolve Tool**, select

the bezier curve and then click on the line.

- Using the **Bezier Tool** again, draw the outline of the **Lens**. When done, **Revolve** that around the same line.

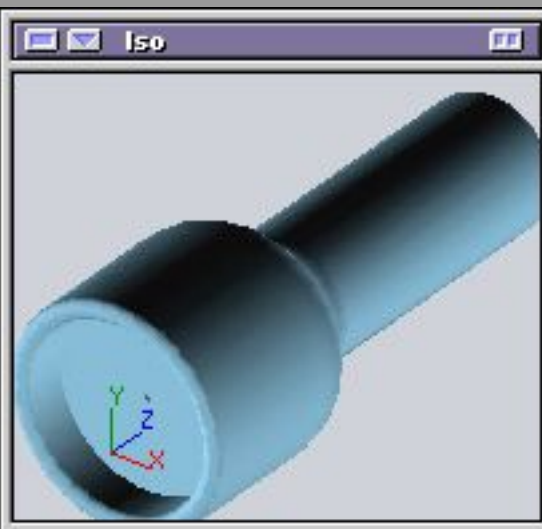
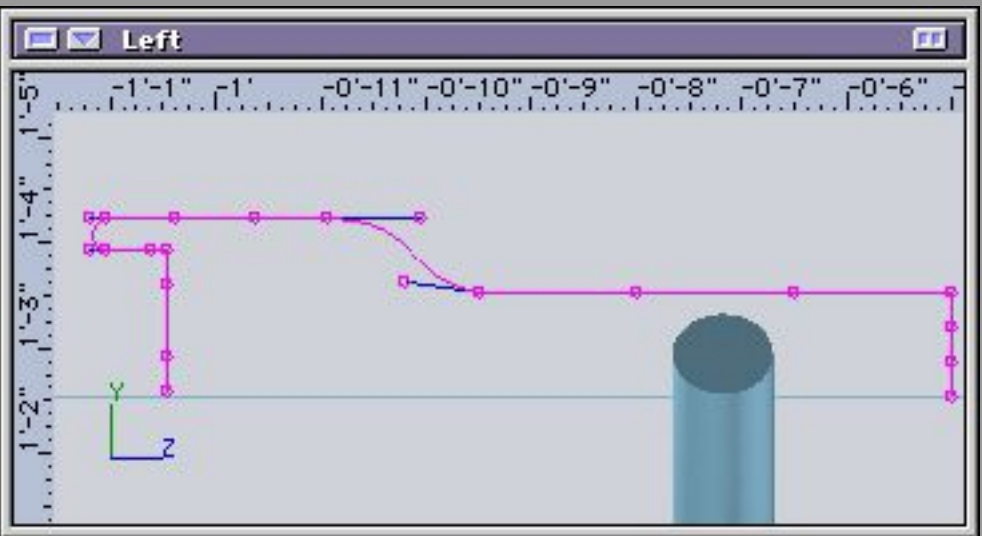
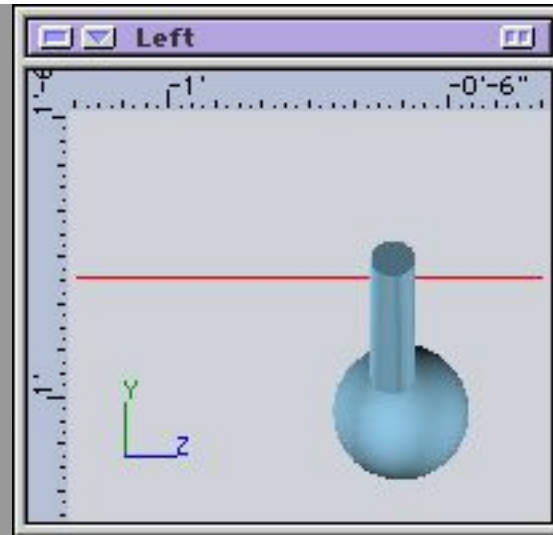
Why create a separate object for the lens? This is so that we can apply a glow effect within Animator. This will give us a little more realism to the final product.

I also want to simplify this a little bit. I don't think we need two separate object, the sphere and the cylinder. We can probably shade those effectively as one object, and I want to bevel the edges where they join to give them a more finished appearance.

- Using the **Boolean Add** tool, select the sphere and post and join them into one object.
- Set the **Pick Filter** to **Edge**, and using the **Bevel Tool**, bevel the edge where the two objects joined.

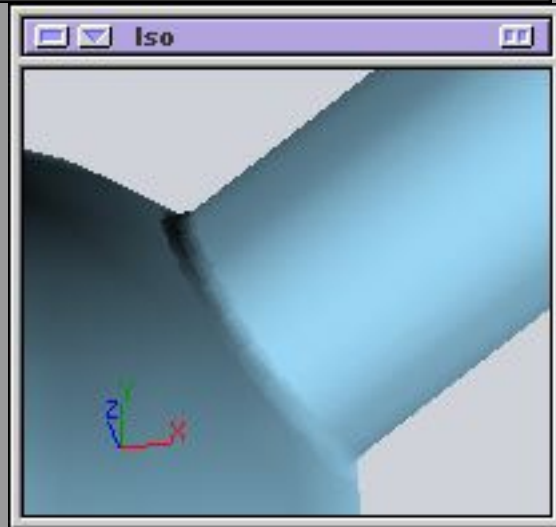
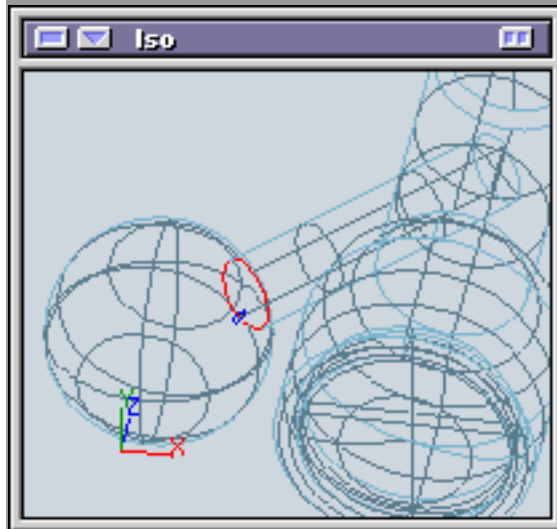
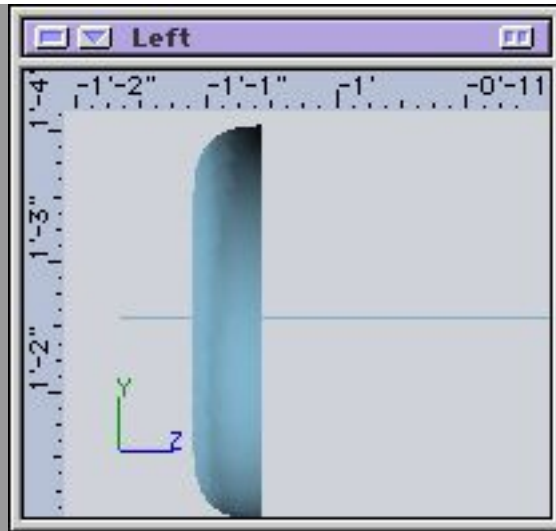
No one likes to reinvent the wheel, so we'll use the reflect tool to duplicate what we did for the other light.

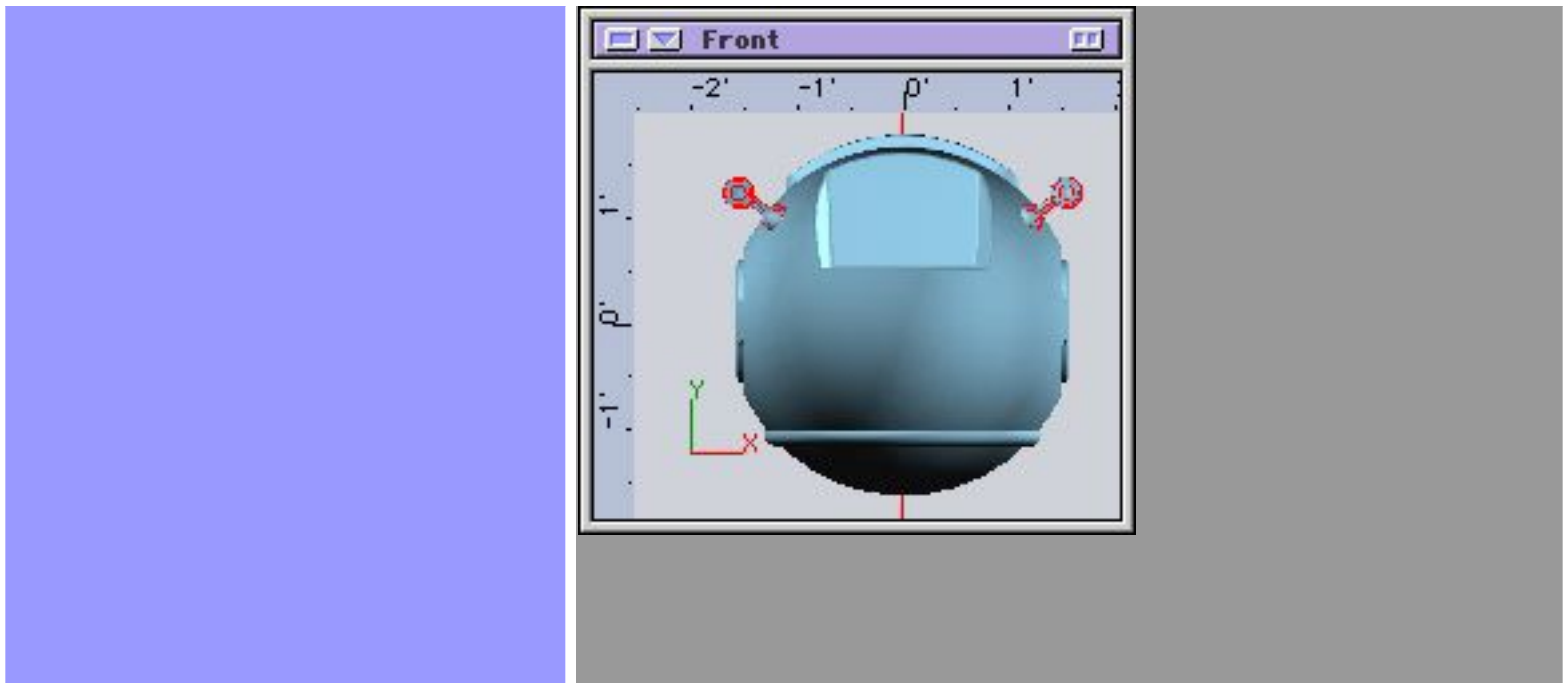
- In the **Front View** draw a **Line** along the $x=0$ axis.
- Select the **Reflect Tool**, and then select each of the objects that make up the light. When all selected, **Double-click** in an empty area. Now, click on



the line you drew.

A new light should be created that is a mirror reflection of the one you started with. In the layers window, organize and rename your object to reflect their actual position/function.





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Eye I

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Our little droid needs some way to see, so we're going to add a camera, a "Seeing Eye".

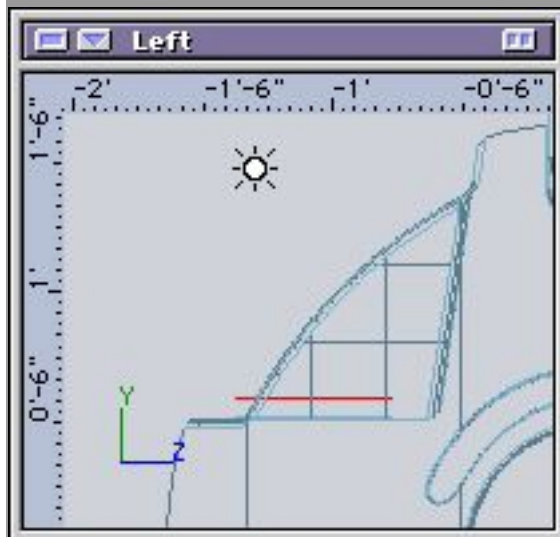
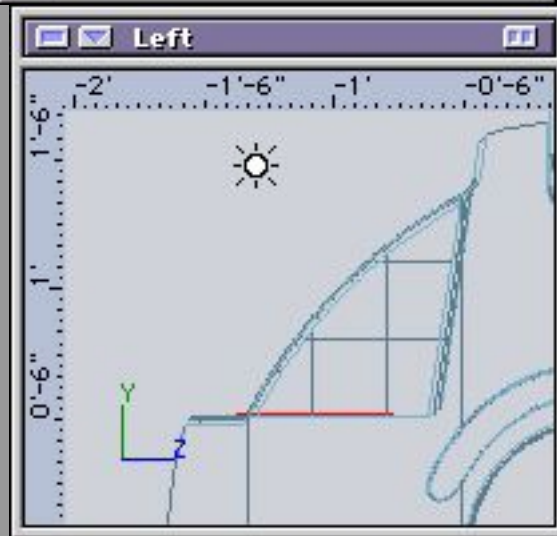
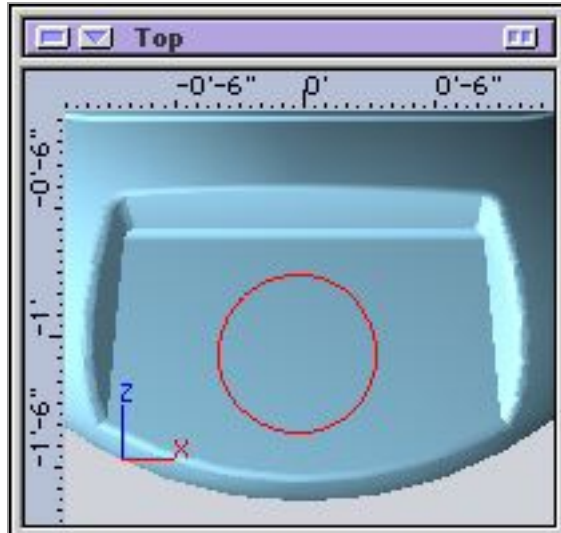
To keep screen clutter down, I would **hide** all of the object except for the **Body**.

The camera itself is pretty simple. It's made up of a few simple revolves and extrusions. We'll start with the **Base**.

- In the **Top View**, zoom in until you can see the bottom of the cut-out we created.
- Grab the **Circle Tool** from the **Curve Primitives** palette.
- Draw a circle right in the center of the cut-out.

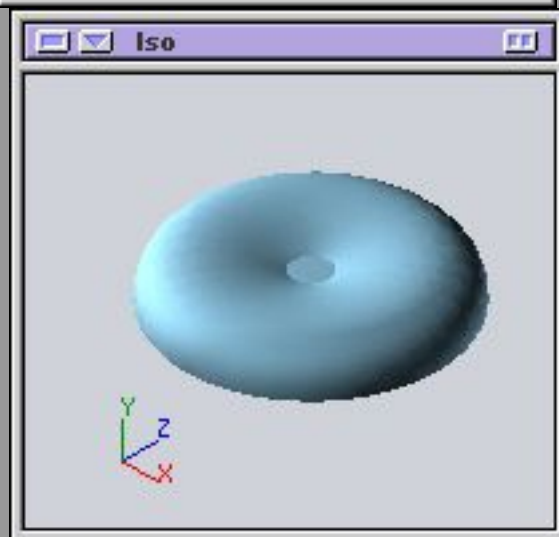
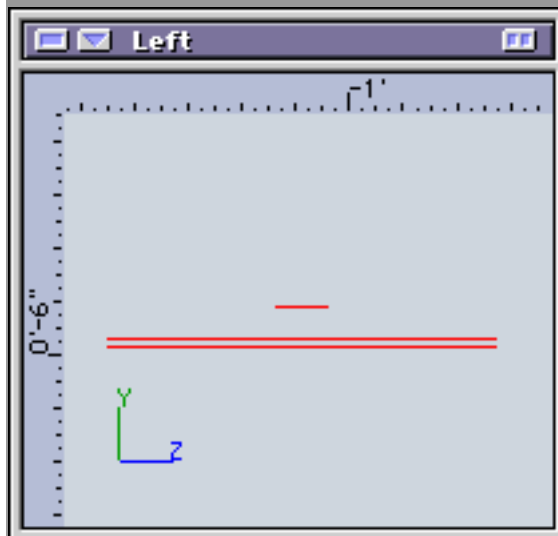
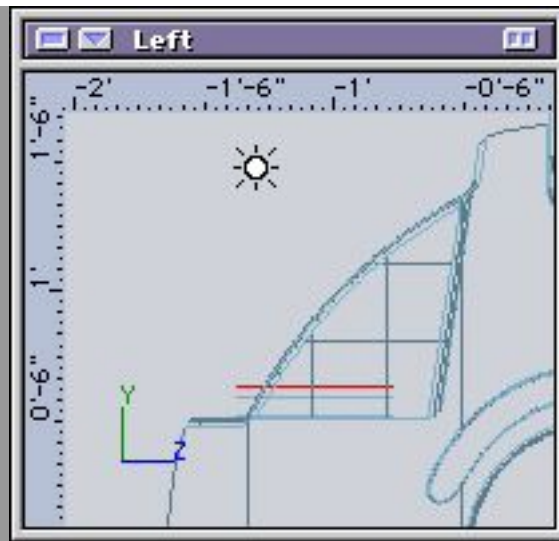
*Note: When you draw this, Modeler drew the circle on the $Y=0$ axis, so it will be below the cut-out, and you might not see it. This can be solved by using **Work Planes**. To keep this short, I'm not going to discuss those here. Refer to the manual for further info.*

- In the **Left View**, select the circle and move it up to the bottom of the



cut-out.

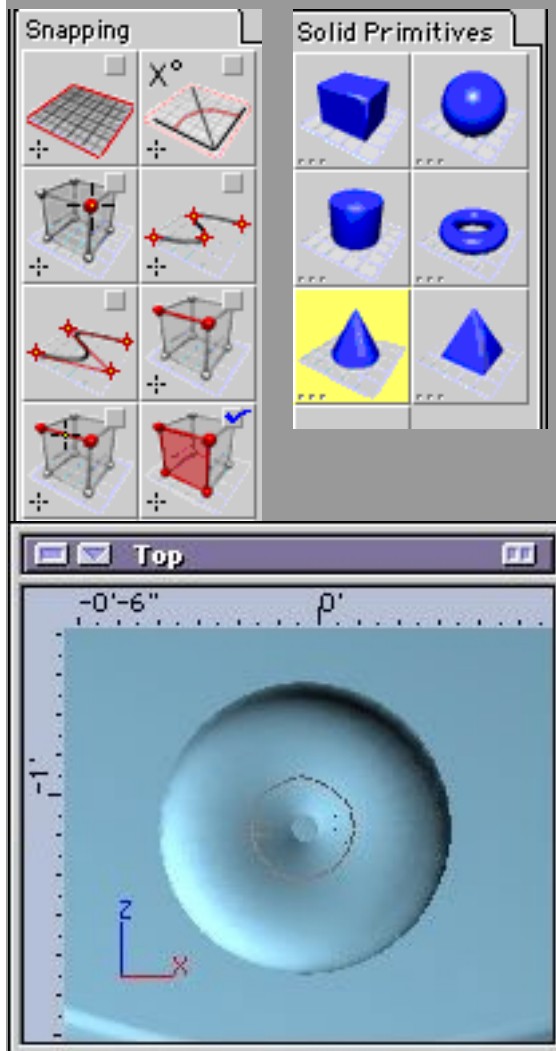
- Make sure the circle is still selected, and press **Cmd/Ctrl-D(duplicate)**.
- Without doing anything else, grab the **Move Tool**, and in the **Left View**, hold down the 'Y' key and click and drag up. This should move the duplicated circle up a little.
- Repeat the **Duplicate** and **Move** again to create a third circle.
- Select the **Scale Tool** and while the 3rd circle is still selected, drag and shrink the wire until it is very small.
- Position the circles, so that the first two are close together, and the third is a little farther away.
- Press **Shift Cmd/Ctrl-A** to deselect all of the wires.
- Grab the **Skin Tool**, and begin selecting the wires, starting at the bottom. When all are selected, **Double-click** in an empty space.
- You should get something that looks like the image at right.



Note: The little dimple in the middle is intentional. It gives it a little character.

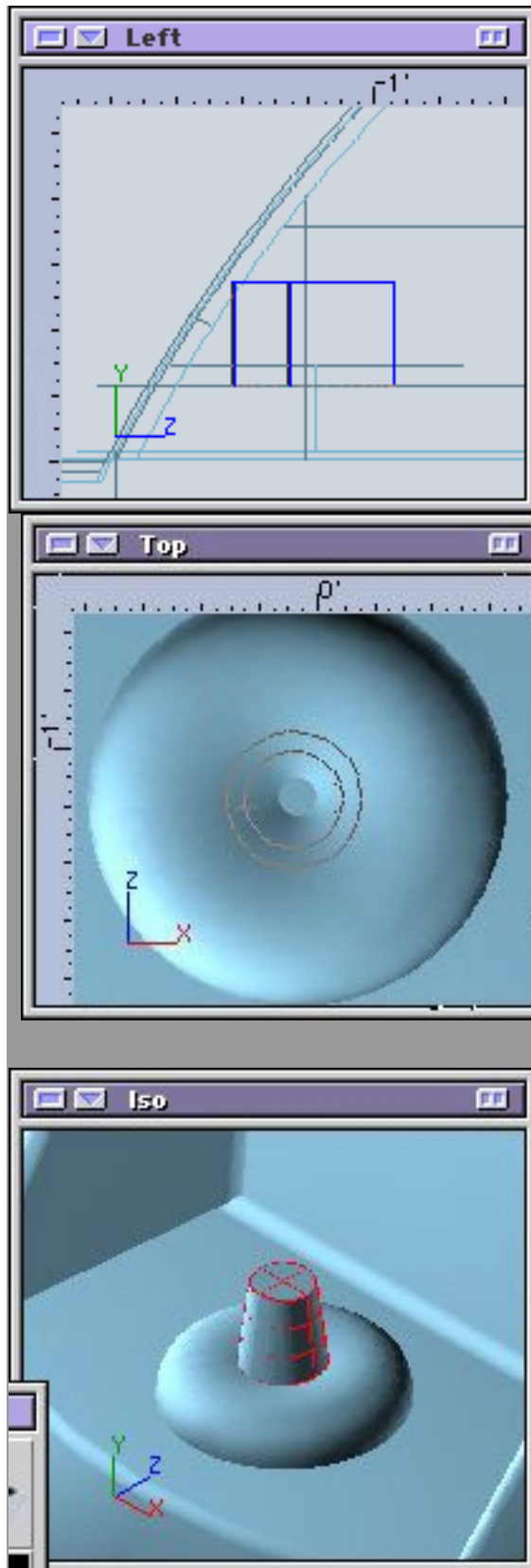
OK, now we're going to use the Cone tool to add the second piece to the base. If you aren't familiar with how this works, check the manual, but as a refresher. The Cone tool requires three separate inputs from the user. The first determines the circumference of the base of the cone, the second (in a perpendicular view), defines the height of the cone, and the third (back in the first view) determines the circumference of the top of the cone. 'Cone' is a bit of a misnomer, because it can have a flat top like ours.

- In the **Snapping** **Palette**, select the **Snap To Face** tool.
- In the **Top View**, zoom in until you can see the base we just created.
- In the **Left View**, position and zoom, so you get a good view of the base from the side.
- In the **Solid Primitives** palette, select the **Cone Tool**.
- In the **Top View**, draw the base of the cone.
- Move the mouse to your **Left View**, and draw the height of the cone.
- Back in the **Top View**, draw the smaller top portion of the cone.
- Grab the **Boolean Add** tool and select the **base** and the **new cone** and



create a single object
out of them.

Feel free to bevel edge as you
like.

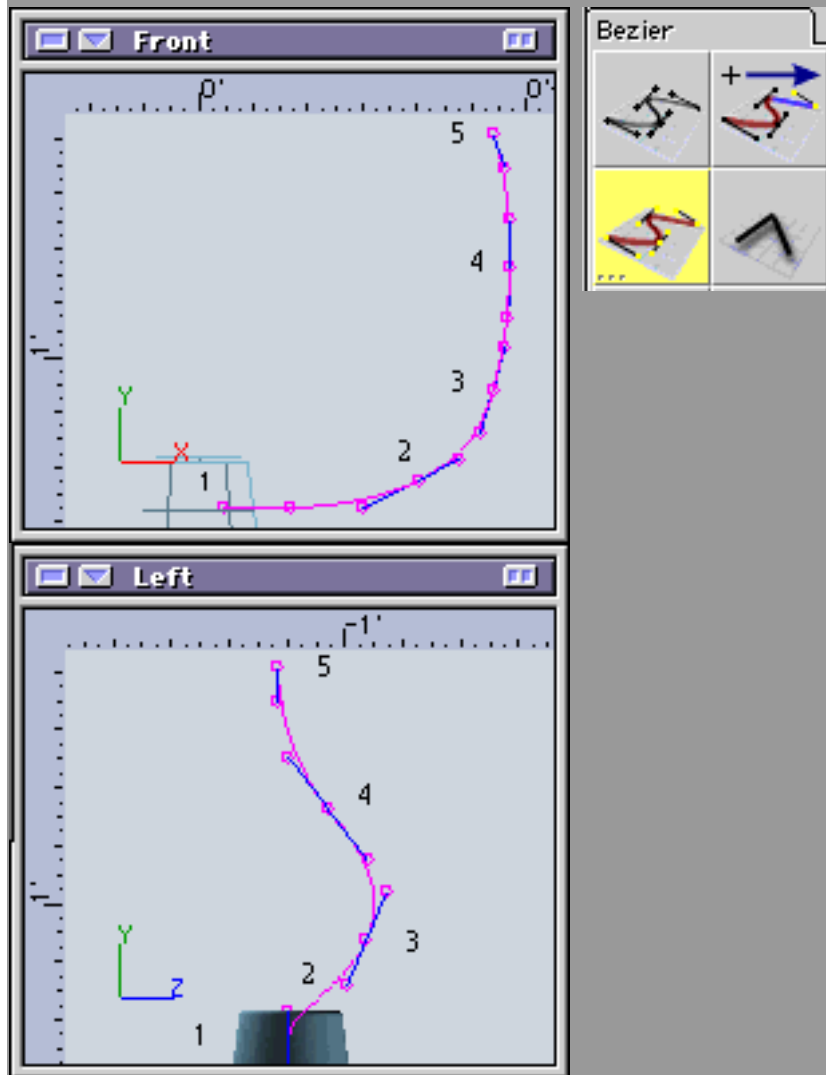


The next piece we need to work on are the arms that hold the actual camera in place. We'll use a simple path extrusion to create these. We'll make the first one and then Reflect it to the other side. This will ensure an exact copy.

- You will probably want to turn off **Grid Snapping** here.
- Grab the **Bezier** tool and in the **Front View**, start creating the wire that will act as our extrusion path.
- Continue adding knots in the **Front View**, until you get something similar to what's shown. I used 5 knots.

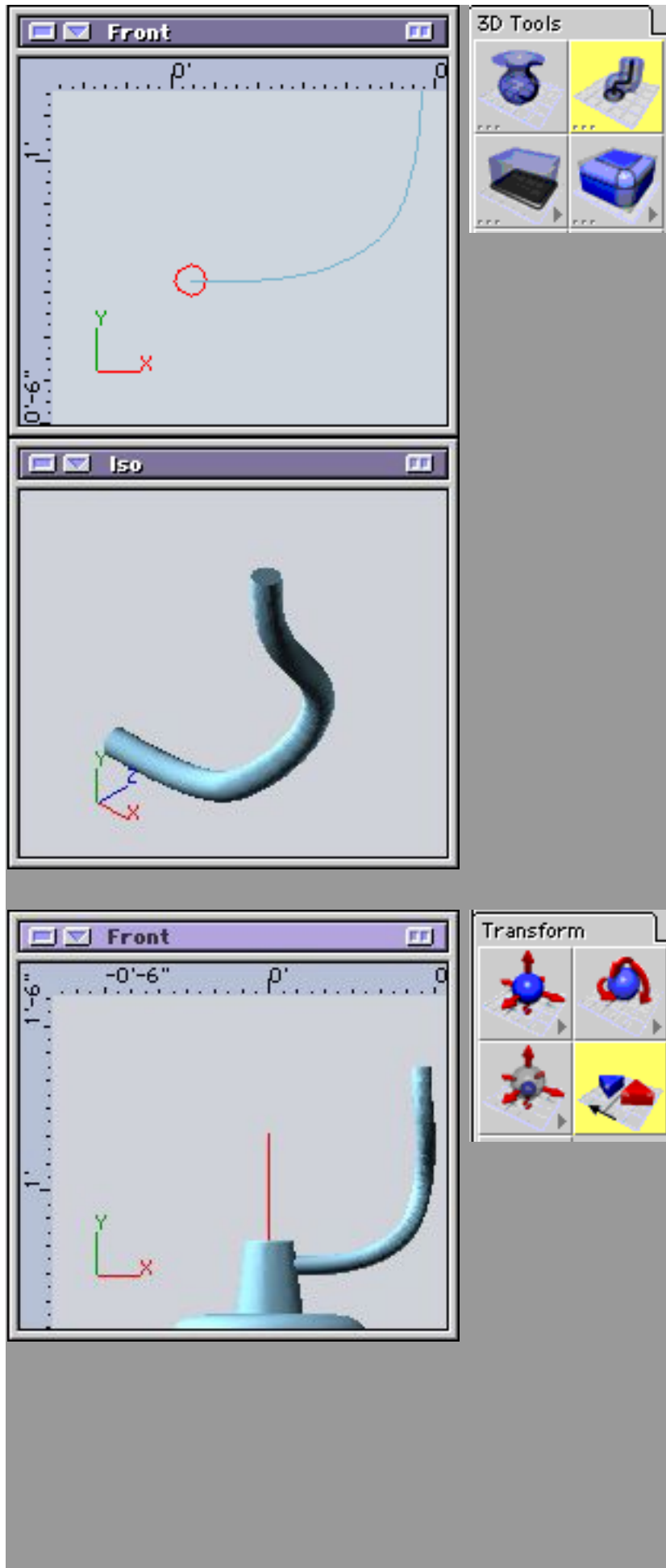
When you are done in the Front View, you will probably notice that this curve was drawn on the **Z=0** axis, meaning that the curve is **behind** where you need it to be. Again, this can be fixed using custom Workplanes.

- In your **Left View**, select the curve, select the **Move Tool**, hold down the '**Z**' key and drag the wire so that it is in the middle of the **Base**.
- While still in the **Left View**, select the **Bezier Edit** tool and edit that



points on the curve as shown. Be sure to constantly check the **Front** view as well to make sure things are staying put there.

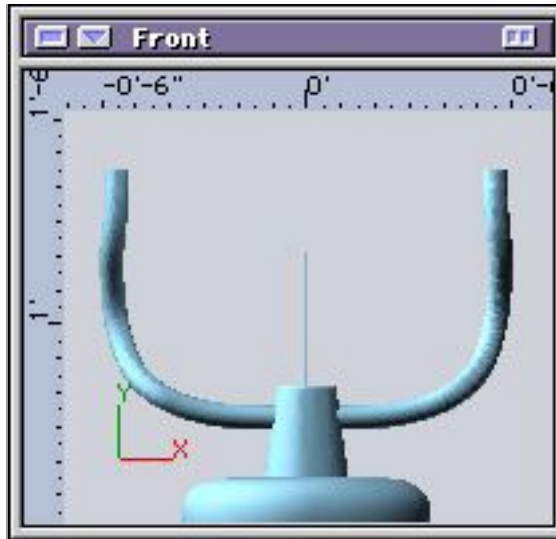
- Once you have the curve to your liking, grab the **Circle Primitive** from the **Curve Primitives** palette.
- In the **Front View**, draw a small circle for our cross section.
- Turn **Angle Snapping** on, and grab the **Rotate Tool**.
- In the **Front View**, hold down the 'Y' key and rotate the new circle until it is perpendicular to the view.
- Grab the **Sweep Cross Section** tool from the **3D Tools** palette.
- Click on the **cross section circle**, and then on the **bezier path**. This should create a nice curvy arm.
- From the **Curve Primitive** palette, grab the **Line Tool**. In the **Front View**, draw a line right down the center of the base you have already created.
- From the **Transform Palette**, select the **Reflect Tool**.
- Select the **Swept Arm**, and double click on an



empty portion of the screen. Then, click on the line you just drew. Modeler will "mirror" the one arm using the line as the mirror axis.

Name your objects and clean up the Layers Window.

OK, we're almost done with the Eye piece. In the next section, we'll finish it up.



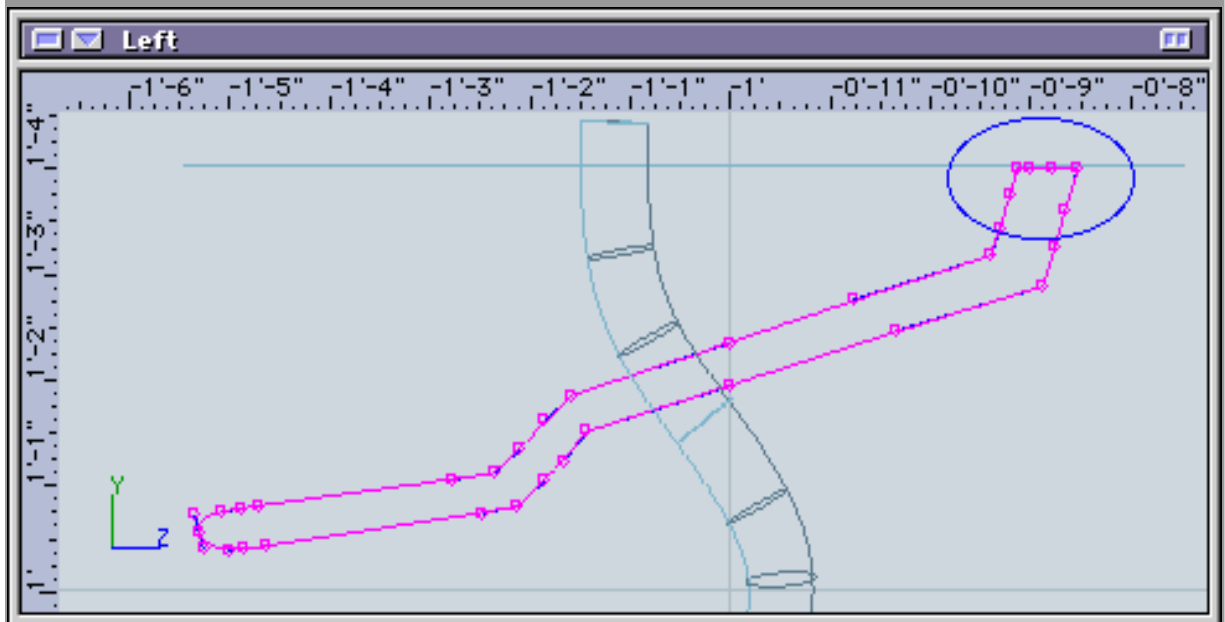
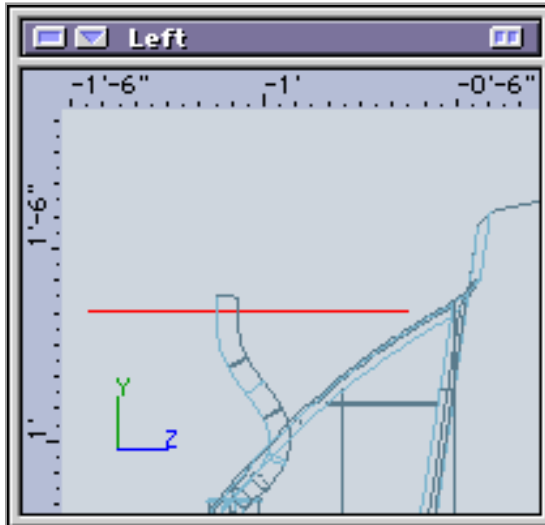
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Eye II

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Well, only a couple of small pieces left for the eye. We need to add the camera eye itself, a lens to see with, and some bolts to hold the eye to the base arms. We'll create the eye and lens by doing a revolve, and then modify it with the non-uniform scale. The bolts will be simple cylinders.

- Hop into the **Left View**, and grab the **Line Tool**.
- Draw a line that will be the approximate center of the eye piece. This will act as a visual reference while we draw, as well as the axis of revolution for the object itself.
- Turn off **Grid Snapping**.
- Grab the **Bezier Create**



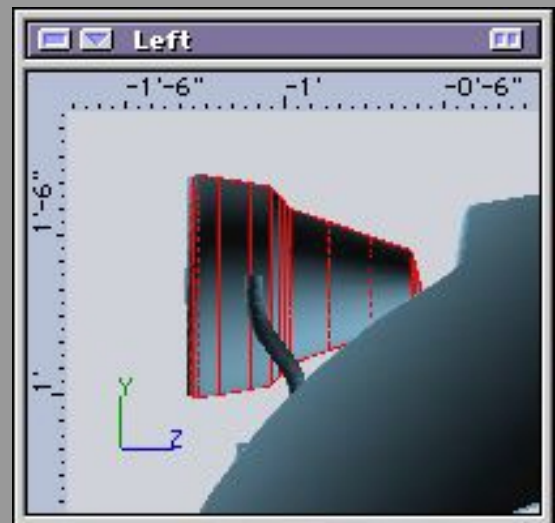
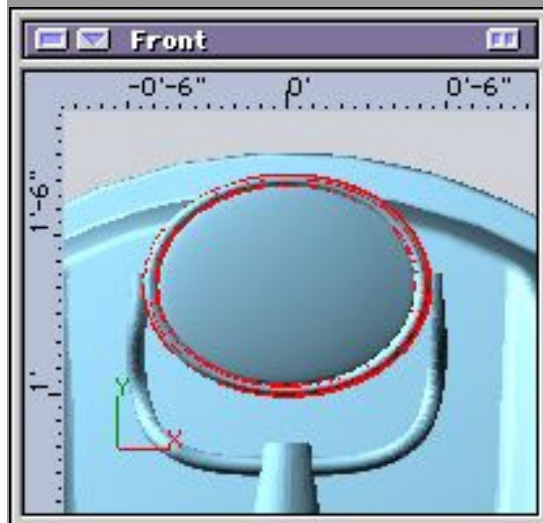
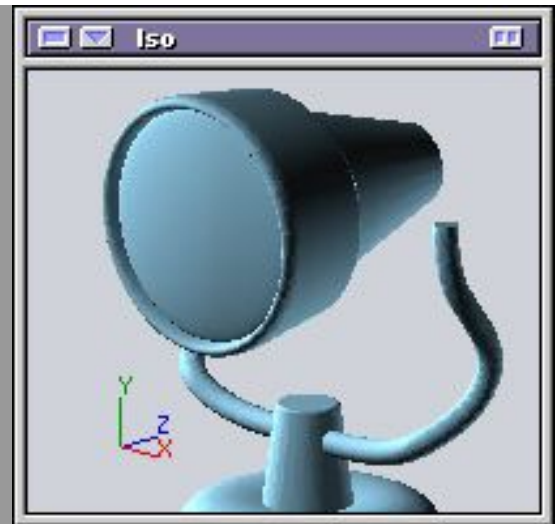
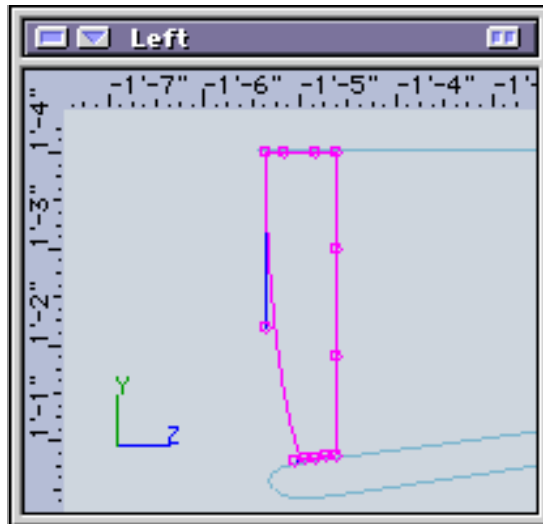
tool.

- Draw the general outline as shown.

*Note: Once you get the basic shape that you like, pay particular attention to the point at the back of the eye that is close to the axis of revolution. This point should be **very** close, but not touching the line itself. If you need, zoom way in and move it real close.*

Note 2: This obviously can be refined, things like creating soft edges, etc. This is just the basic idea. Edit to your liking.

- Once you like your outline, grab the **Revolve Tool**. Click on the **bezier outline**, and the the **axis line**.
- While we're here and still have that revolve axis, let's quickly draw the **Lens**.



- Grab the **Bezier Tool** again and draw another outline as shown.
- Using the **Revolve Tool** and revolve that outline around the center axis line.
- You should have something like what's shown.

Some more notes: We created the lens object by revolving the bezier wire around that center line. In absolute terms, since the bezier was not sitting on the revolve axis, there is a slight "hole" in the lens. If I were creating something that was made out of glass or clear plastic, where transparency, reflection, etc. were essential, I probably would not of used this revolve technique. In our case, the absolute precision of this piece is not essential, so I used this method.

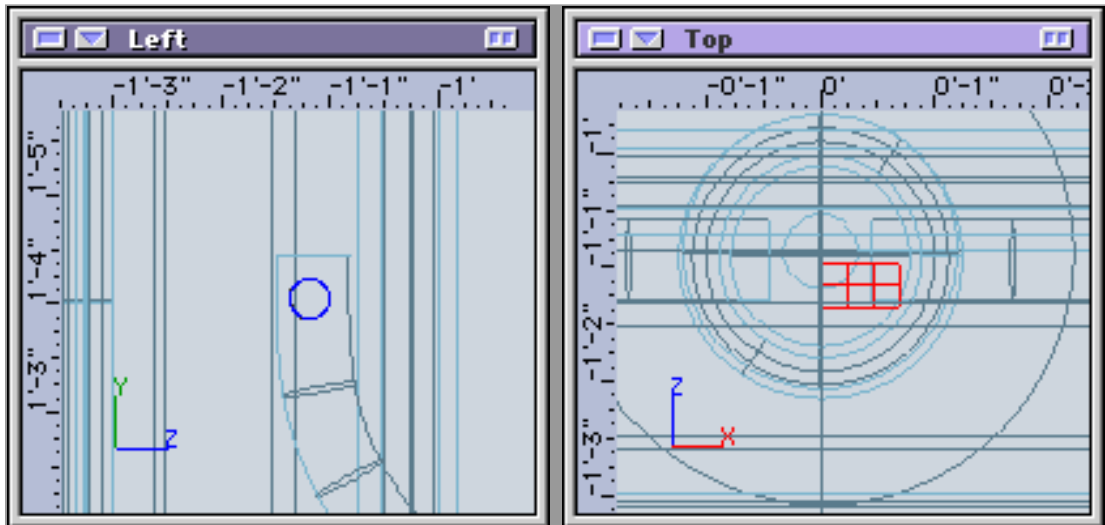
Well, this still doesn't

look very good, because the eye does not fit within the holder arms. We need to scale the eye and lens to fit better within the holder.

- Select the **Eye** and **Lens** objects.
- Grab the **Scale Tool** and begin scaling the object to your liking. Hold down the '**X, Y, or Z**' keys to scale in one axis. With no keys held down, it will universally scale the objects.

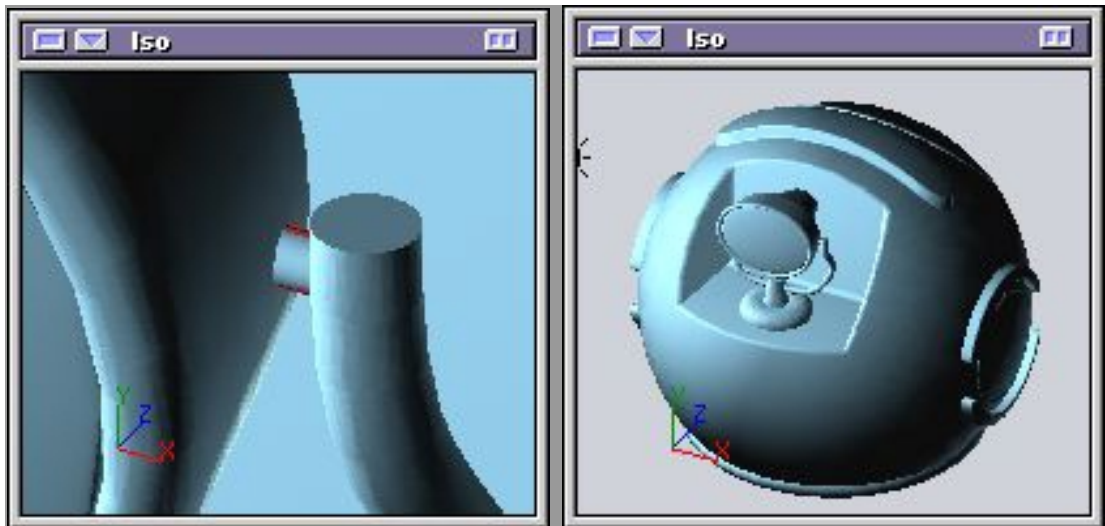
Well, we're finally here, the last little step for the eye portion of our droid. All we're going to do here is create two little bolts that will attach the eye and lens to the arms. Nothing tricky here, just two cylinder objects.

- Grab the **Cylinder Tool** and in the **Left**



View, draw a small circle, make sure it's centered in the top of the arm object.

- Switch to the **Top View**, and drag out the cylinder until it's a few inches long.
- Once it's drawn, grab the **Move Tool** and move the little bolt over until it is intersection the arm and the eye.



Maybe I should read up on the workplane tool, so I don't have to keep moving objects around after I create them ;-).

All we need to do is duplicate this one bolt to the other side. Now, if you have been saving your wires like I recommended, you should already have a line representing the reflect axis that we used to reflect the arms. If you don't, create a straight line that runs down the

center of the eye from the front view.

- Grab the **Reflect Tool**, click on the **bolt**, double click in empty space, and click on the **Reflect Axis**.
- That's it! We're done with the Eye.



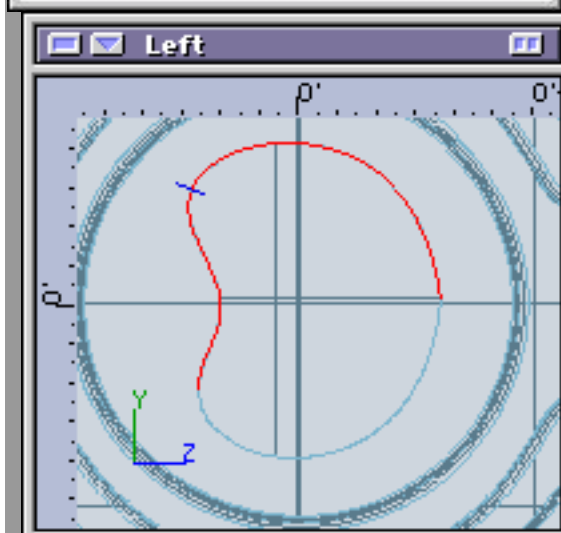
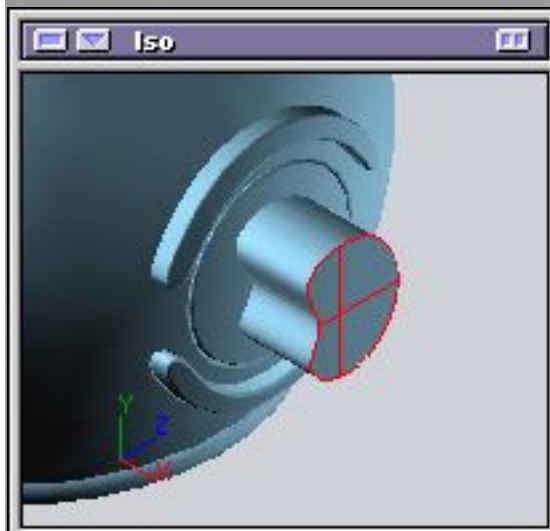
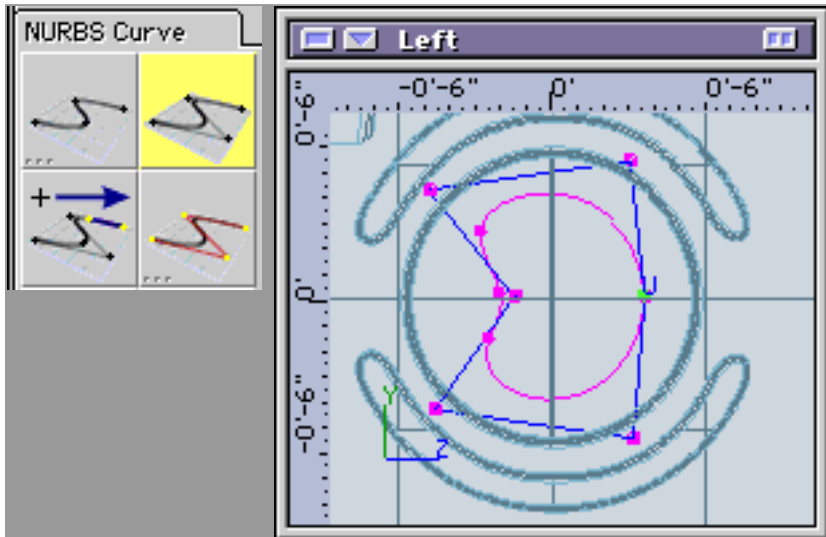
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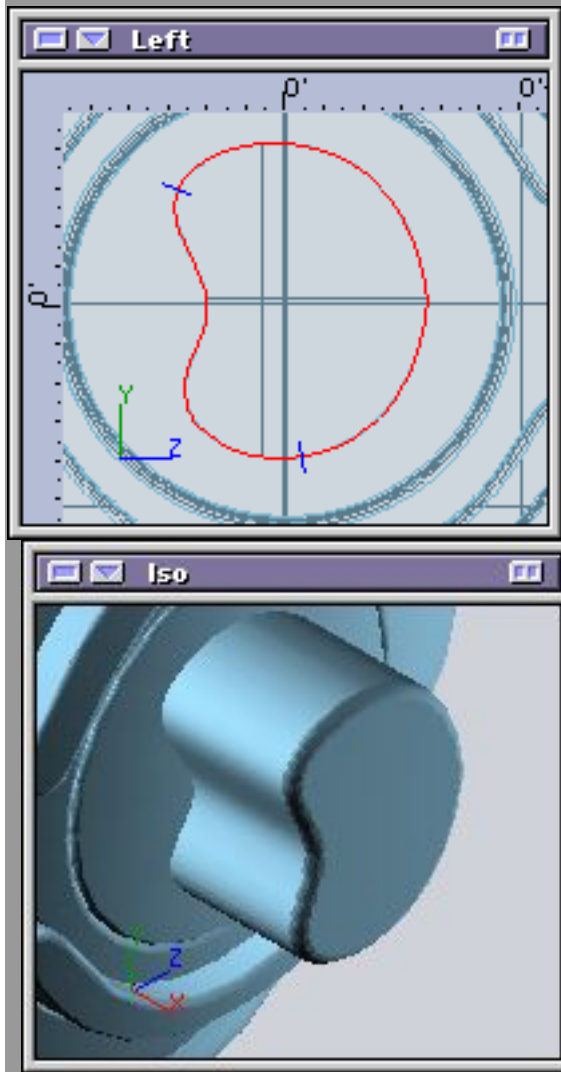
Arms

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Almost done folks, just have to add some arms to this puppy, then we're done with the modeling portion. It's been a fun trip. If you have managed to stay with me so far, I'm going to try and breeze through this section a little faster without as much detail. It will allow you to practice up some yourself, and hopefully allow me to finish the arms in one page ;-)

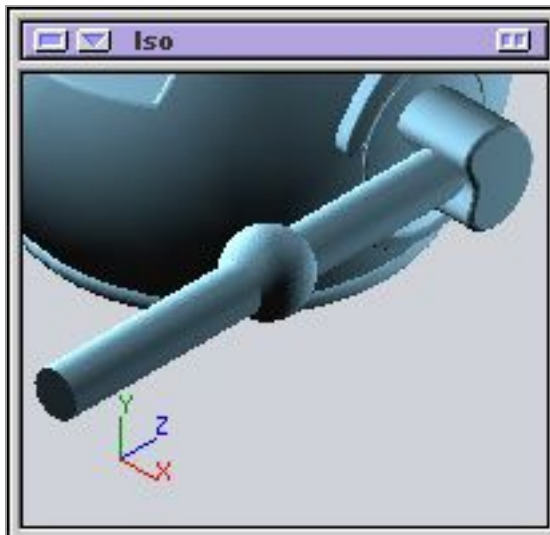
- In the **Left View**, draw a **NURB Curve From CVs** as shown.
- Grab the **Extrude Tool**, and extrude this out a couple of inches.
- Move the new object, so that it extends out of the left side of the body.
- Set your **Pick Filter** to **Edge** and bevel the edges with a nice big bevel. *Note: Remember to watch the other views as you select edges to bevel. In this case, you will have to make sure all of the edges of the outer loop of the object are selected **before** doing the bevel.*





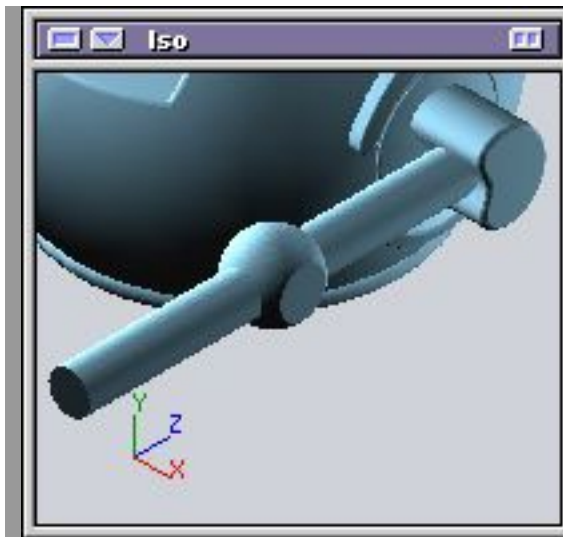
Well, now that the shoulder is in place, let's move on to the arms. These are going to be pretty simple primitives, some with a little tweaking

- From the **Front View**, add a cylinder, acting as the upper arm.
- At the end of that column, add a **Sphere** for the elbow.
- Add another **Cylinder** as the lower arm.
- Draw two **Straight Wires** on either side of the elbow, and then use the **Wire Knife Tool** to slice off the outsides of the



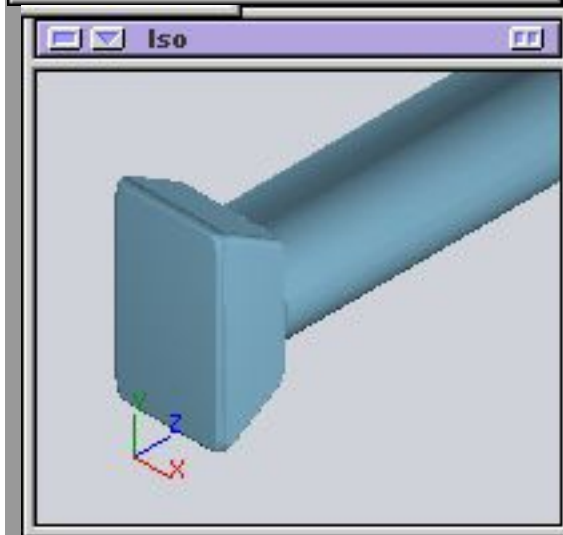
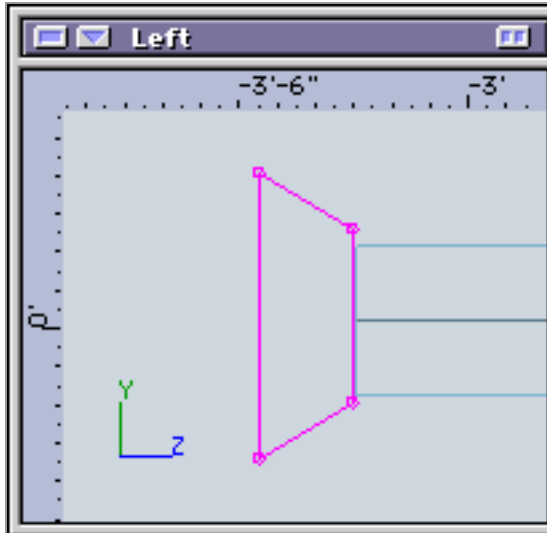
sphere.

- Apply a little **Bevel** to make it look good.



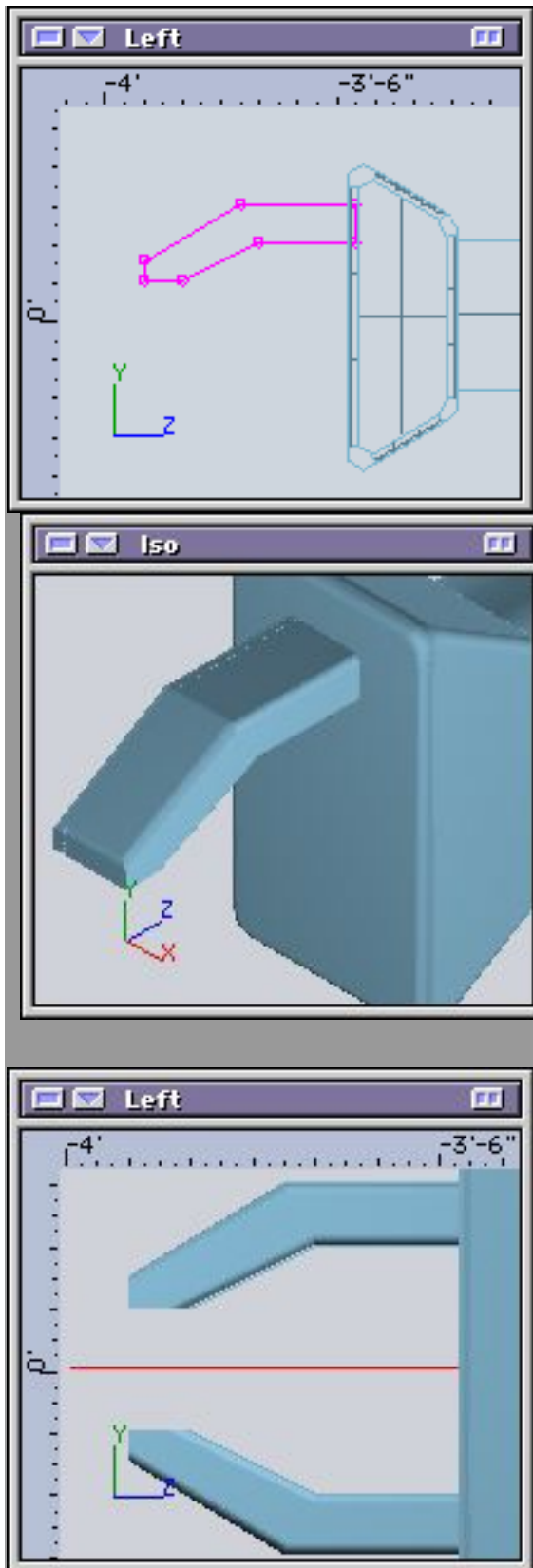
OK, now we need some hands and fingers. We'll do a simple claw like appendages that will allow our droid to pick up objects and perform simple tasks.

- In the **Left View**, select the **Polyline Tool** and draw an outline like the one shown.
- Using the **Extrusion Tool**, extrude this out a little.
- Move the new object, so that it lines up with your new arm.
- Grab the **Bevel Tool**, set the **Pick Filter** to **Body** and bevel away.



It's finger time! Pretty much same technique. Polyline, extrude bevel.

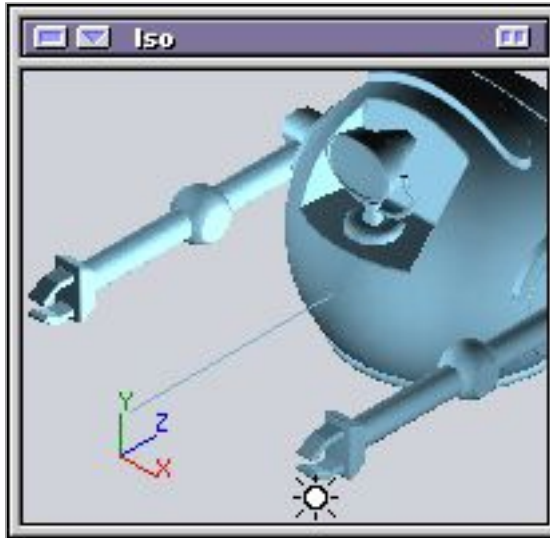
- Using the **Polyline Tool**, draw the outline of one of the claws.
- **Extrude** this. and **Move** into place.
- **Bevel** to your liking.
- Draw a **line** for doing a **Reflection**
- **Reflect** the claw to create the second one.



Last but not least, we simply need to reflect the completed left arm over to the right side and we're done!.

- Draw a **Line** in the **Top View** along the **Z axis**
- Select the **Reflect Tool** and select all of the objects that make up the left arm (Shoulder, Upper Arm, Elbow, Lower Arm, Wrist, Upper Claw and Lower Claw).
- **Double click** and then click on the line you created.
- The complete arm should get duplicated.

Note: Watch your object names when you do copies and reflections. Go back and fix them now to eliminate headaches later on.



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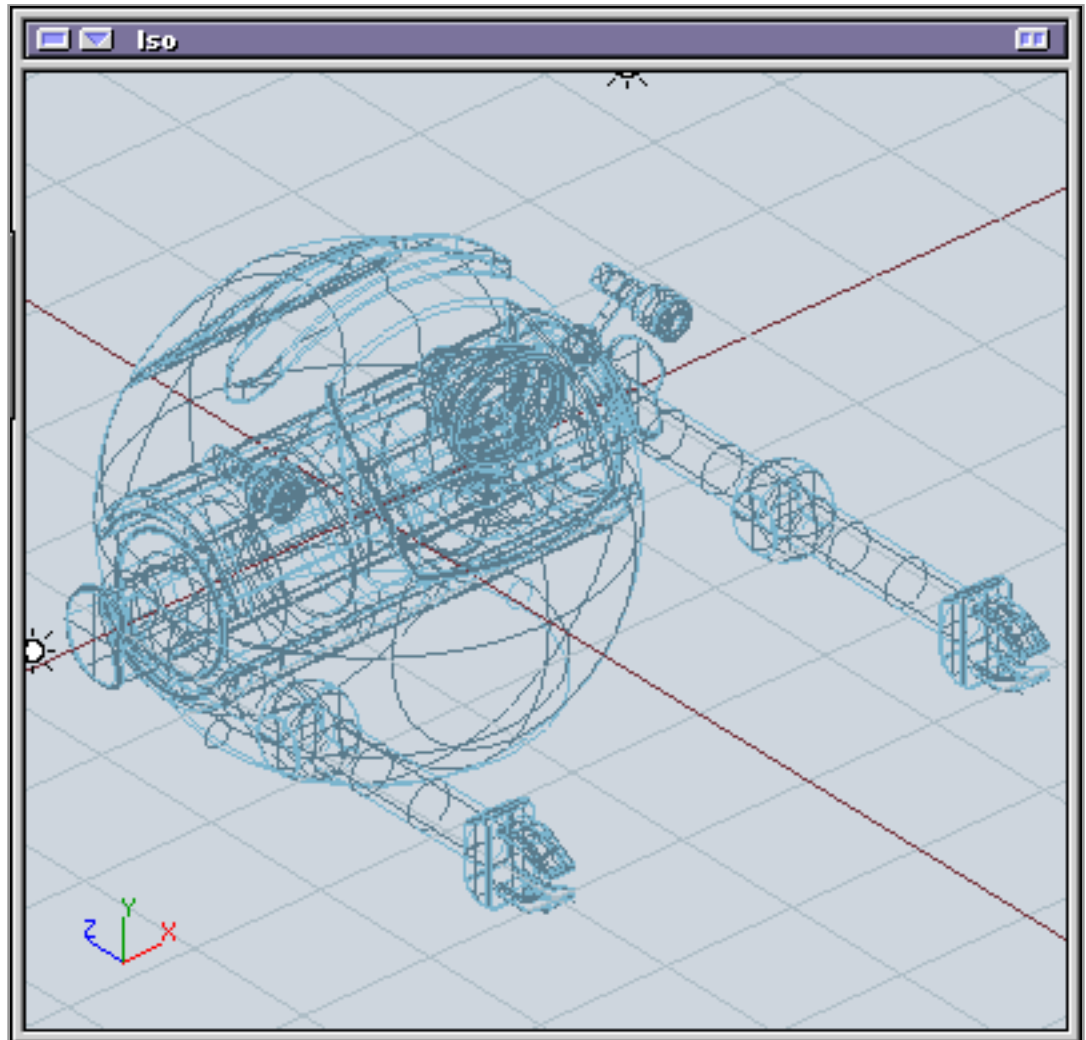
Done!

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Well, that just about finishes up our droid, at least the modeling portion. As you can probably see, you can accomplish a lot with some basic techniques and tools. Modeler is a very deep tool set, and there are many ways we could have accomplished a lot of this model. The steps I chose tended to be using the simpler tools and object types.

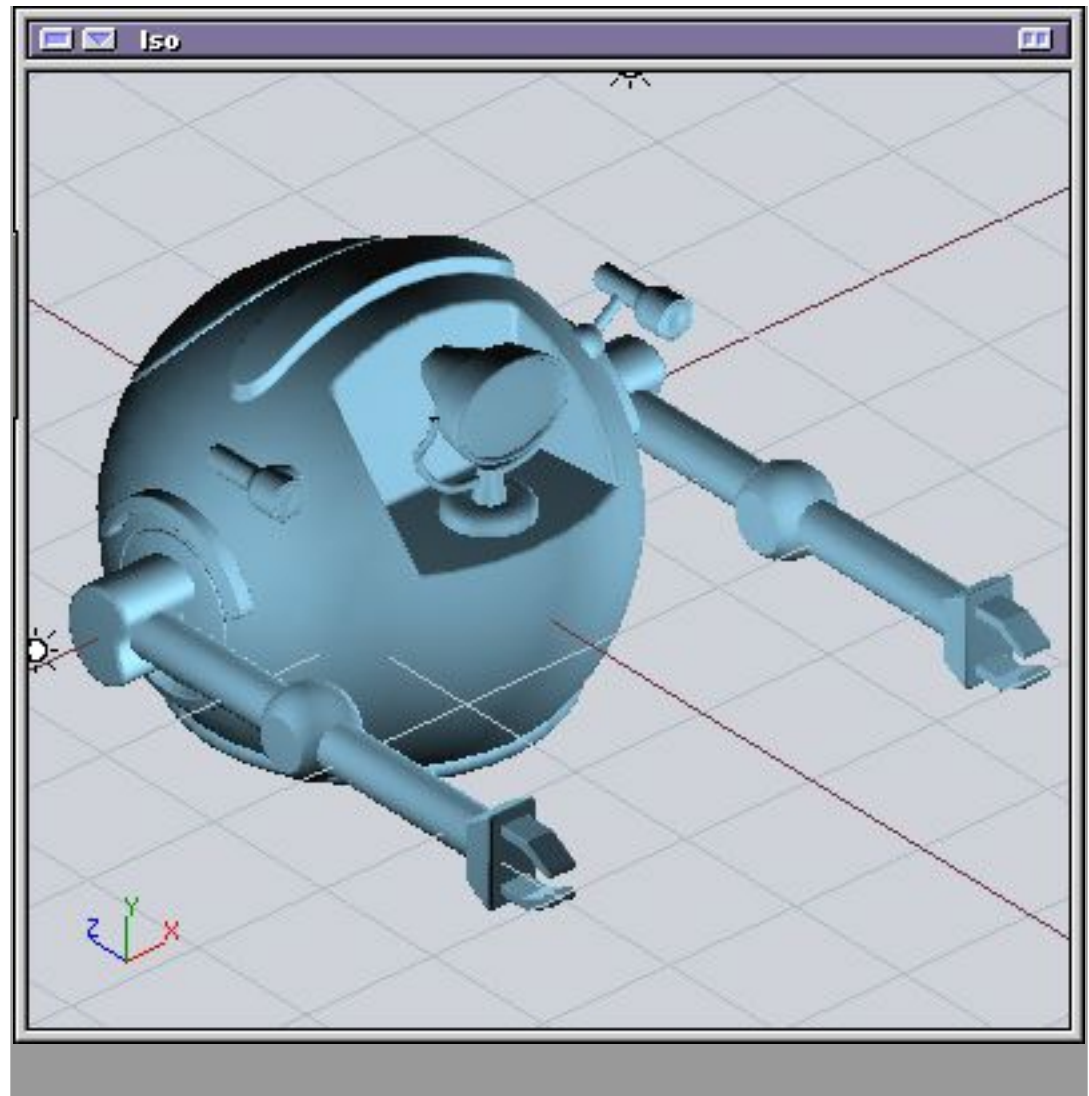
Many things help determine how best to model something. How are you going to shade it? How close you are going to get to it? Is it going to animate? If so, are you going to use bones or skeletons? All of these questions come into play when modeling, and as you garner more experience, you will learn which questions are important to you and which are not.

I can guarantee that on more than one occasion, you will be in the middle of shading or animating and realize that you should have modeled something a little different. Unfortunately, since Modeler and Animator are separate apps, this can sometimes cause problems. Plan ahead, and



always save your construction objects, and you can usually recover pretty quickly.

Well, I hope to continue this series with shading and then animating. Hopefully I can find the time to do so. Until then, happy modeling!



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