Build a Sea Scorpion with Subdivision Surfaces in Carrara Studio 2

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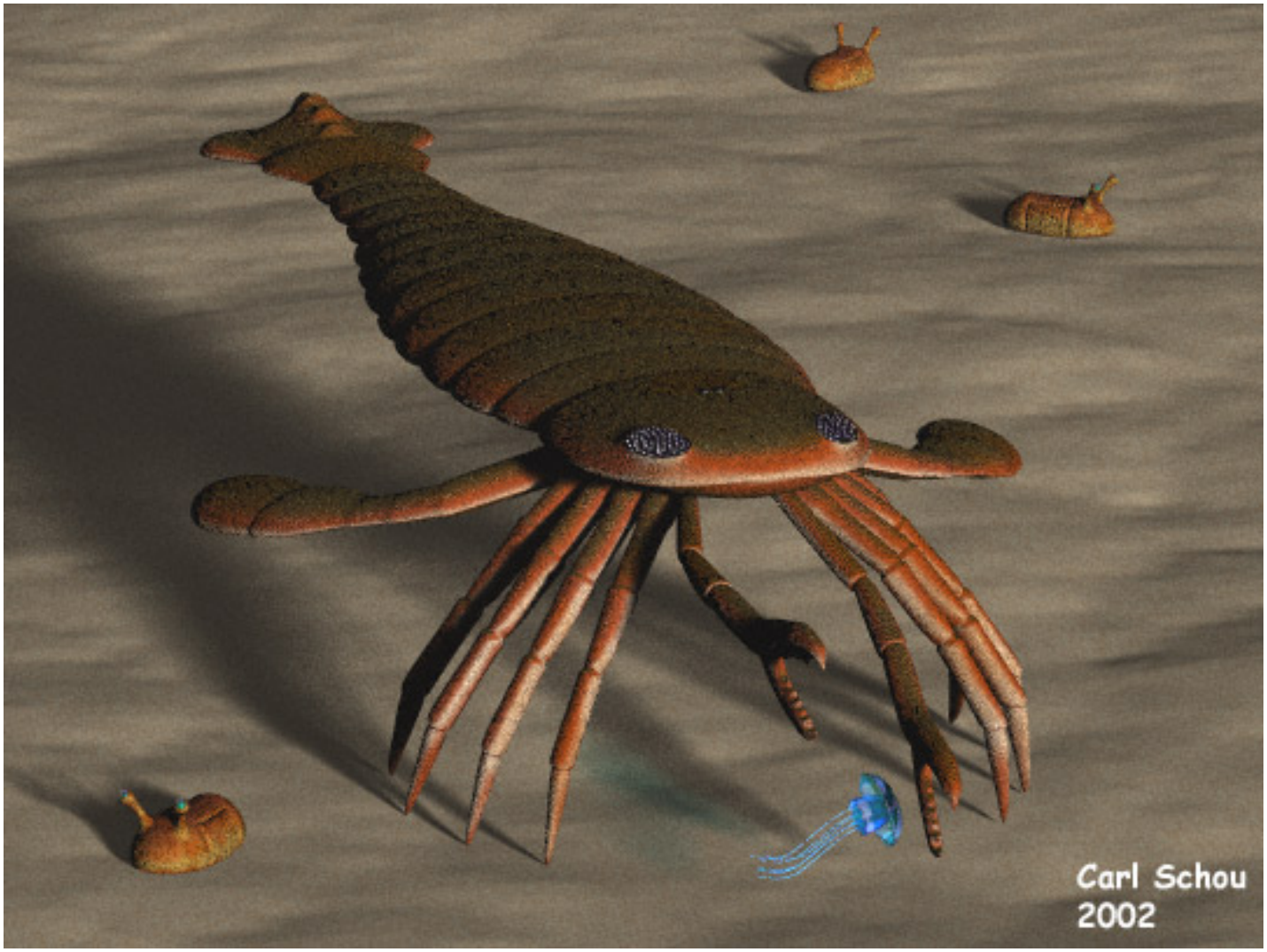


The Crawdad of the Apocalypse

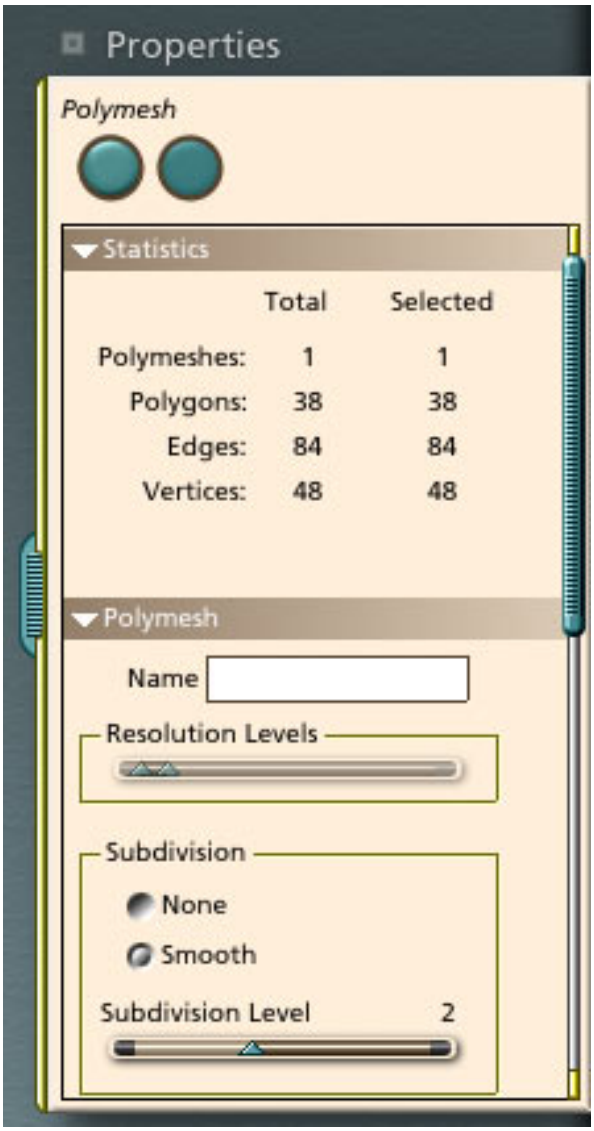
The picture shown above is dedicated to anyone who enjoys dining on lobster, Crawfish Ettoufe, or seafood in general. It is a prehistoric Sea Scorpion and it is the subject of this month's entry into the digital domain.

We will start with a quick look at Subdivision Surfaces and how they are implemented in Carrara. We will also cover some background on the Sea Scorpions before we begin the modeling process.

Subdivision Surface Modeling

One of the new features in Carrara Studio 2 is Subdivision Surfaces. This is a modeling technique that allows the user to build a complex surface using a simplified wire-frame model, whose vertices act as control points. The name Subdivision Surfaces derives from the fact that they are based on the binary subdivision of the uniform B-spline curves and surfaces.

In Carrara, Subdivision Surfaces are turned on from within the Vector Modeling room. All you need to do is to select your model, open the Polymesh section of the Properties tray at the right side of the screen, and click the button labeled "smooth" in the Subdivision section as shown below.



Background on the Sea Scorpions

The Eurypterids, also known as Sea Scorpions, were primitive arthropods whose closest living relatives are the scorpions. They lived approximately 400 million years ago and ranged in size from 10 centimeters (4 inches) to over 2 meters (6.5 feet) in length, making them one of the biggest predators of their day. One of the largest known species is called Pterygotus buffaloenisis, and that's what we'll be modeling here.

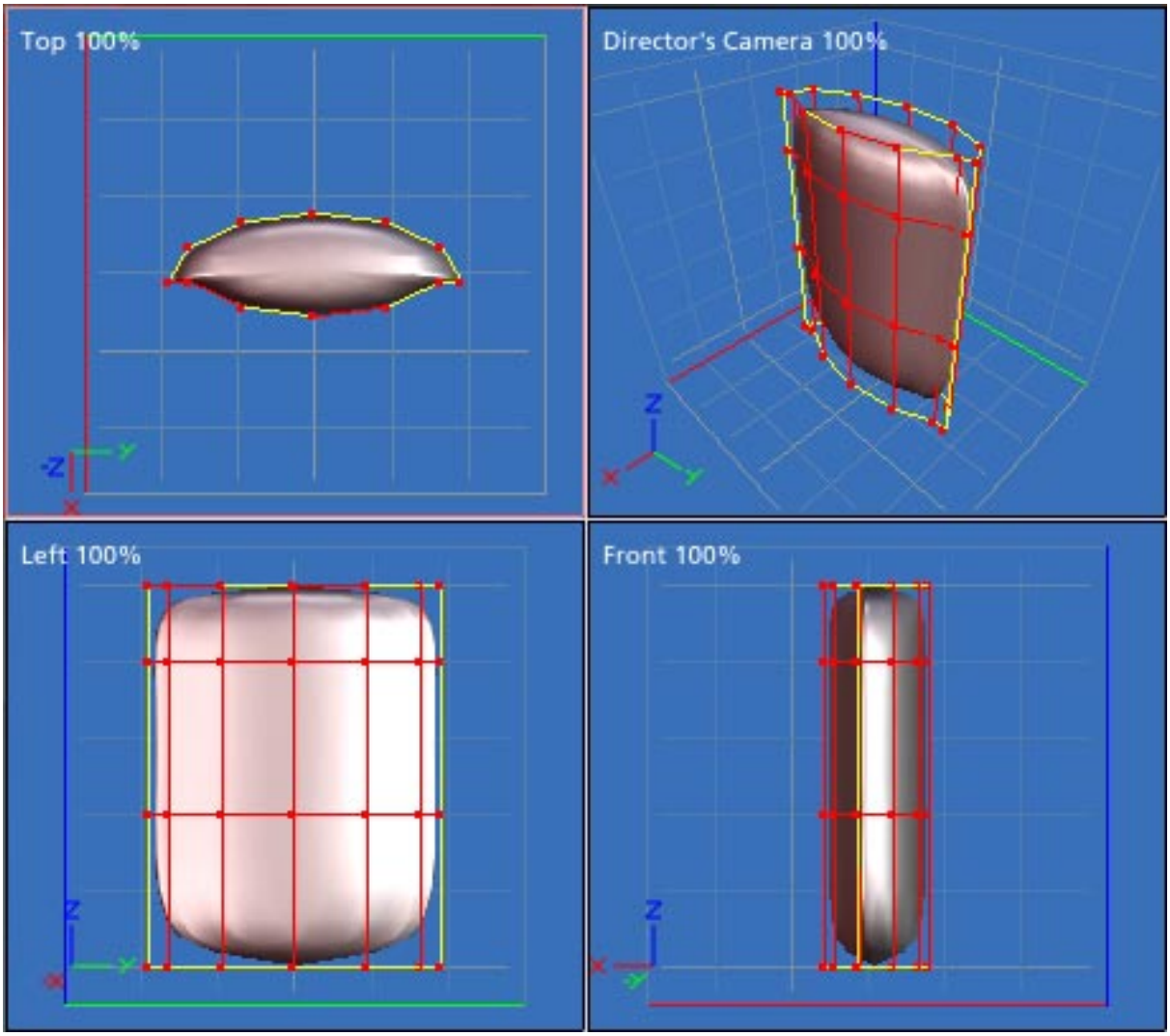
Sea Scorpion Modeling Strategy

Before beginning work on this project, it is recommended that you read through this tutorial so that you will know where each step is heading. Some reference images can be found on the internet by following the links given at the end of this tutorial.

To create our Sea Scorpion, we will build a simplified wireframe model in the Vertex Modeling room with Subdivision Surfaces turned on. To get the insect-like segmented effect, we will tuck each body part slightly inside the next body part, being careful to avoid overlap. We will start with the body, building it segment by segment, then add the tail, the head, the compound eyes, the flippers, the legs, and the pincers. The last part to be added will be the simple eyes. Only one object will be built for each type of part. For example, a single leg will be built, then duplicated with scaling and symmetry to get all eight legs.

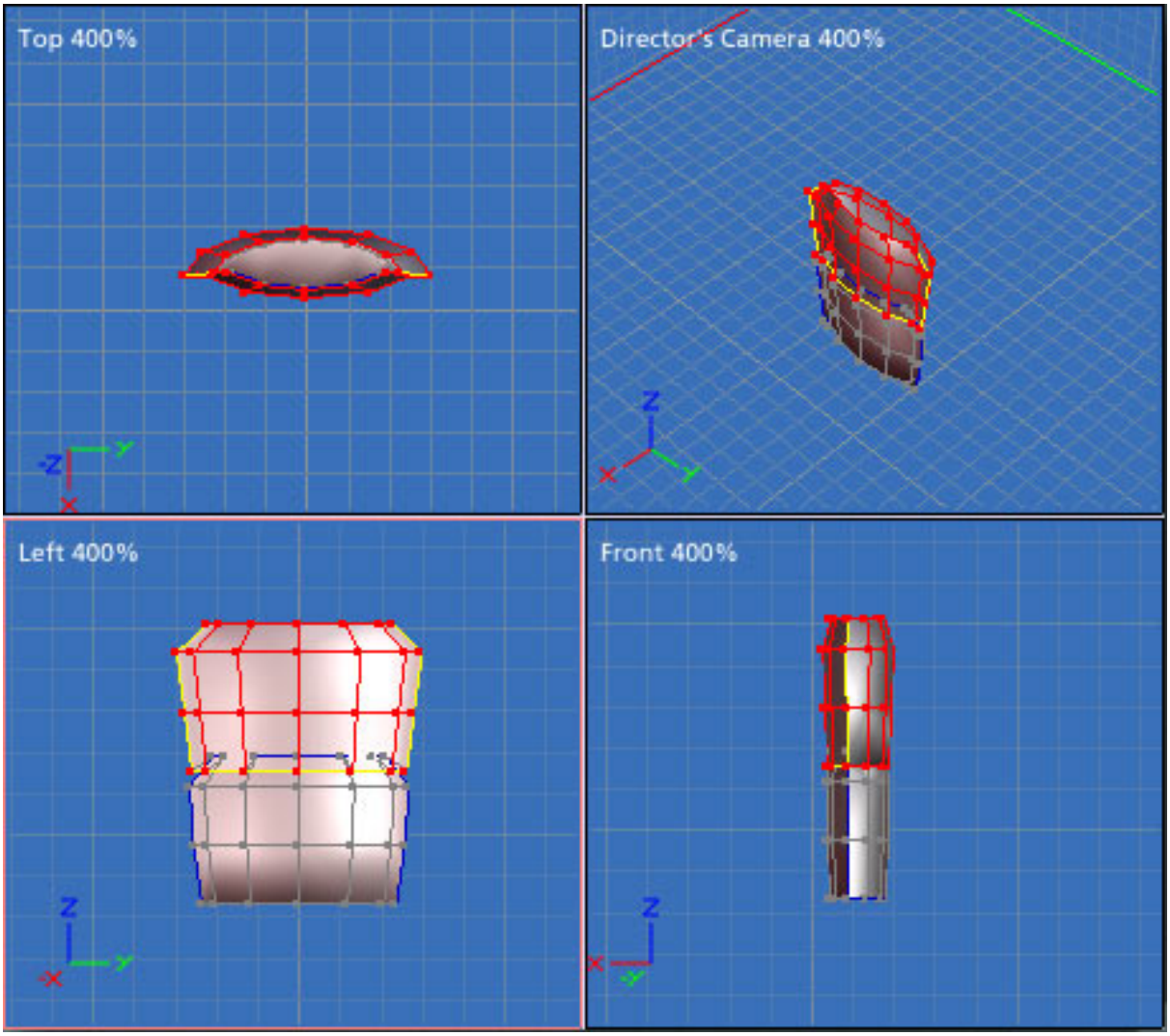
Building the Body

To begin, we open Carrara and start a new document. Create a vertex object by dragging the vertex symbol into the Assemble room workspace. This will put you into the Vertex Modeling room. Now create a circle with 12 vertices. If you're set up for the quad view, the circle will be facing you in the Top view. With the whole circle selected, scale it down in the X direction to get an oval shape. Select just the bottom 5 vertices and move them up a little as shown in the Top view of the image below. Next, select all 12 vertices and extrude them upward for a distance of 2 units. Extrude them again for 2 units, then extrude them for 1 unit. You should see something like the image below.

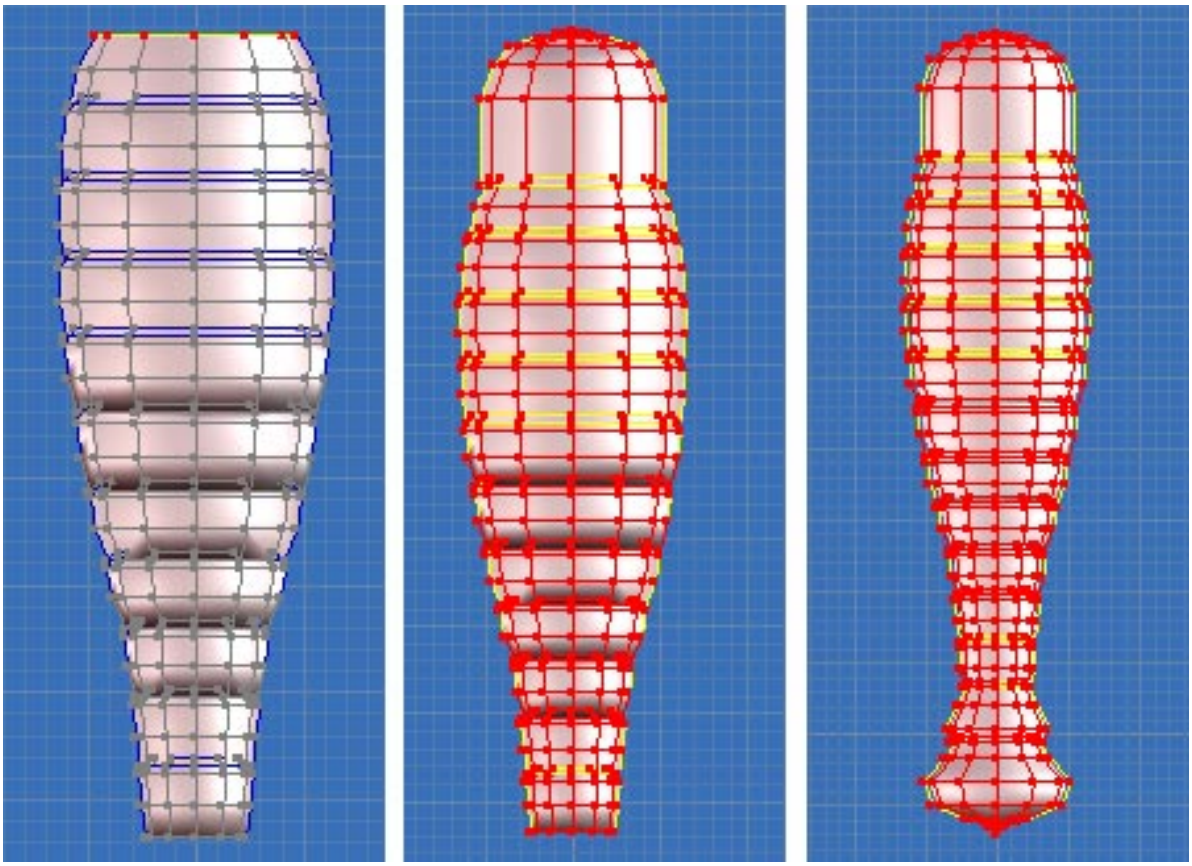


Now we are going to scale down and shape the first body segment a bit and then add the second segment. With everything selected, scale the model down to the size shown in the Top view of the image below. Hold down the Alt key while scaling to lock the XY scale. Any scaling done in this tutorial will be done this way unless otherwise noted. Using the Left view, select and scale each of the four rings of vertices until it looks like the grayed-out (unselected) portion of the model in the image below.

Next, we add the second body segment by extruding it from the first. Select the top ring of points and extrude them downward for a short distance. Enlarge these points to get them back to their original size and extrude upward. Enlarge them and extrude them upward again, then extrude them upward for a short distance. Shrink the new top ring of vertices down about 85%. You should see something like the image below. Note that for this image, the second body segment is selected for illustration purposes.

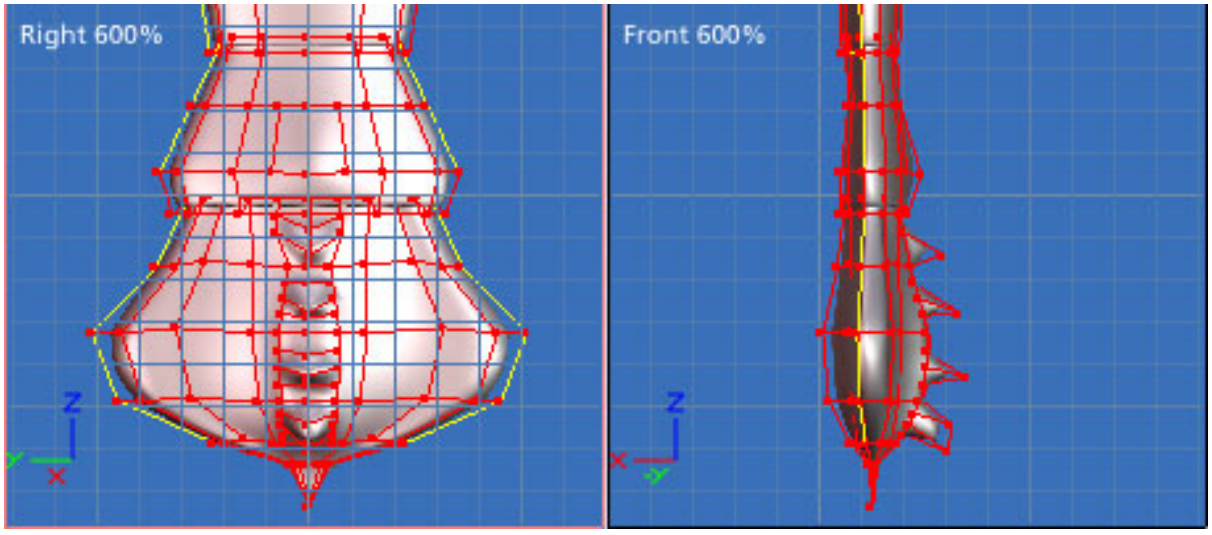


Continue the sequence described above to build the body as shown below left. The head has been added in the image below center and the tail has been added in the image below right. Remember not to leave an open tube at either end of the body. Scale the vertices down to nearly a point, then weld them together.



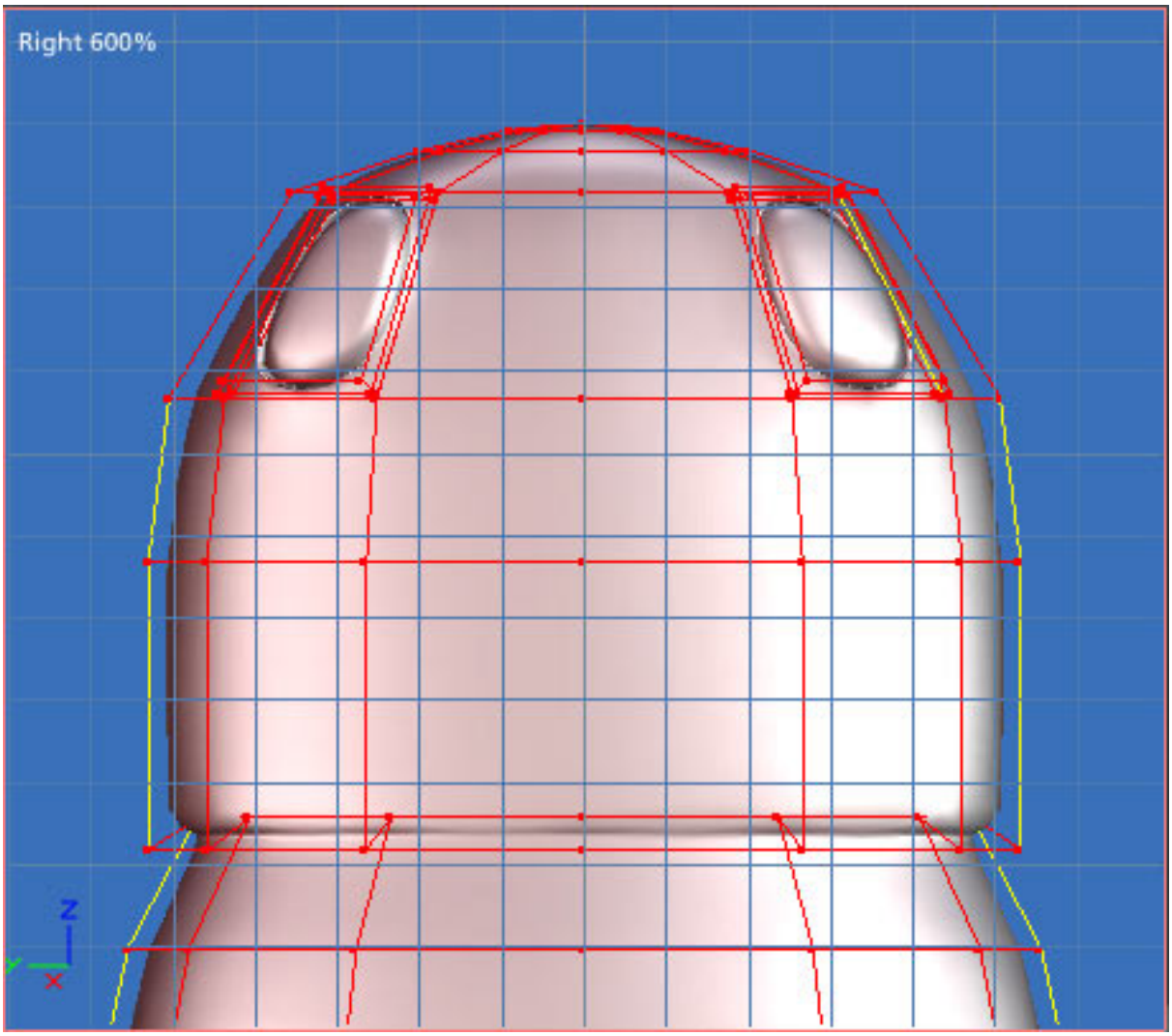
Giving Detail to the Tail

The tail, or telson, of this species of Sea Scorpion had short spikes running down the top centerline. To model these, we need to increase the control mesh density by adding vertices to the model as shown below. This may be done using the Add Point tool, or by selecting two adjacent points, then clicking Edit>Subdivide. When you have the extra needed points, connect them by adding edges. This is done by selecting two points and pressing CTRL+Shift+L. If you have difficulty selecting only two points, you can deselect the extra points by holding down the ALT key while moving the select marquee over them.



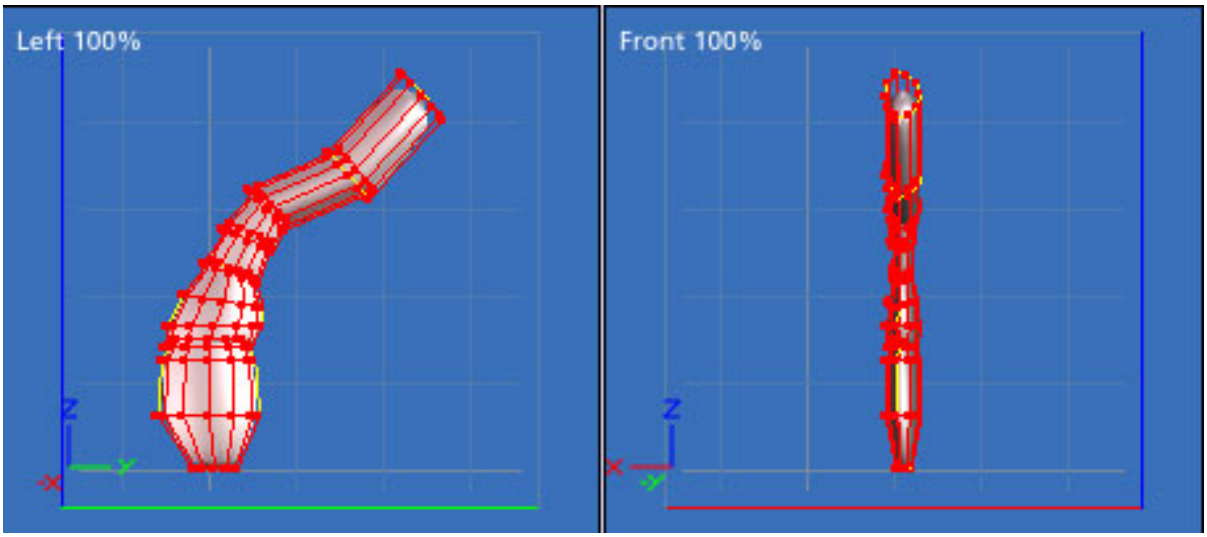
Adding the Eyes

To make an eye, select a rectangle where you will want the eye to be located. Extrude it outward a short distance and scale it down a very small amount. Extrude inward a little farther than the first extrusion and scale it down again. Extrude it outward a greater distance and scale it down again. Repeat this process for the other eye and the result should look like the image below.



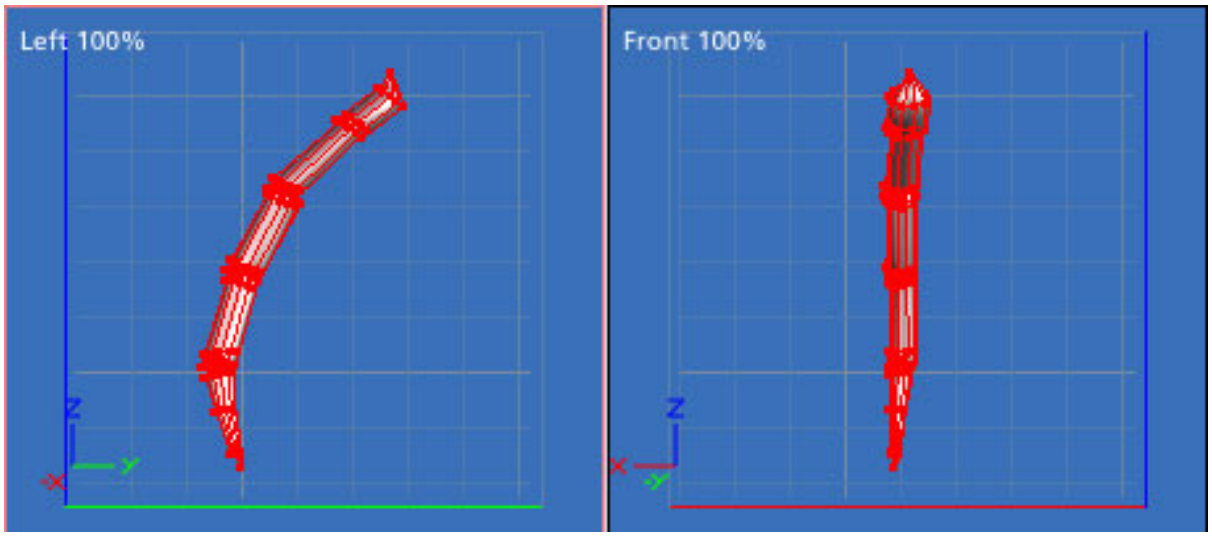
Building the Flippers

To build the back flipper, we take one of the cross-sections from the body and repeat the process of extruding and scaling as shown below. Remember to articulate the joints by using the same tucking process we used for the body.



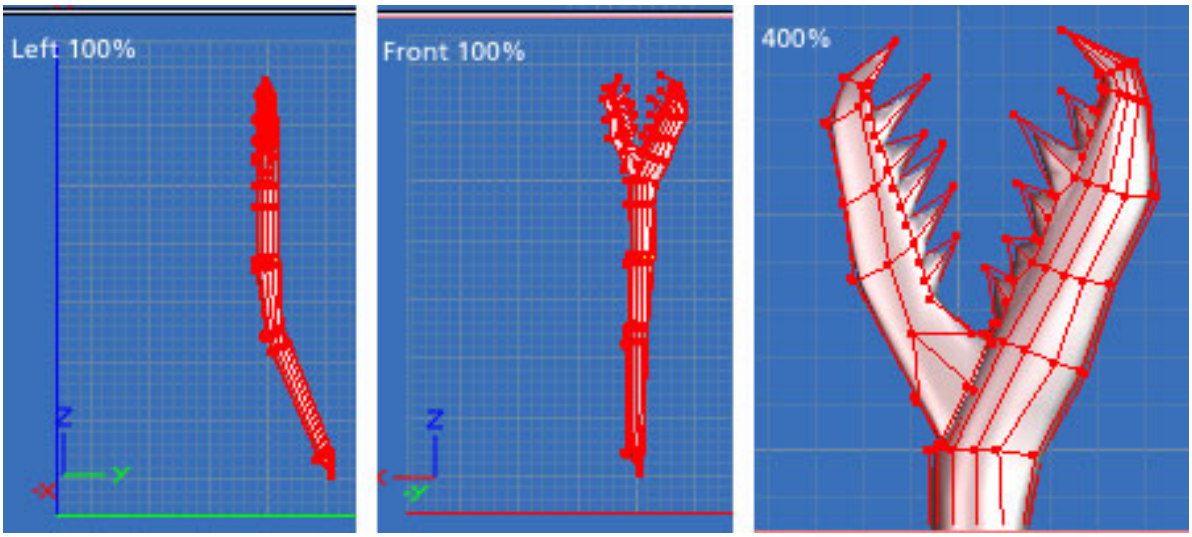
Building the Legs

To build a leg, we again start with a cross-section from the body. This is scaled up in the Y direction to make it rounder. You will see there are two pairs of tucked vertices which will form a seam we don't want along each edge of the leg after extruding. Select one pair of the vertices and weld them together. Repeat the weld for the other pair of vertices. Now perform the same scaling and extruding process to create the leg.



Building the Pincers

To build the pincer, start from one of the cross-sections developed for the leg. When you get to the joint in the claw, perform the same trick of extruding in, scaling down, and extruding out to give the appearance that the smaller claw part is inset into the larger. Add the spikes on the inner edges of the claws using the same process that was used for the spikes on the tail.



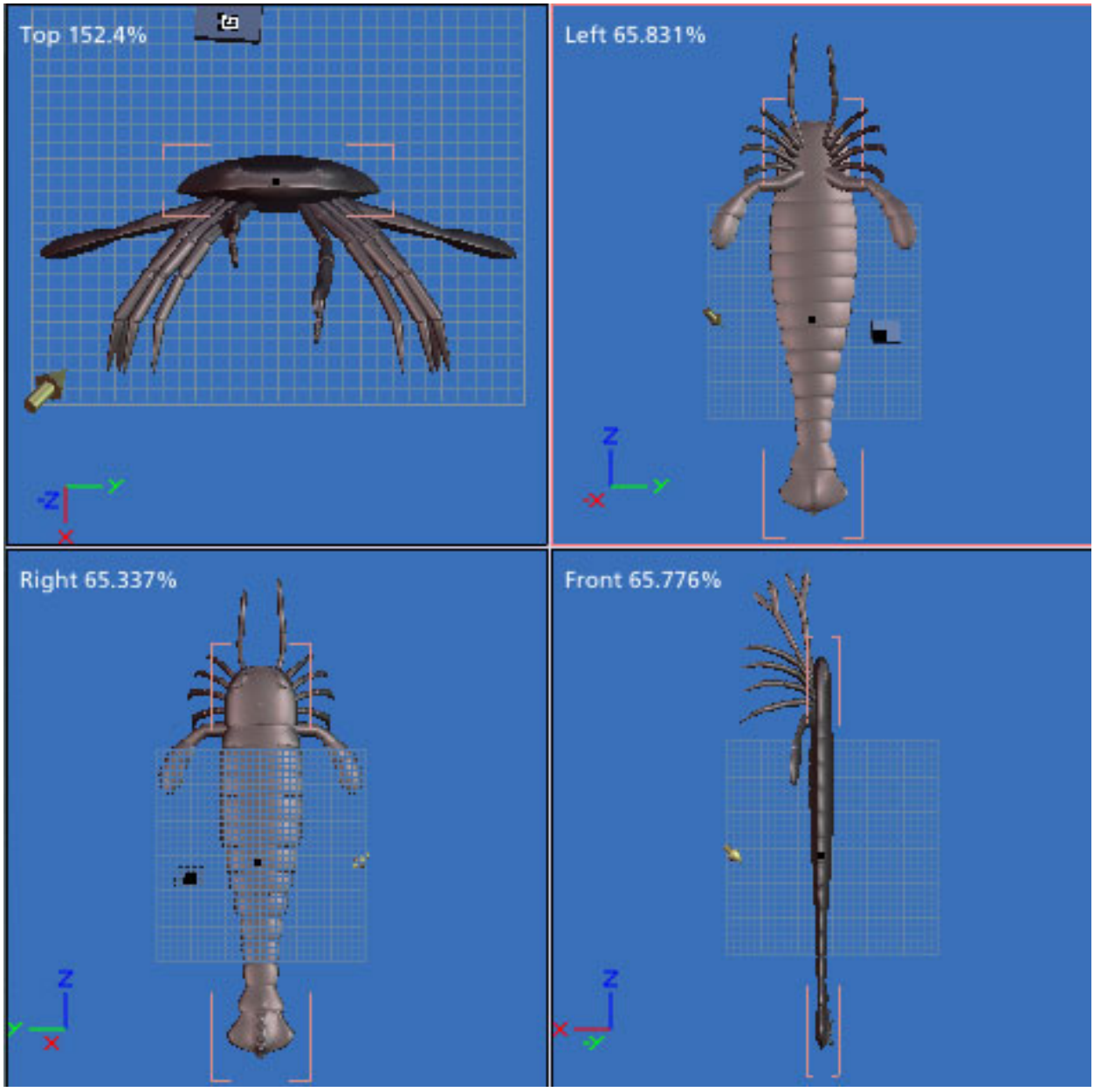
Putting it All Together

Now comes the fun part, putting it all together. Go back into the Assembly room and start adjusting the sizes on the body, flipper, leg, and pincer. Using the Properties Tray, make sure that the body is centered at Y = 0.0. Move and rotate the flipper into position on one side of the body as shown. Then use the Duplicate With Symmetry function in the Edit menu to mirror the flipper around the Y axis. Repeat this process with the pincer in the front of the body. Select the leg, then move and rotate it into position on one side of the body and Duplicate it three times. Apply a bit of scaling so that the legs get smaller towards the front of the body. Now use the Duplicate With Symmetry function around the Y axis on each leg to produce a total of eight legs. To save yourself headaches later on, you will probably want to rename each part in the Properties Tray as you go.

The last part to be added is the pair of simple eyes in the middle of the top of the head. In the Vertex Modeling room, create a sphere. Back in the Assembly room, scale

it down to make it tiny, and inset it into the top of the head a little off of center. Duplicate with Symmetry and the simple eyes are done.

Open up the Sequencer Tray at the bottom of the screen and make all of the other parts children of the main body part. This may be done by dragging each part onto the main body part in the Sequencer Tray.



Finishing Touches

When you see the parts all together, you will probably notice things that need adjusting. If a problem exists in all of the legs, you don't need to adjust every one of them. Simply edit one of them as a Master object, and any changes you make will be carried over to all of the duplicates.

Exporting Your Model

If you plan on applying textures and rendering your images within Carrara, then exporting your model is not an issue. Indeed, Carrara's rendering engine with Global Illumination really can't be beat. However, if you want to use your model with other 3D applications, you will find that the Subdivision Surfaces mesh does not export from Carrara as easily as do the other model types. There are currently two ways to export a Subdivision Surfaces mesh from Carrara.

The first exporting method is done entirely within Carrara. Select a part of the model in the Assembly and go into the Vertex Modeling room. In the Edit menu, click ConvertToOtherModeler and select Primitive for the model type. Again, click ConvertToOtherModeler and select Vertex for the model type. Repeat this process for each part of the model. When you are done, select all of the parts and export.

In the second exporting method, the simplified wireframe control point model is exported from Carrara and imported into another program. This second program regenerates the Subdivision Surfaces mesh, then exports the mesh. A free and easy way to do this is by using the Anim8or program, following the steps given below:

(1) Export the simplified wireframe control point model from Carrara as an OBJ file by selecting the model and clicking File>Export filename.

(2) Import the model into Anim8or by clicking Object>Import filename.

(3) Click on Build>ConvertToSubdivided.

(4) Click on Build>ConvertToMesh.

(5) Click on Object>Export newfilename.

Viola, you have an exported mesh ready for use in the app of your choice.

The Rest of the Picture

To produce the picture "The Crawdad of the Apocalypse", the Sea Scorpion mesh was exported as an OBJ file using the second process given above. It was imported into Poser 4 for grouping (eyes and body). The Jellyfish was modeled in Carrara using the Spline modeler for the tentacles and the Vertex modeler with Subdivision Surfaces for the body. The stalk eyed Trilobites were modeled in Organica and grouped in Poser. The models were then imported into Bryce for texturing and rendering.

So good luck with this project and I hope you enjoy it as much as I did. Right now, I've got a sudden craving for seafood, especially lobster...

Related Links

Carrara Studio 2 from Eovia

Subdivision Surfaces

Anim8or

Eurypterids: the Sea Scorpions

Pterygotus buffaloenisis

[RETURN TO TUTORIALS]