

Photo texture modeling

Mastering 3D Graphics ~ issue #2

LightWave ~ Bill Fleming

Creating realistic image maps for your models can be very aggravating, particularly if you are seeking something very detailed and complex. I've found that it's often easier to work backwards. That is, gather photographic source material and create a model to match the image. For example, when creating a brick wall the average 3D artist will simply take a stock brick wall image map and place it on a simple plane. While this is very fast, it's rarely effective at convincing the viewer that the object is real. Why? Simply because the object lacks depth.



Sure, you can place a bump map on the image map to create the illusion of depth but this won't hold water in the majority of cases. If you rotate the camera at any angle other than looking directly at the object you'll find the bump map will merely flatten itself out, making the object appear unrealistic. This can be a real problem when animating the camera in a scene. The object will go from realistic to unbelievable in a matter of seconds. [Figure 1](#) shows what happens when you use a simple image map on a flat plane.

Yes, the brick wall does look realistic at first glance but notice how the shadow from the newspaper dispenser is linear. It doesn't show a change in shape as it moves over the bricks. We also don't see the bricks casting any shadows because there is no physical depth to them. Of course, this image doesn't really show the true problem of using

flat planes because our camera angle is deceiving. Let's try rotating the camera a bit more and see what happens. [Figure 2](#) shows the result of viewing the wall from an extreme angle.

Notice how there is no depth to the bricks whatsoever. This simply won't do if you are looking to create a realistic image. OK, so what's the answer? Well, it starts with that source material you gathered. To create a realistic brick wall you'll need to use the image map as a template for creating a detailed model to match. Basically, you bring the image map into your modeling program and build the actual 3D bricks to match the image. Sure, it's more work but the results are amazing. You'll end up with a model that's completely photorealistic, even to the most discerning of eyes, as shown in [Figure 3](#).



Figure 1: The downside of the quick fix.



Figure 2: The flattened bricks.



Figure 3: The depth of an image map modeled object.

Notice how the shadow rolls over the depth of the bricks and the light gets trapped between the bricks, giving them depth. It only took a few minutes to make the 3D bricks and the result is clearly worth it. This brick wall object was created using the photo modeling process. Let's take a look at how the photo texture modeling process works.

The Photo Texture Modeling Process

The first step in the photo texture modeling process is to get yourself a high quality image of the surface you are creating. In the case of our brick wall example I dug up an old image of a weathered brick wall. If you haven't already downloaded the support file you should do so now, we'll need the "BrickWall.jpg" image map from the support file to complete this tutorial.

Once you have your image map the next step is to load it into your favorite painting program and remove all of the shadows in the image map. The last thing



Figure 4: The brick wall image map.

you want is some residual shadow fighting the actual lighting of your scene. It takes a bit of tweaking but the clone tool is your best defense against unwanted shadows. Simply clone areas of the image over the shadows. I have already done this for you so you won't need to edit the "BrickWall.jpg" image. Figure 4 shows our brick image map with all the major shadows removed.

Now that we have the image map ready to go we can load it into our 3D modeling program as a background image template. In Modeler, select the Display Tab, then the Options button. Now load the "BrickWall.jpg" file as the Z Image backdrop and keep the default settings. Now press OK. Figure 5 shows the image loaded into the background layer of LightWave.

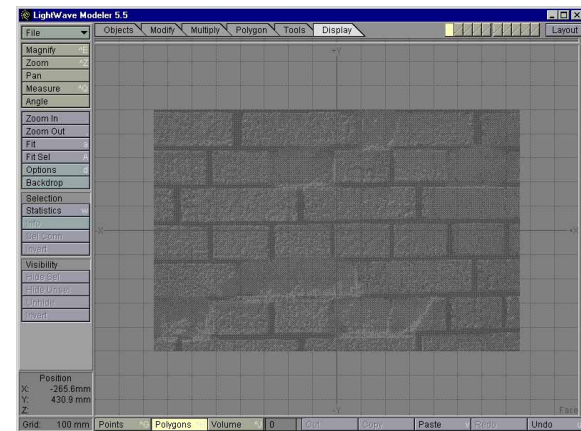


Figure 5: The image map template loaded into LightWave.

The next step is rather simple, yet repetitive. What you need to do is create an object that matches the template. For our example we need to create the individual bricks on the wall by manually placing points and creating polygons. Since we're using LightWave for the example, I'll demonstrate how this procedure is accomplished in LightWave. First, select the Polygon Tab and then the Create Points tool. Now move the cursor over the place where you want a point and press the Right Mouse button to create the point. Continue this process until you have a brick outlined. Don't worry about including every little detail in the bricks. Just focus on the major areas of detail, the rest will be compensated for by the image map. Once you have the points laid down. Simply press the "P" key to create the polygon. Now repeat this process for the other bricks (see [Figure 6](#)).

Now that you have the basic brick polygons created you need to add depth to them by using the extrude tool. You should extrude the polygons back slightly so they appear like bricks protruding from the wall, as shown in [Figure 7](#).

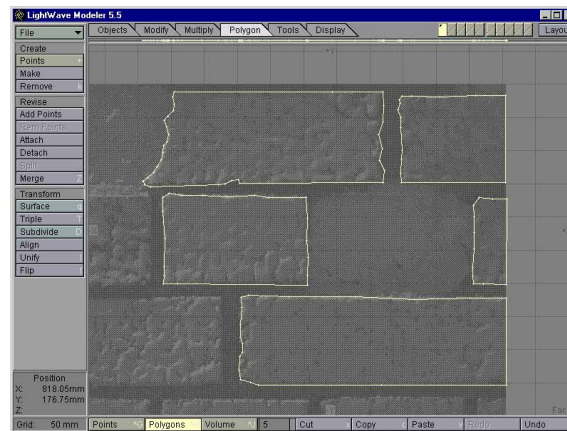


Figure 6: Creating the polygons from the template

The last step in creating the bricks is to add a very small bevel to the edges of the brick face so they appear a bit more organic, creating specular highlights when rendered. To do this, select the polygons along the front of the bricks and then select the Bevel tool from the Multiply Tab. The amount of Inset and Shift should be set to the same value, which depends on the size of your bricks. You should set these values so you create bevels like the ones seen in [Figure 8](#).

The next step is to add the plane that represents the mortar between the bricks, which is done by creating a simple flat plane behind the bricks, as shown in [Figure 9](#).

Now there's just one final step in creating the photorealistic brick wall – we need to surface it. Before

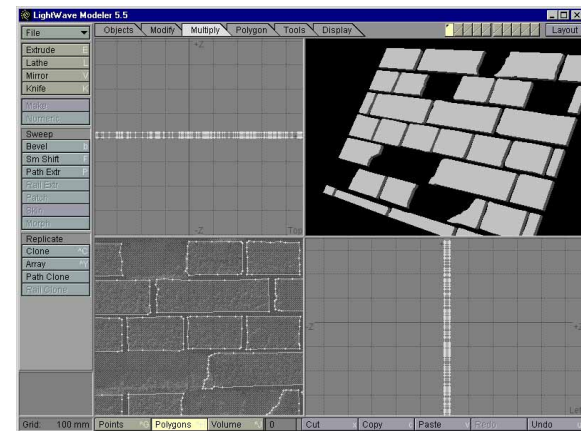


Figure 7: The extruded polygons for the bricks.

we apply the image maps let's give the object a unique surface name. Press the "q" key to pop up the Change Surface window, then create a new surface name called "Bricks", keep the default settings and press Apply. Now save the model as "BrickWall.lwo" and Load it into Layout. Then load the "BrickWall.jpg" image so we can texture the object.

Surfacing the bricks is quite simple. First, apply the "BrickWall.jpg" image to the Color Channel as a Planar map on the Z-Axis. Be sure to Automatically Size the image map so it fits the object. This will ensure the details on the image map line-up properly with the physical details of the model we created. You should also toggle off the Texture Antialiasing switch since it will only blur the surface. This setting is only necessary when you have heavily repeating patterns like a grid.

Now we need to add some Diffusion to the Bricks so they look natural. This is accomplished by applying the same image map

as a Planar map on the Z-Axis of our Diffusion Channel. Of course, if we kept the Opacity at 100% the bricks would be extremely dark so we'll use one of my favorite quick fixes, set the Opacity to 15%, which reduces the intensity of the diffusion map. By using the Opacity we can save ourselves the trouble and wasted system resources of creating an actual Diffusion Map. Of course, this really only works with industrial surfaces since a creature texture would require more specific Diffusion Map editing.

Okay, now set the Specularity to 5% and then apply the "BrickWall.jpg" image to the Bump Channel as a Planar map on the Z-Axis, Automatically Size it and set the Bump Value to 100%. Disable the Texture Antialiasing so the texture of the bricks will be rough.

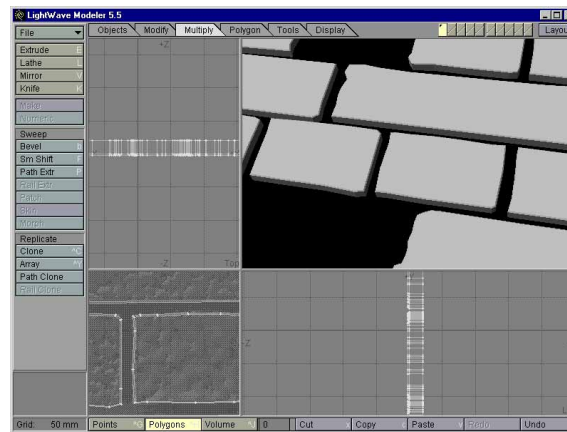


Figure 8: The final bricks with the bevel.

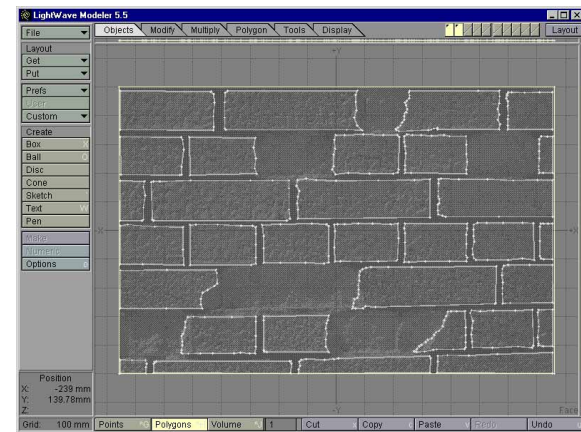


Figure 9: Adding the mortar plane.

The last step is to Set the Smoothing of the object to 45 degrees. We don't want it to be 89 since that will smooth the object too much, making the bricks a bit rounded. We want them flat, but with smooth edges.

Great, now save the object and then do a simple test render to see the result of our surfacing effort. You'll end up with something similar to [Figure 10](#).

As you can see, the brick wall now has 3D depth when the camera is rotated. If this were a seamless image map you could easily tile the model to create a larger, seamless wall by tiling the objects, just like you would with image maps. Of course, we'll cover this technique in another tutorial.

While the photo-modeling technique is certainly more work than simply slapping an image map on a plane, it goes a long way toward making the scene appear realistic. After all, if we are to truly achieve photorealism we need to spend time on the



Figure 10: The completed brick wall.

details. Speaking of details, let's take a look at a great technique for adding even more depth to the wall – negative details.

Creating Negative Details

One great way to add depth to your models is to dig holes in them. A critic of 3D images will believe that you would take the time to create the bricks, since they aren't terribly difficult but digging into the mortar is another story. By creating negative holes in the mortar and dropping an object in it we can create amazing depth and realism, that will dupe even the most critical of viewers.

Our brick wall has some perfect places for negative details. We can dig holes into the mortar in many places.

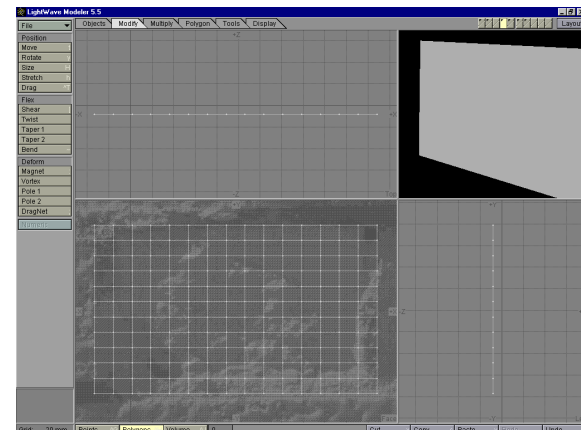


Figure 11: Creating the flat plane.

Probably the best place is in the lower right corner of the wall. In Modeler, zoom into the lower right corner of the wall where there is a brick missing on the image map. Then create a flat plane over the empty spot on the wall with 15 segments on the “X” Axis, 11 on the “Y” and one on the “Z”, as shown in Figure 11.

We will be editing this plane to create the irregular shaped hole in the mortar. We want the plane to have a curved shape to match the shape of the depression in the mortar. To do this, we’ll use the Magnet tool. Select the Magnet tool from the Modify Tab and drag the outer edge of the plane until it takes the shape shown in Figure 12.

Now we’re ready to add depth to the plane so we can use it to cut a hole in the wall. Extrude the plan back slightly as shown in Figure 13.

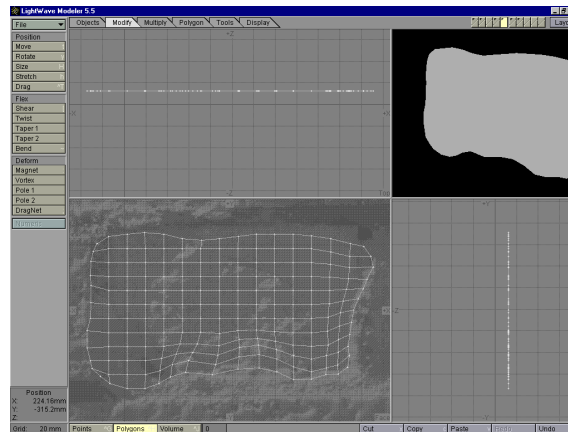


Figure 12: Shaping the plane.

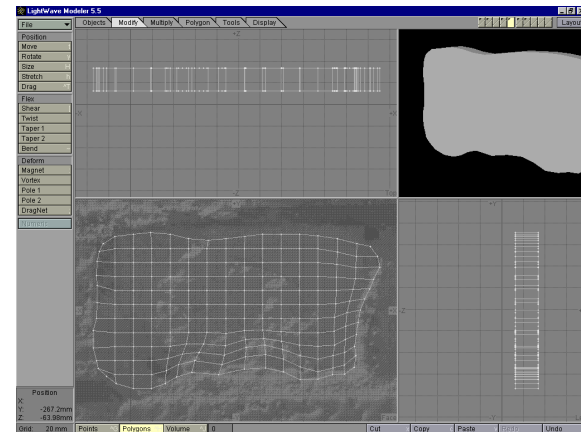


Figure 13: Extruding the plane.

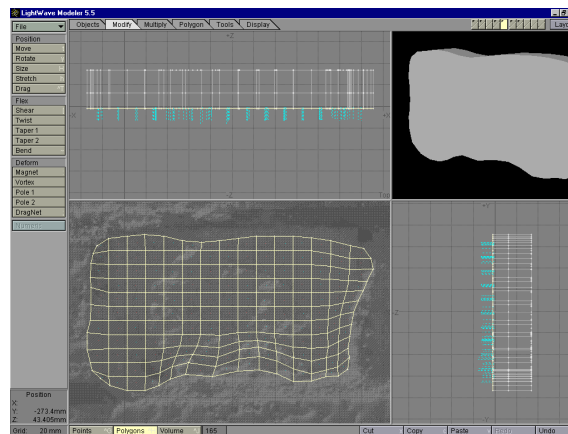


Figure 14: Smooth Shifting the front faces.

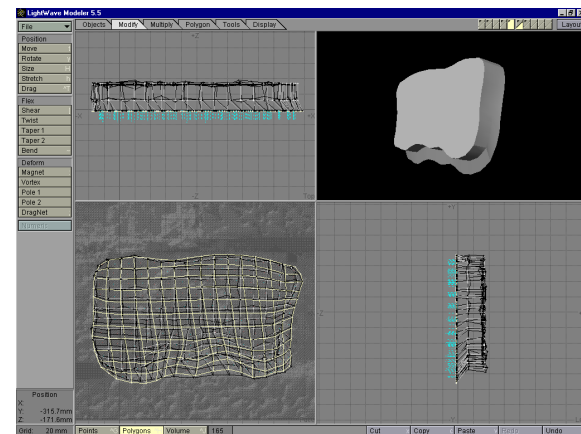


Figure 15: Smoothing the front edge.

Of course, if we simply Booleaned a hole using this object we'd have a very linear cut in the wall, which would not simulate the crumbling mortar. To make the hole more natural, and to conform to the details on the image map, we need to soften the hole. This is accomplished by widening the front of the object. First, select the front faces, then Smooth Shift them outward slightly as shown in [Figure 14](#).

Now we need to taper the new faces outward on the bottom and right side to match the slope of the image map. Once again we use the Magnet tool. Nothing makes organic tweaking easier than the Magnet tool. The trick here is to only manipulate the front faces so you want to keep them selected when you edit the mesh with the Magnet tool. Simply pull the polygons down on the lower front edge and then to the right slightly as seen in [Figure 15](#).

Great, now we simply need to make the object rough so it looks like the image map. Select the back half of

the object with the Polygon Selection tool and then apply a small Jitter (Tools Tab). The size of the Jitter depends on the size of your object. Basically you want it to resemble [Figure 16](#).

Now that looks more like eroded mortar. We now have a completed Boolean object to create a hole in our wall. Before we apply the Boolean we need to add depth to the wall so we have something to carve out. Select the Wall polygon we created earlier and extrude it back slightly as shown in [Figure 17](#).

Now position the Boolean object so its front edge extends just beyond the front of the wall object. Then set the wall object on the foreground layer and the Boolean

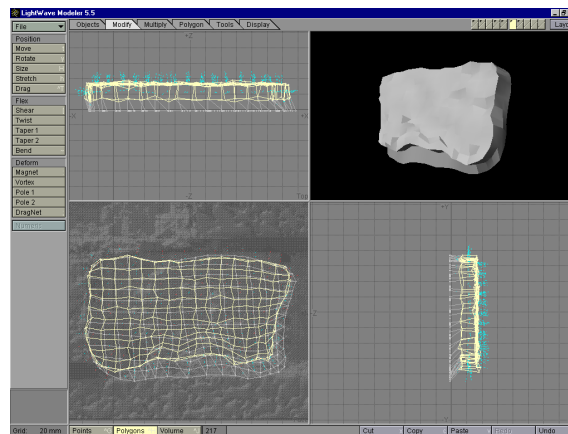


Figure 16: Jittering the back polygons.

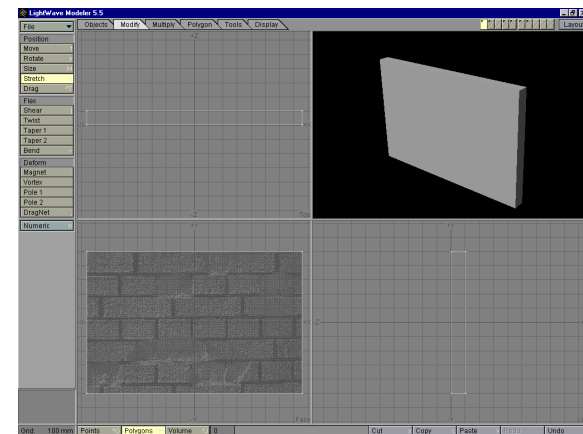


Figure 17: Extruding the wall polygon.

object on the background layer and perform a Boolean Subtract operation by pressing “Shift+b” and selecting Subtract. Your wall should now have a hole in it resembling the one seen in [Figure 18](#).

The hole definitely looks good but it’s still a bit too harsh, looking rather manufactured. What we need to do is taper the top of the hole so the depression is more gradual. Before we do this we need to merge the points on the outer edge of the hole with the wall object. The points will be shifted a bit so a simple Merge Points won’t work. You’ll need to use and Absolute Value to merge them properly. I used an Absolute Value of 5mm on my wall – yours should be similar.

Once you have merged the points, select your Magnet tool and pull the upper back segment of the hole down and towards the front to soften the top edge of the hole. Then do the same to the right side so you have something similar to [Figure 19](#).

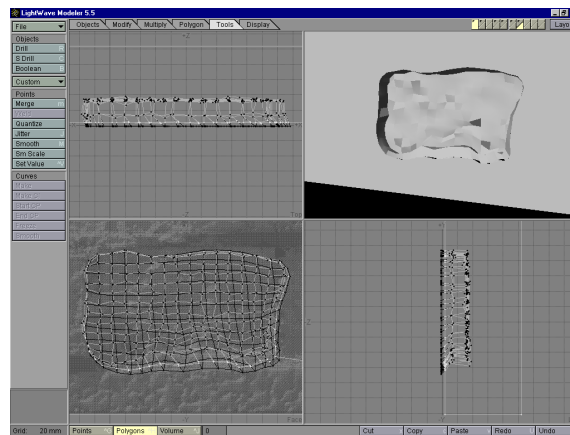


Figure 18: The booleaned hole.

Now that’s more like it. The hole looks more naturally eroded. The last step is to combine the wall with our bricks and save the object as “BrickWall_Hole.lwo.” Then switch to Layout. We now want to copy the surfacing we did for the original wall to our new wall. To do so, create a Sample Render of your old brick wall surface, then replace the “BrickWall.lwo” object with the “BrickWall_Hole.lwo” object. Now copy the Sampled surface to the “BrickWall” surface by selecting the BrickWall surface and clicking on the thumbnail render. You will be asked if you want to copy the sample to your surface – select Yes.

Okay, now you’re ready to test the wall. To make the test more effective you might want to place an object in the hole you created. Anything will do for the test. We just

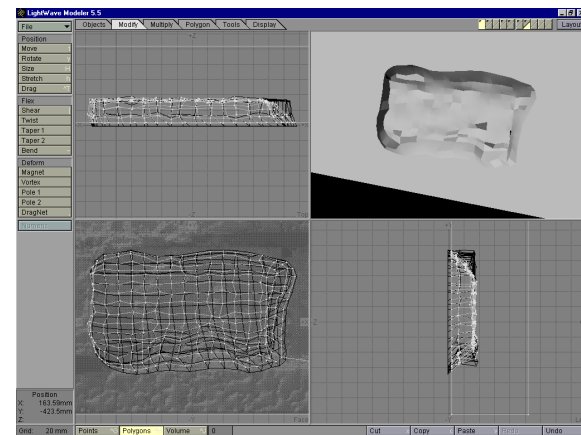


Figure 19: The softened hole.

want to see how the negative detail adds depth. I used a rusty old can, which can be seen in [Figure 20](#).

Notice how the hole with an object in it really makes the wall appear more credible. It's a very effective technique for creating amazing photorealistic detail with little effort. It only took a few minutes but it goes a long way towards convincing the viewer the wall is real.

Wrap Up

Creating photo models isn't complicated at all, it's actually quite simple and the results are always worth the effort. Of course, the photo modeling technique isn't limited to walls, it can be applied to more detailed objects

such as windows, doors, etc. Just about any model can be greatly enhanced through the use of photo texture modeling. While working on the new P-XG1 Graphic Novel I used this same technique to create the buildings and rooftops. In fact, [Figure 21](#) shows one of the scenes I created for the graphic novel.

All of the wall textures and windows in this image were modeled using image maps as templates and then applying the image map as the surface. You can see how the technique can be very useful for rapidly creating photorealistic environments. Try using this technique in your next photorealistic 3D project and you'll soon realize why it is an invaluable tool in your 3D photorealism toolkit.



Figure 20: The completed wall.



Figure 21: Photo models in action.





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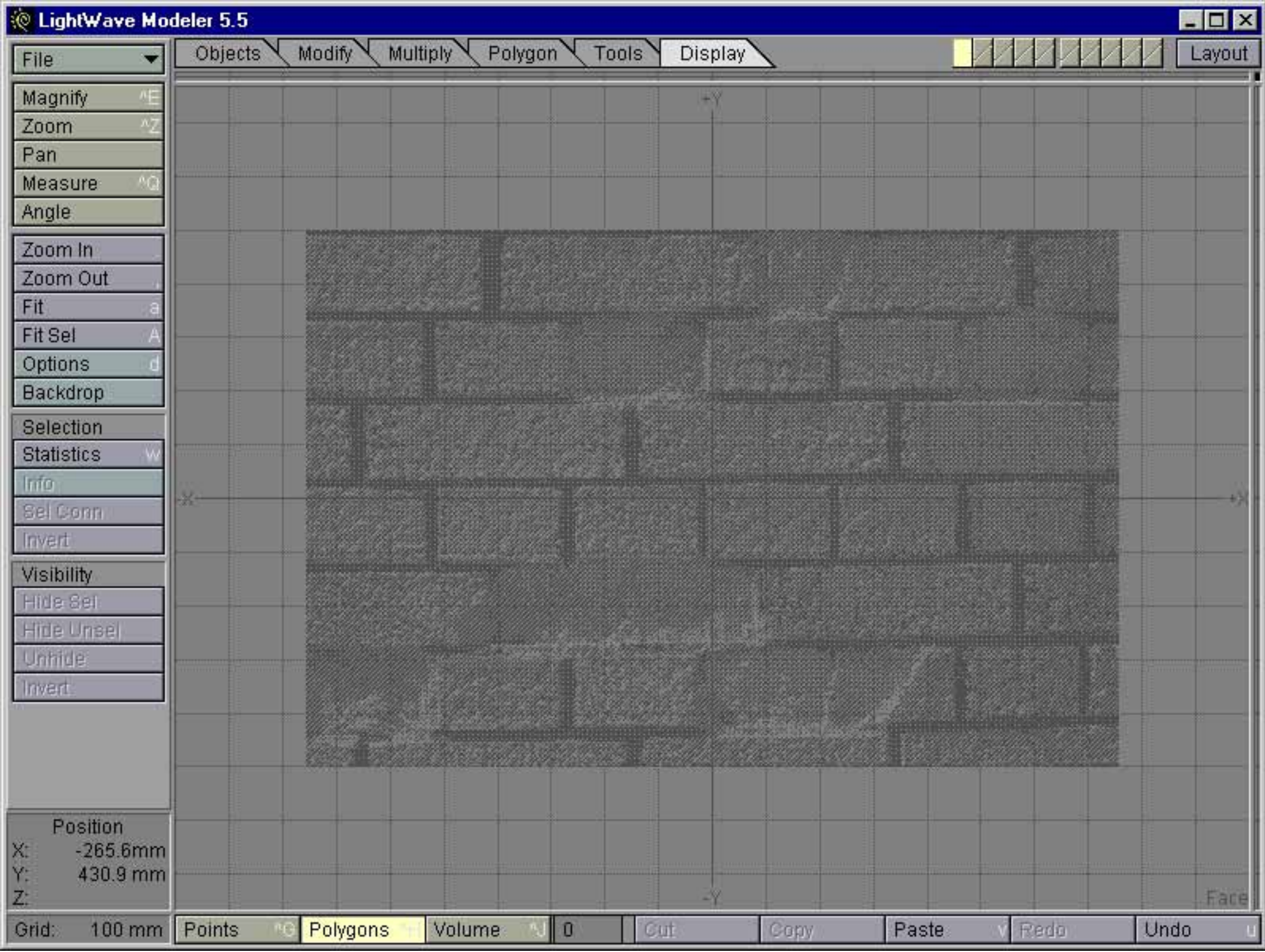
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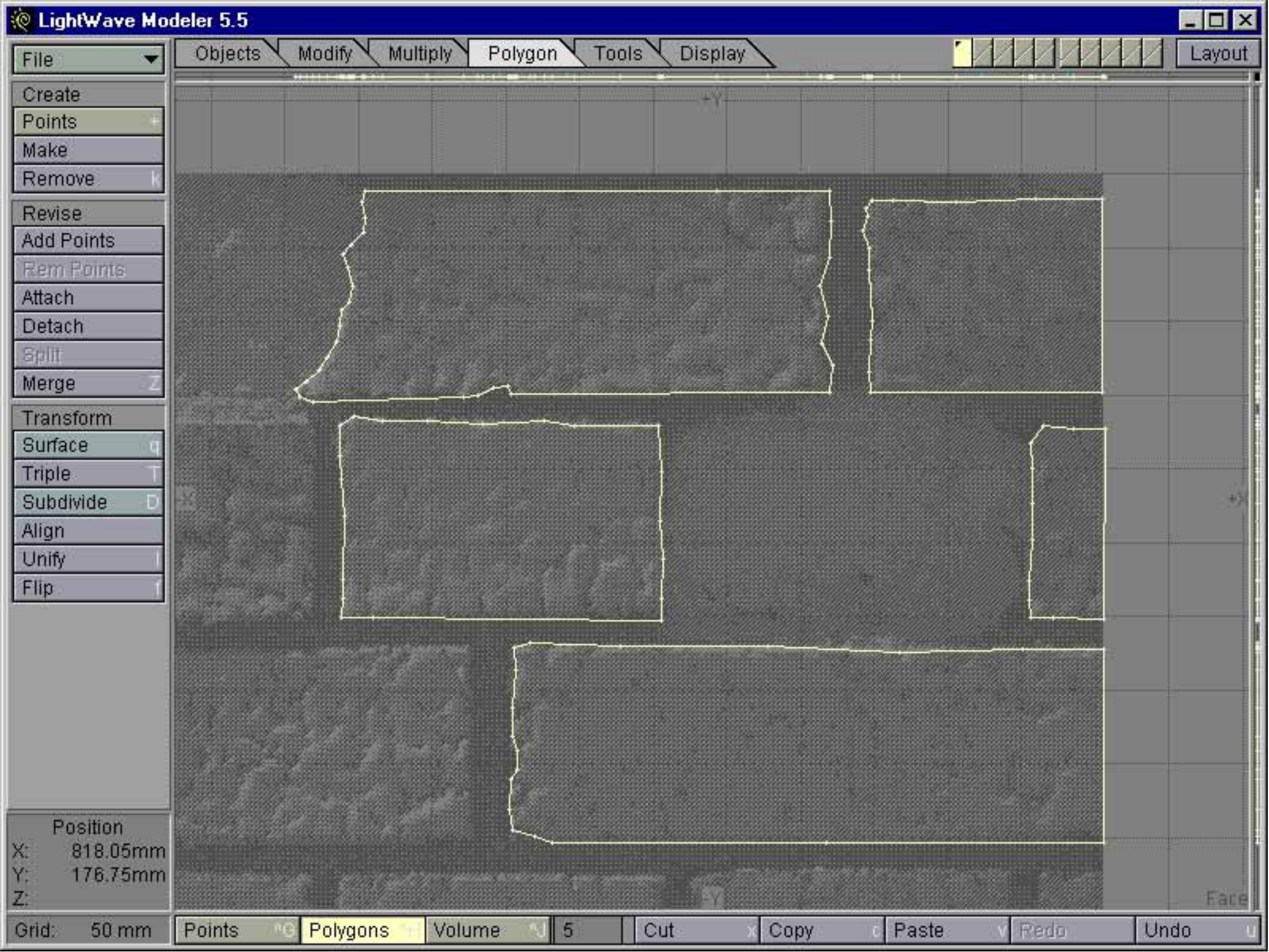


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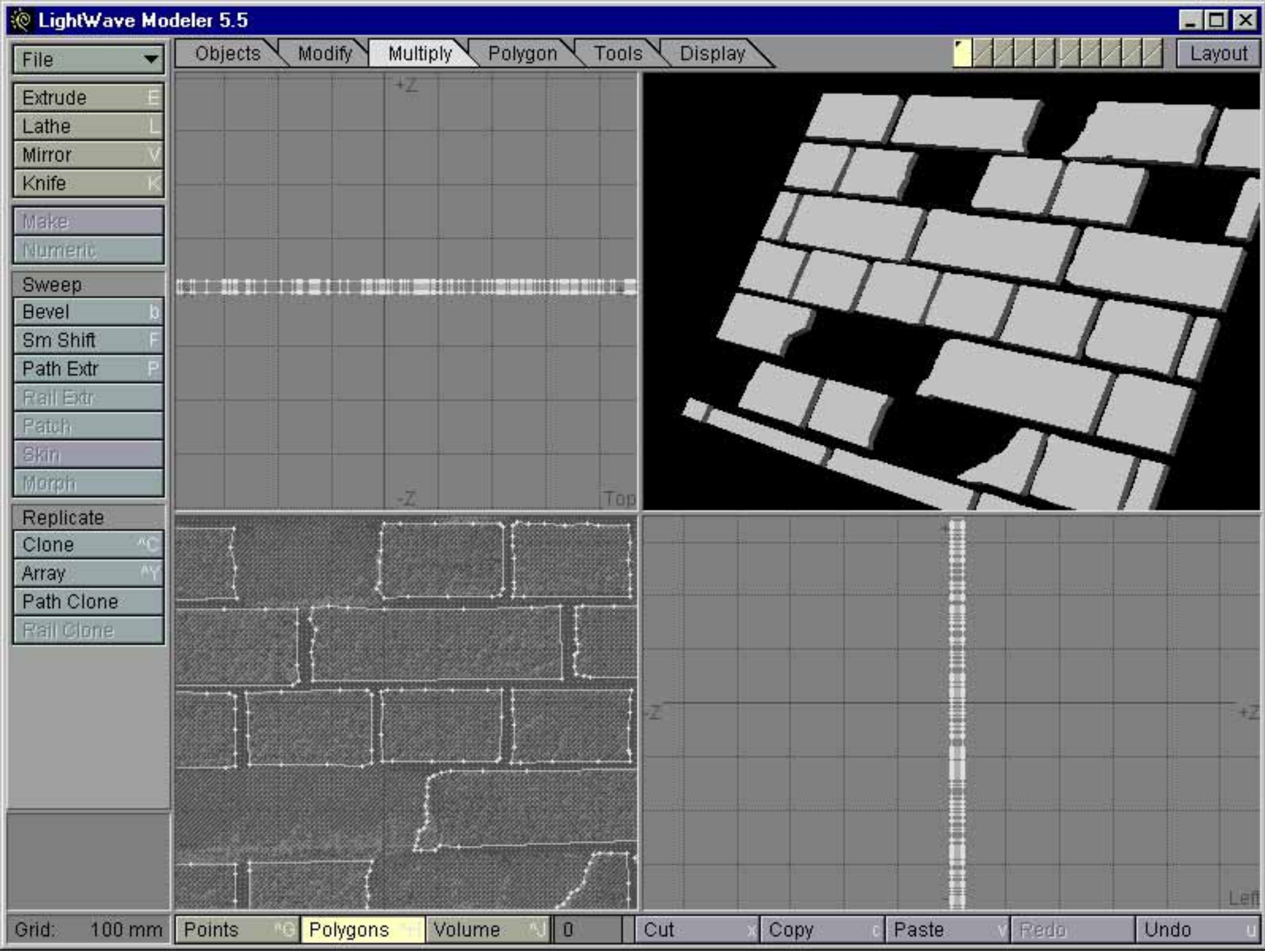
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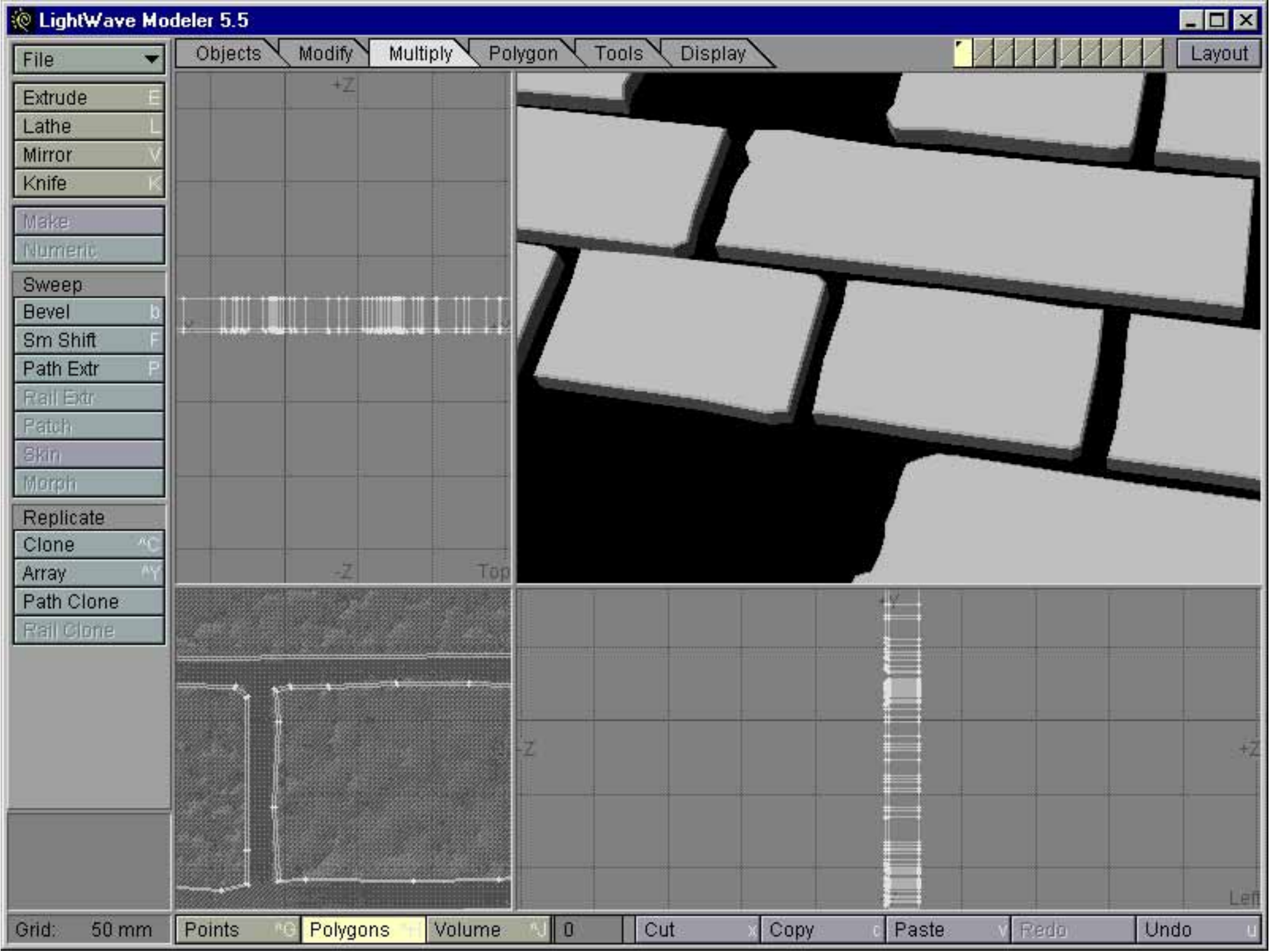
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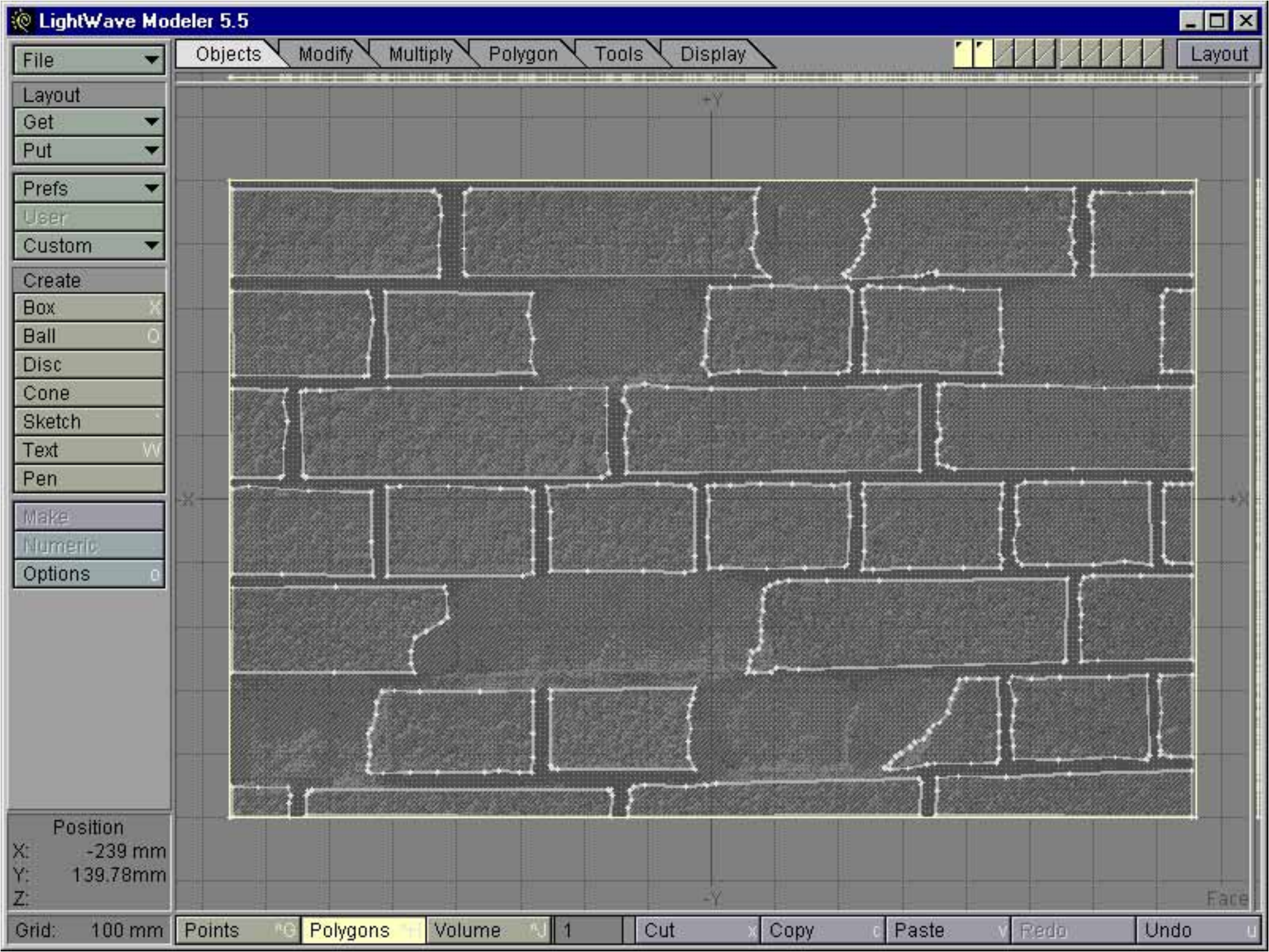
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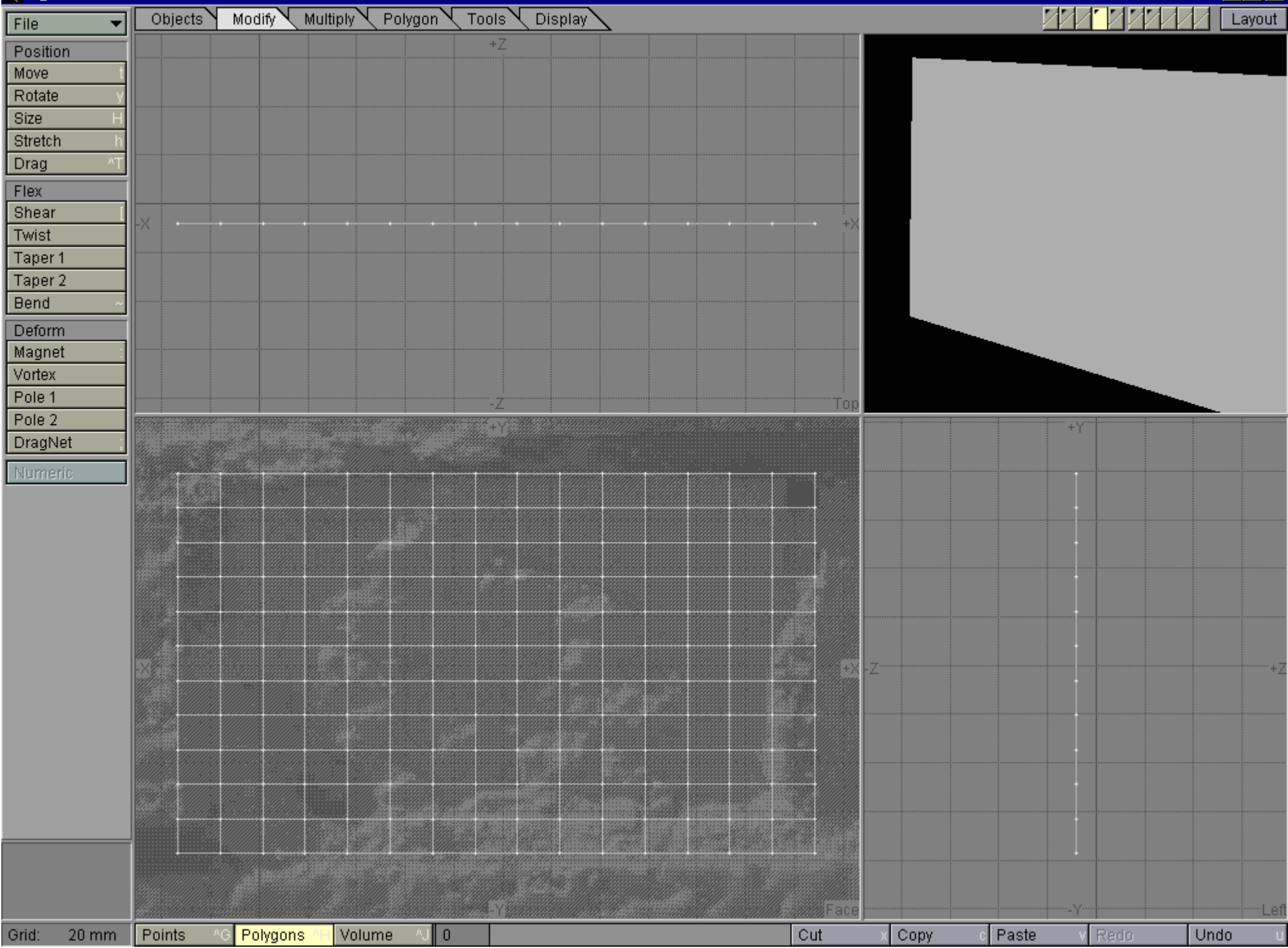
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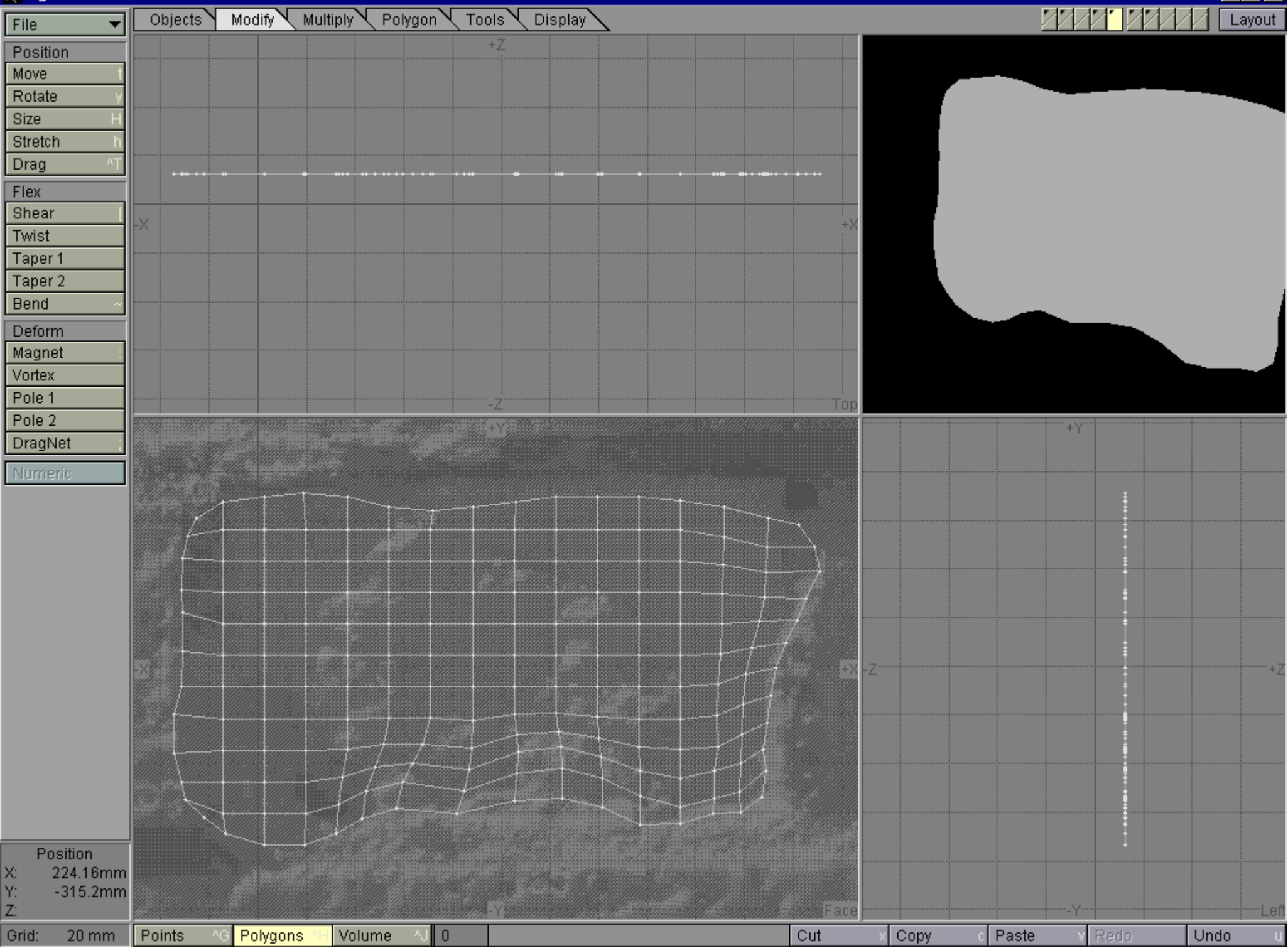


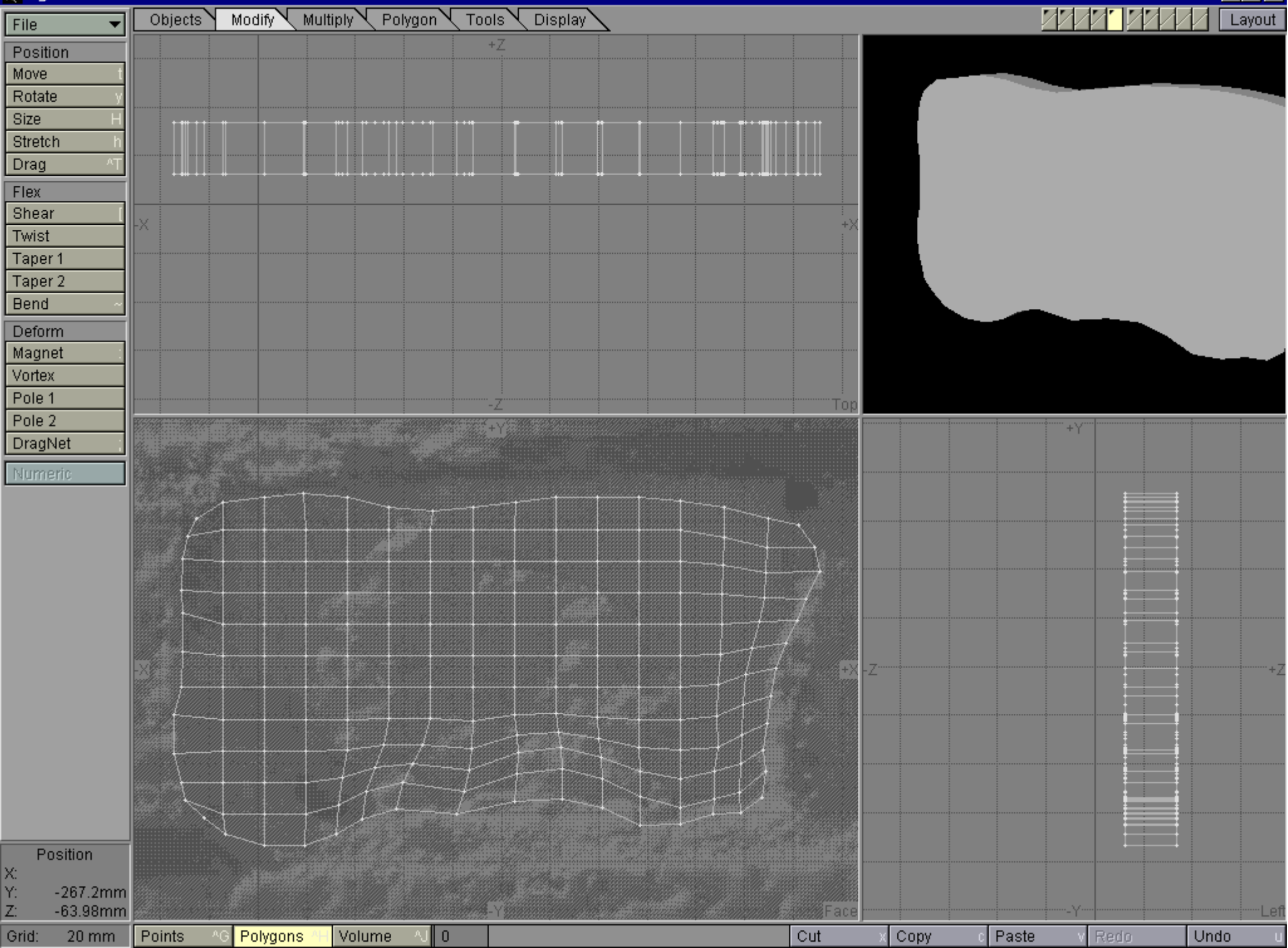


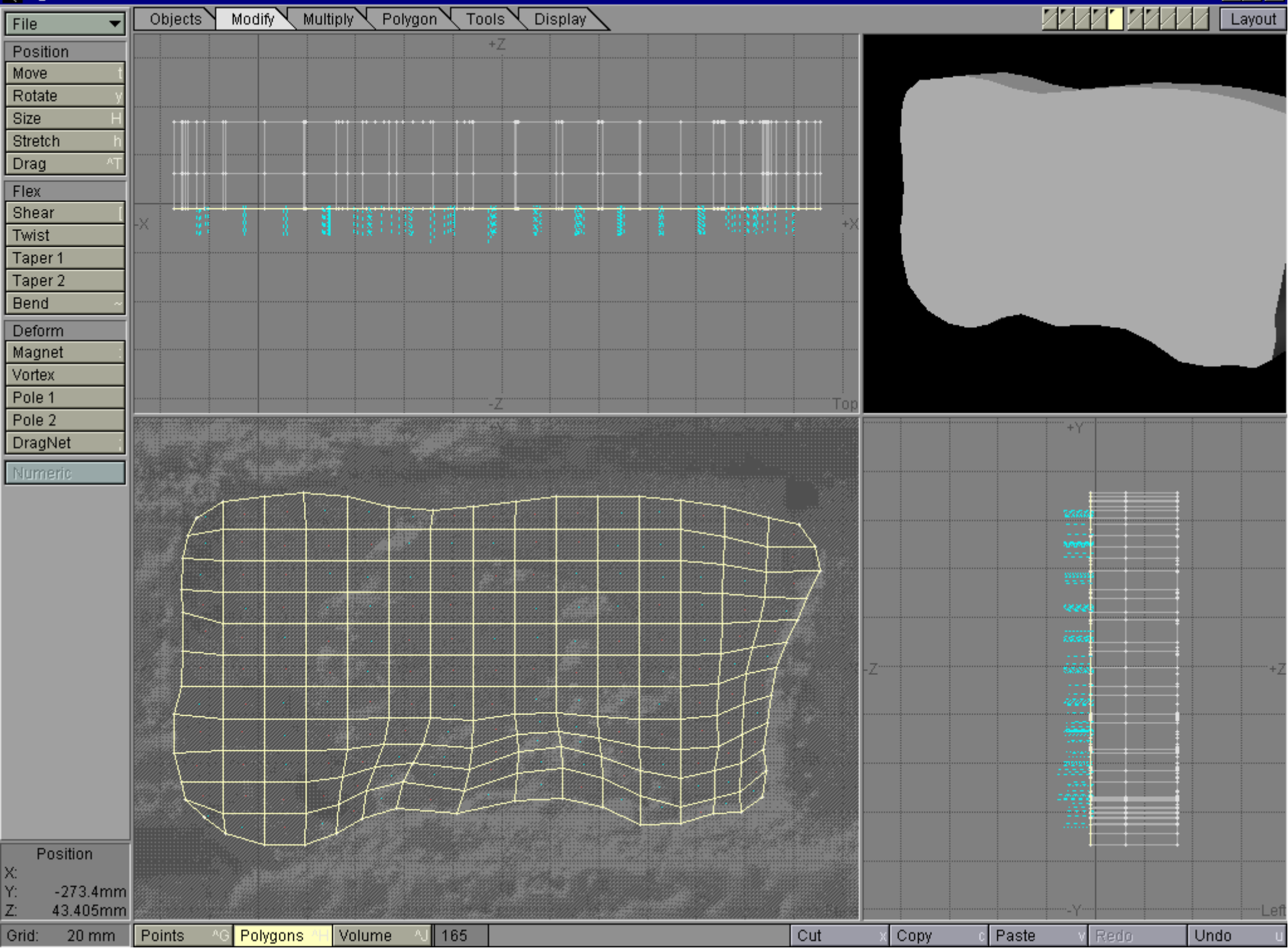


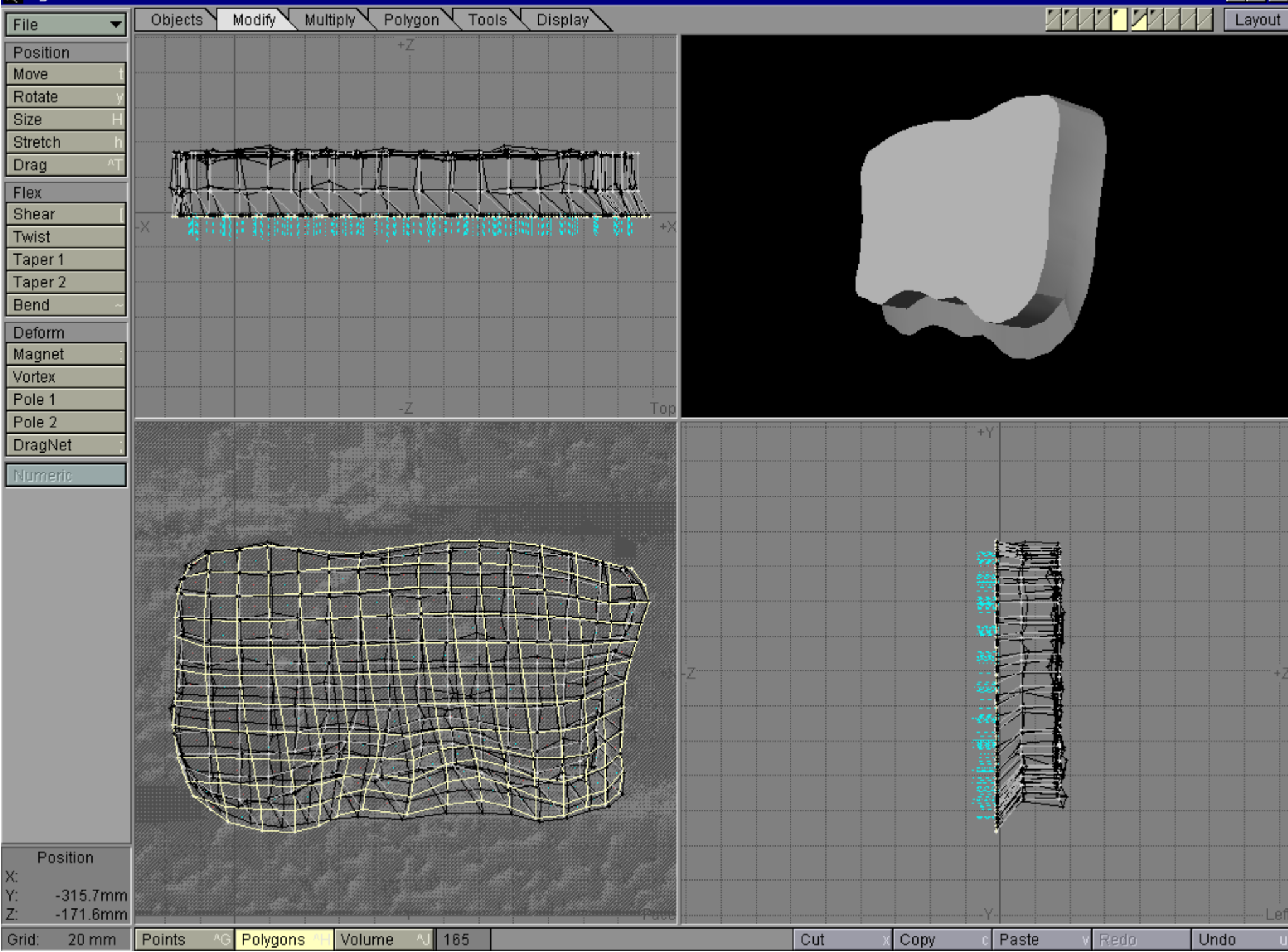












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Magnet

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Polygon

Tools

Display

Layout

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+X

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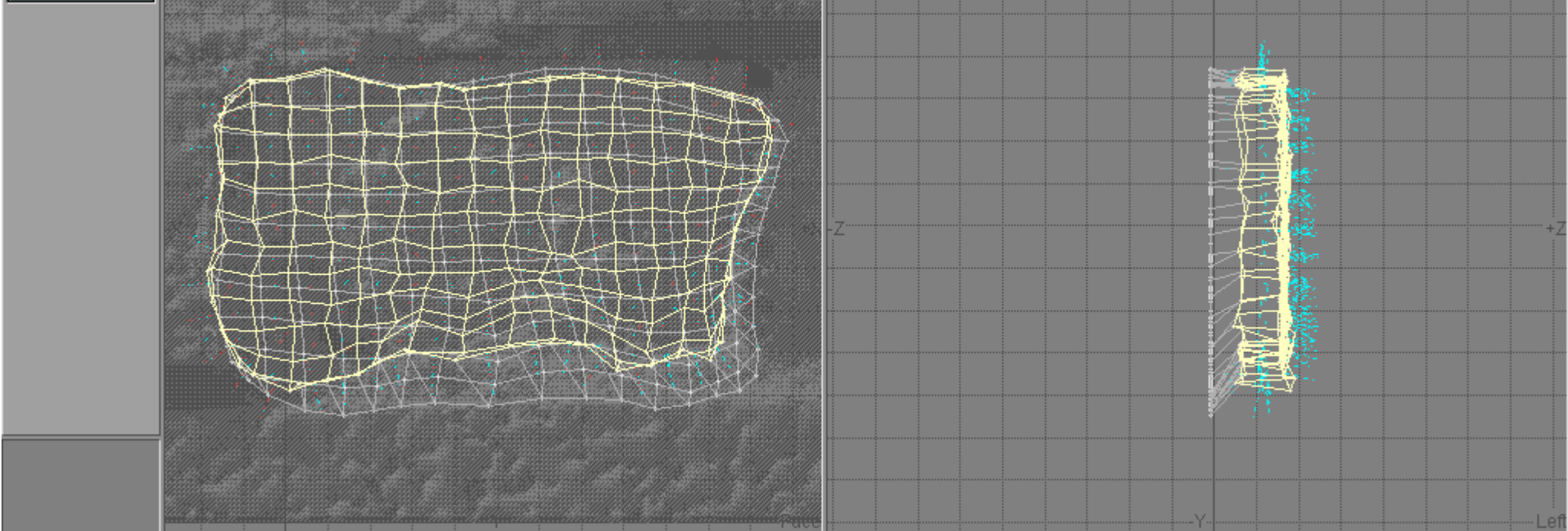
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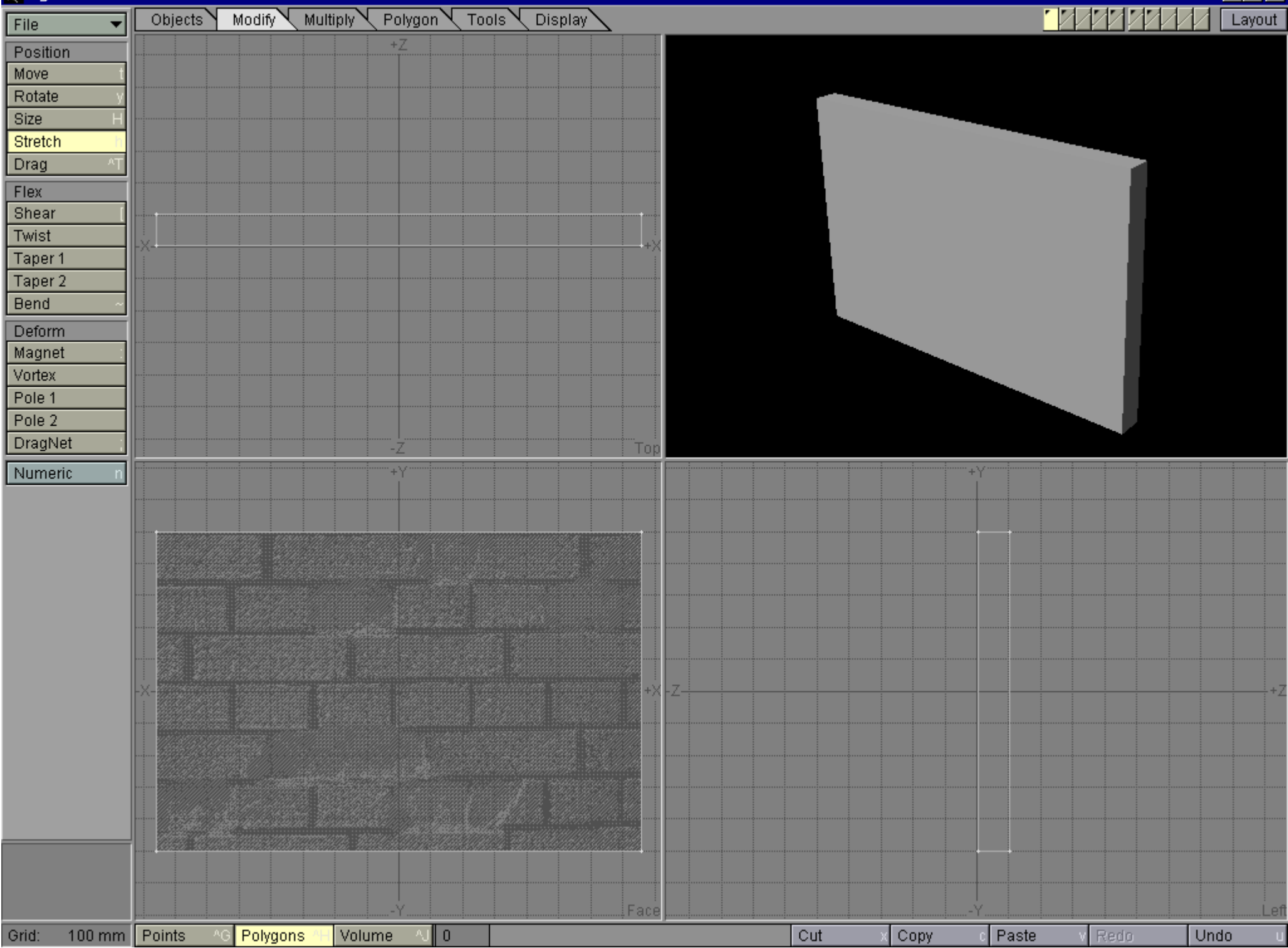
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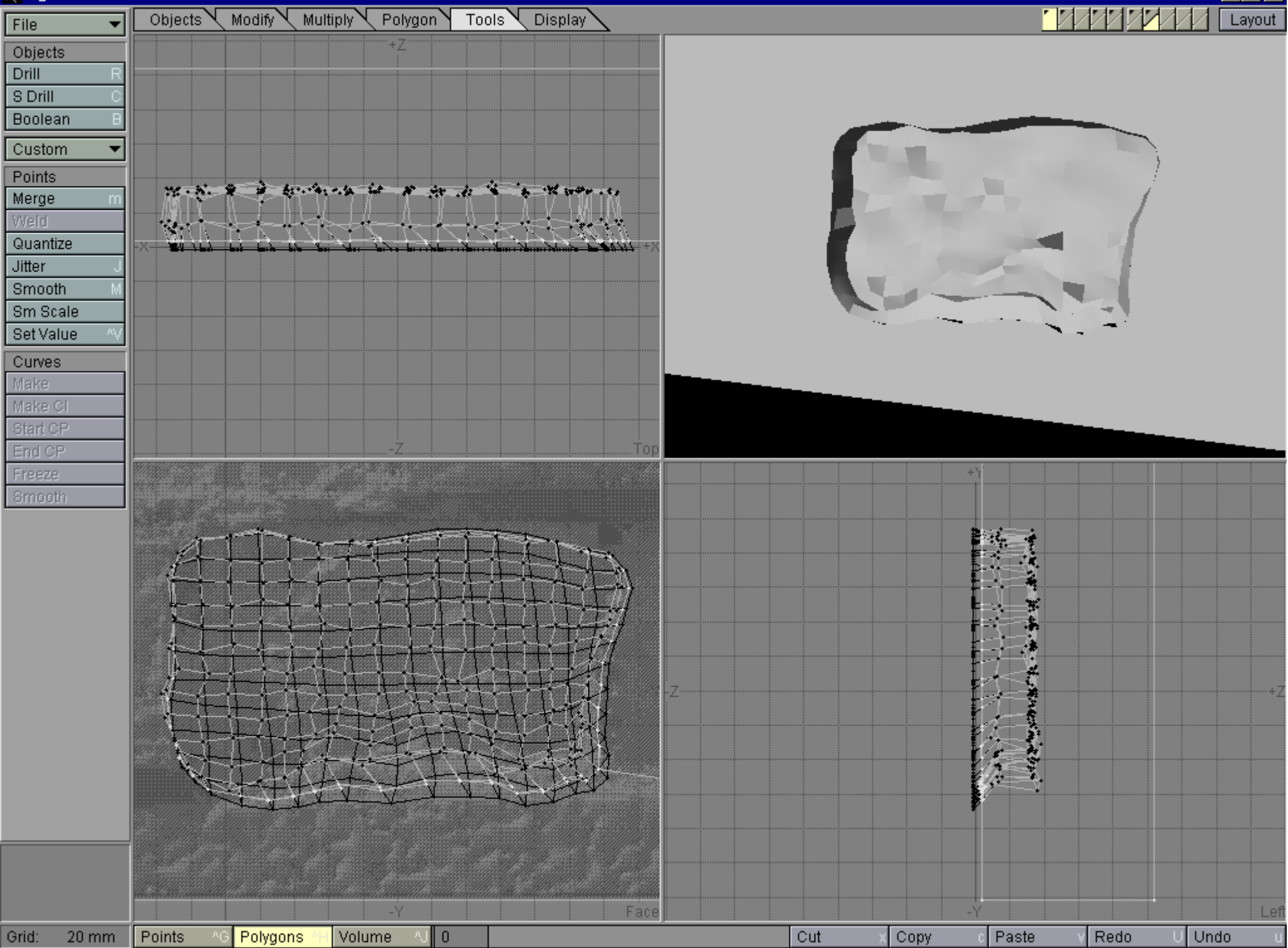
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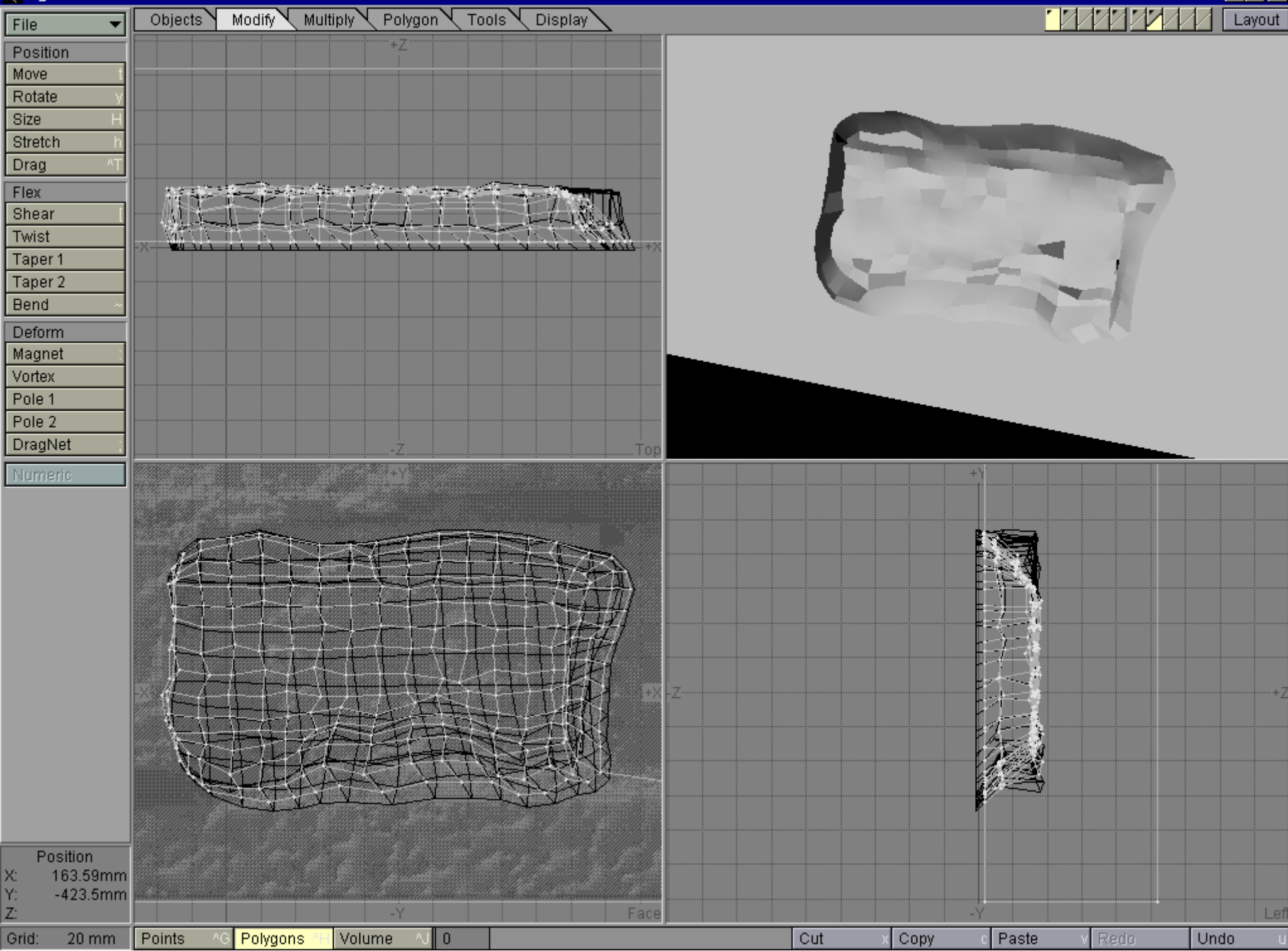
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