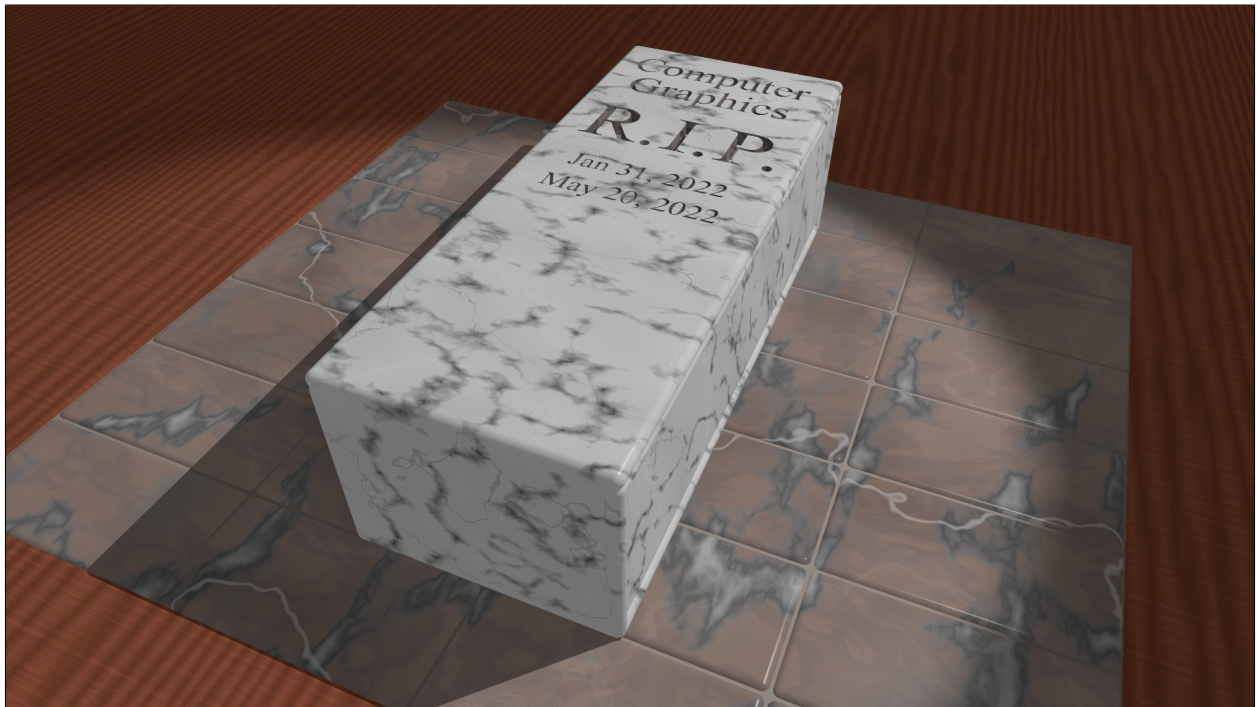# 1   Introduction

As usual, zip the project directories into one zip file. Upload the zip file to the Homework #8 page of the MyClasses site for this class. These exercises are using the POV-Ray ray-tracer to create a couple "final" images. One of your assignments this semester was inspired by the old Frankenstein films, this one is inspired by the old Dracula films.

2   Image #1

The first image is a marble coffin sitting on a tiled marble platform, surrounded by a hardwood floor that extends in all directions out of the scene. There is a single spotlight with a soft edge lighting the scene. The coffin is engraved with the words "Computer Graphics R.I.P. Jan 31, 2022 May 20, 2022" with the lines and centering as you can see. A birds-eye view of this is below. Don't worry that the R.I.P. looks lighter than the rest, this is simply because the letters are larger and hence let more light in. The coffin itself has a base and a lid that have curved edges. In addition, the base has the sides inset from the curved edges. You can see this a little on the right side of above image. There is another image of this below, of the base of the coffin with the lighting changed. The image below also gives a better view of the lid and base coming together.

Here are some specifics about the image and its construction that I will be looking for and may help you in the construction of your pov files.
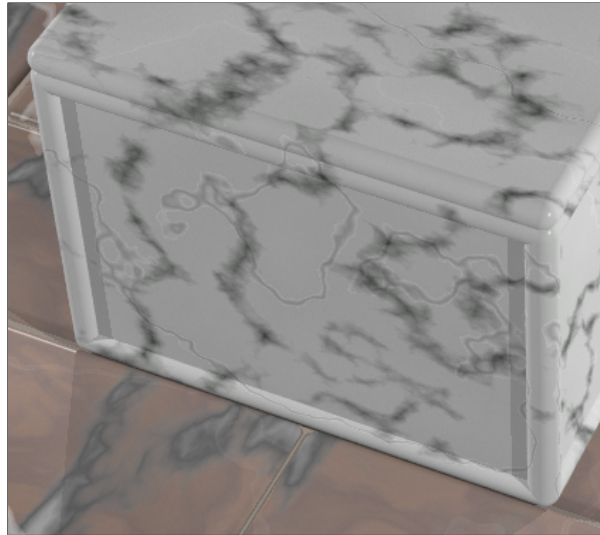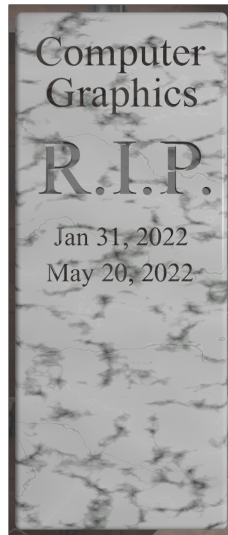
- The tiles the coffin is sitting on are in a ratio of 1×2. That is they are twice as long as they are wide. There are 4 tiles int he direction of the long side and 7 tiles on the short side.

- The coffin sits on the 5 middle tiles and is centered over the 4 in the other direction.

- You will want to look at the documentation on the shapes, shapes2, and shapes3 include files to see what options they have for constructing the coffin and lid. You do not need to use these, you can create this using the primitive shapes we have in the examples, but it may make your construction faster.

- Note that the tiles are curved at the edge, just like real life tiles.

- Between the tiles there is a beige mortar.

- I used 4 built-in textures. `T_Wood14` for the floor, `T_Stone22` for the tiles, `T_Stone17` for the coffin, and `T_Stone10` for the cutout (engraved) letters. Using this different texture for the cutout letters darkens them a little and hence makes them easier to read at an angle. You may need to adjust the texture scaling to match the desired image.

- The font on the lettering is the built-in "timrom.ttf" we have in the examples. The sizes are clearly different, so try to match your sizes as closely as you can with the ones in the above images.

- To do the engraving you will be using a CSG difference as in the examples. You will want to union the font objects into a single object and then take its difference with the lid. There are other ways to do this engraving but this is probably easier.

- Make sure that you set the up and right on the camera so that the aspect ratio is compensated for no matter what the image dimensions are.

2.1　Image #1: Extra Credit #1: Add in the Dracula family crest.

This addition is optional and will be worth some extra credit. Here we will add in the Dracula family crest to the lid of the coffin. In the included files is an image "HouseDracula.png" that contains the Dracula family crest with a black background. Look at the documentation on the `height_field` object and its syntax. The `height_field` object works the same way that the height map object did that we created in OpenGL. This will create a raised (by color) height map of the input image. You will need to do some scaling and repositioning of the map to make it look like the one above, and the birds-eye view to the right. I used a darker texture for this so it stands out better, I used the same texture as was used for the engraved letters. You will notice that the raised edges are very sharp, due to the image colors of course. The height field does have a smooth modifier that will smooth these out a bit. Of course, scaling the y direction down will help manage the spikes as well.
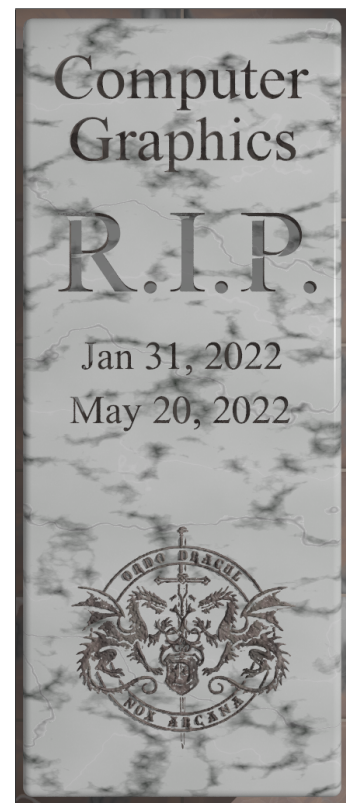
## 2.2   Image #1: Extra Credit #2: Add in some eerie fog.

This addition is optional and will be worth some extra credit. This one may take a little research on your part. You will add in some fog (or mist) to the scene. First tighten up the spot light and make it narrower, with the fog and the original spotlight it will dominate the image, much like when you use your high-beams in real fog. The fog is easy to produce with media, as in the examples, but the more difficult part is creating the unevenness in the fog patches. Without the unevenness the fog looks too unnatural. In the documentation on media look over the information on scattering and creating a density map.

3   Image #2
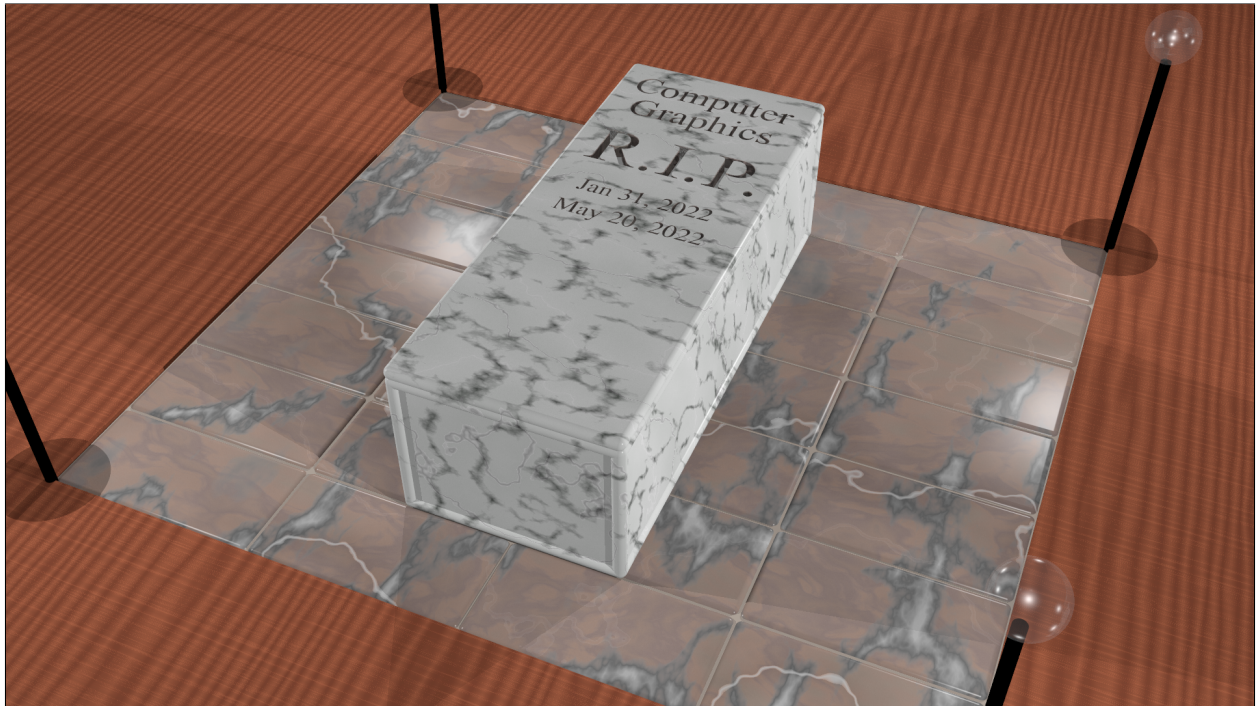
The second image to create is just a change of lighting from the previous one. The image for you to create is above, but a zoomed out version is below so you can see all of the objects in the scene.
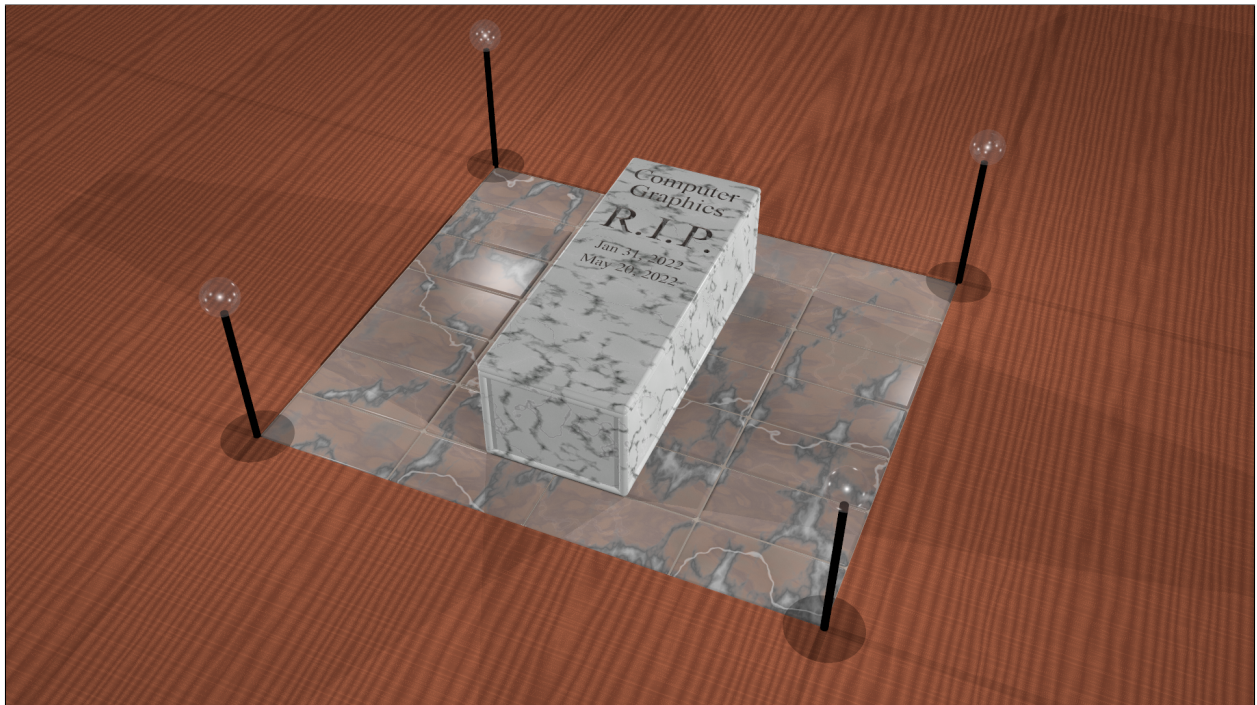
In this version there are 4 lights on lampposts at the 4 corners of the tiled area. The

lampposts are simply cylinders with a clear glass spherical top. We could do better here but it is good enough as a start. To make a really nice looking lamppost we could use a lathe object, like doing a surface of revolution back in Calculus. Inside each of the glass spheres is a single white light point light source. Since there are 4 of them you will want to lower the intensity of the light to not overwhelm the image. For the sphere texture I used `T_Glass3`. This creates an excellent lead crystal glass texture and is in the `glass_old.inc` include file. The texture is deprecated but should still be available.
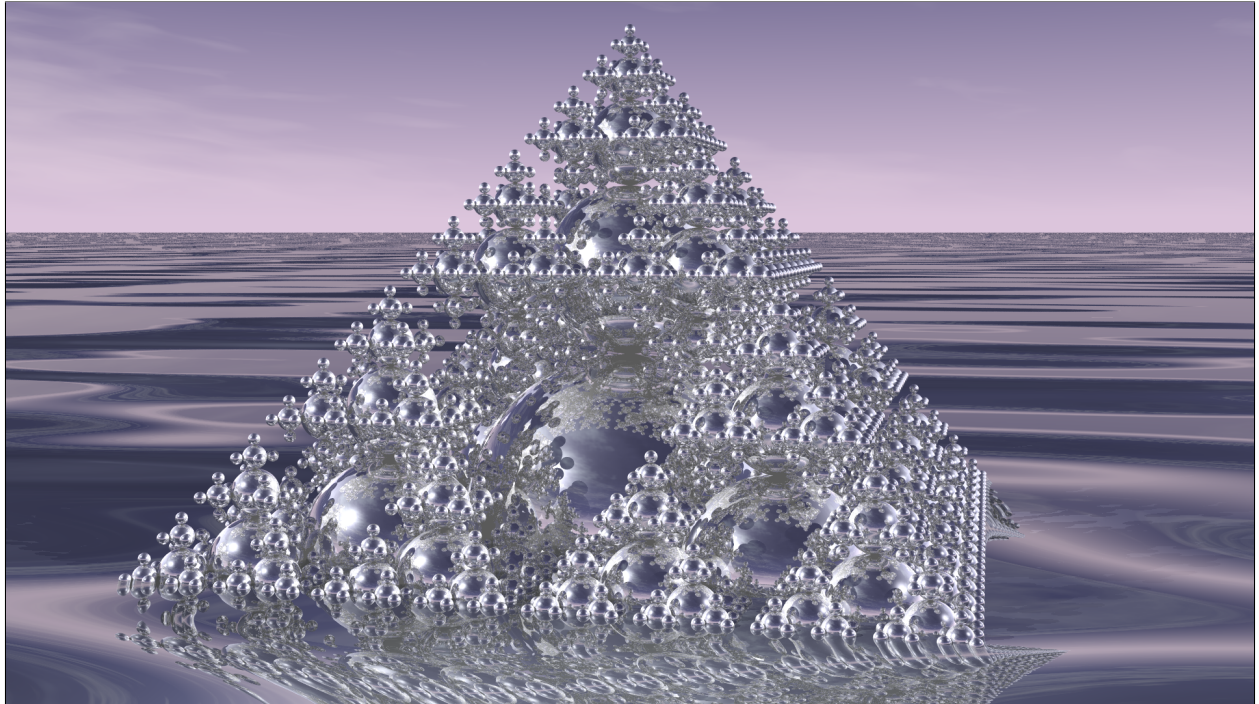
## 3.1   Image #2: Extra Credit: Add in the Dracula family crest.
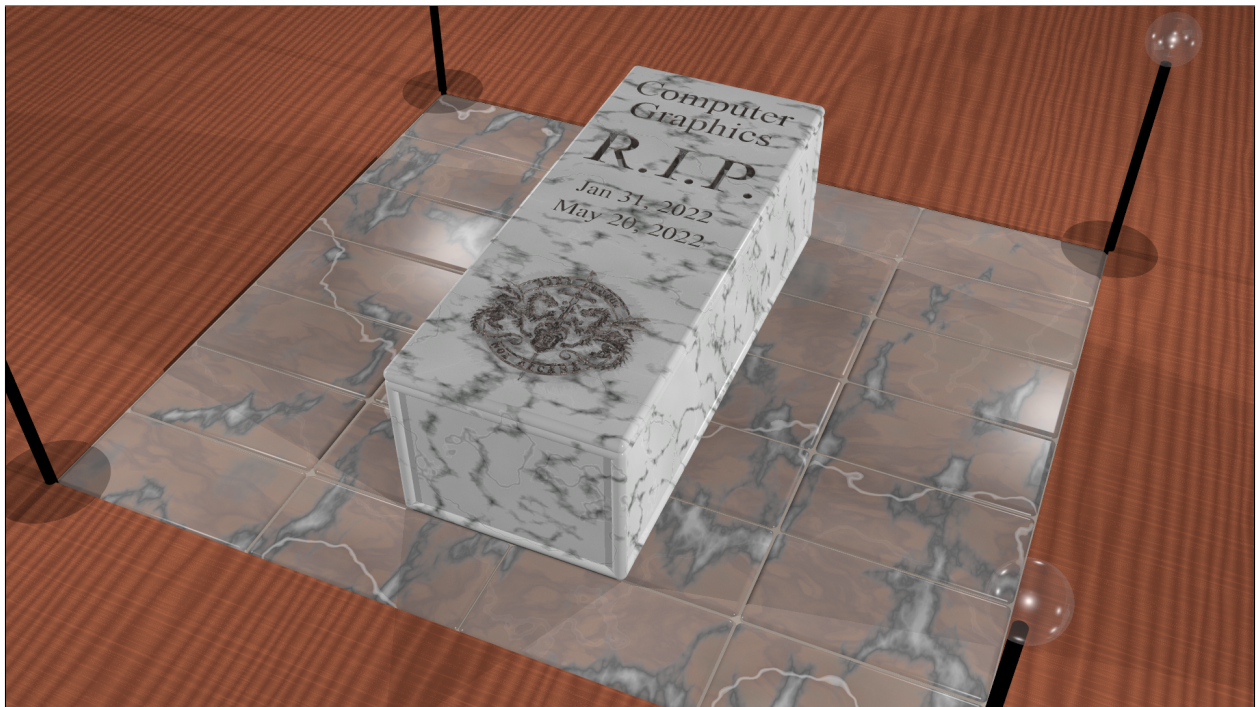
This addition is optional and will be worth some extra credit. As with the first image sequence add in the Dracula family crest to the lid of the coffin using the height field.

4   Extra Credit Image

   This is a fractal-like image (self-repeating) similar to the Menger sponge example from the while loop examples. Additionally we have a water simulation and sky-box environment. You are actually only seeing half of the object. If we lift it out of the water a little bit you can see that the bottom is a mirror image of the top.
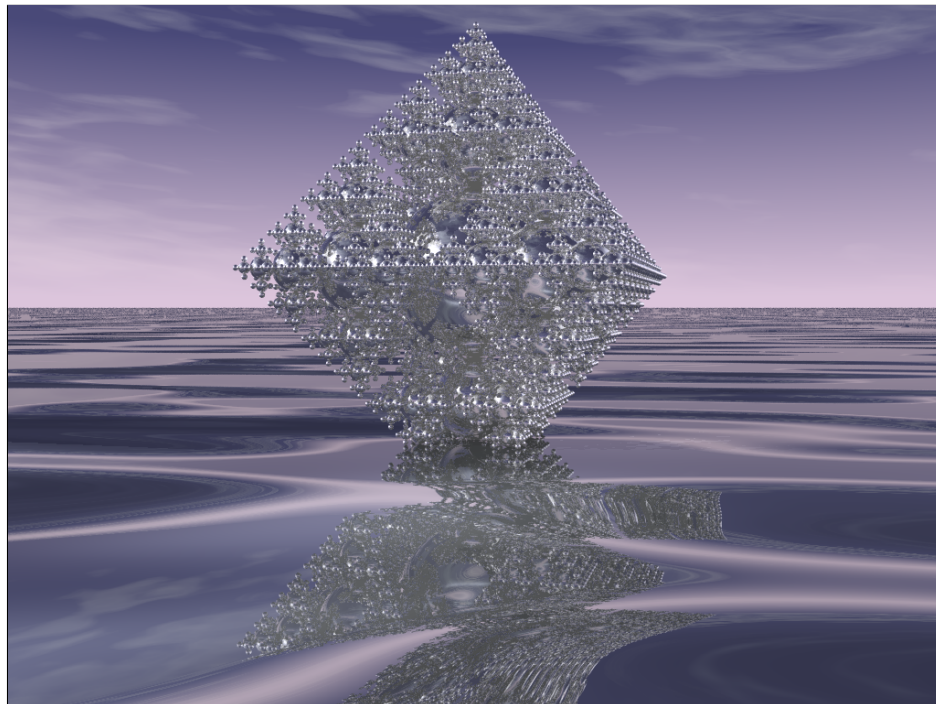
This can be created with similar code to the Menger sponge example or if you would like to take a more sophisticated approach you can create a macro (function) that creates the object recursively. Below is a sequence of images that build up the final fractal showing each "level". The first is a chrome sphere at level 0, then level 1 has 6 more smaller spheres attached to it, top and bottom, left and right, front and back. The rest are levels 2, 3, 4, and 5. The final image is at level 5.
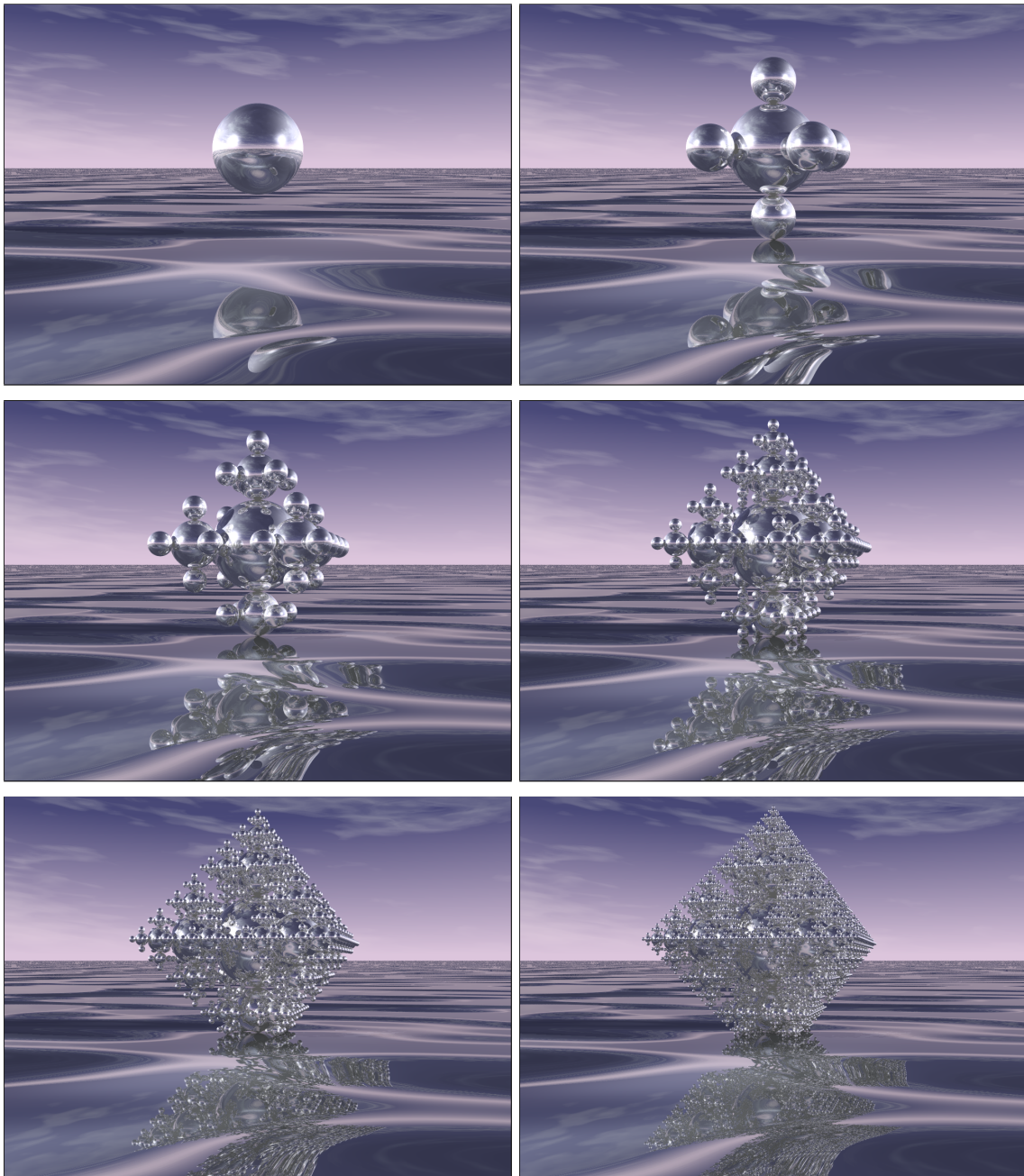
Here are some specifics about the image and its construction that I will be looking for and may help you in the construction of your pov file.

- Make sure that you set the up and right on the camera so that the aspect ratio is compensated for no matter what the image dimensions are.

- There are two point light sources in the scene, looking at the level 0 image above will help you position them.

- Sky-maps are called `sky_sphere` in POV-Ray. There are predefined maps, I used `S_Cloud1`.

- For the plane that is producing the water you will want to texture it in one of the chrome textures and you will need to investigate the normal modifier for the texture, to simulate the waves. Also consider the modifiers of wave, frequency, and scale for the normals.

- I textured the spheres in `T_Chrome_5E` and the water with `T_Chrome_2D`.