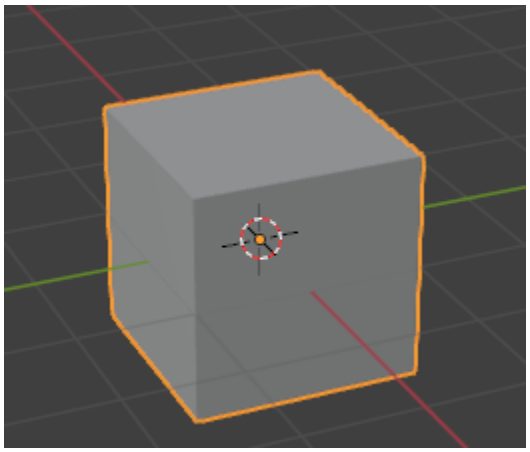
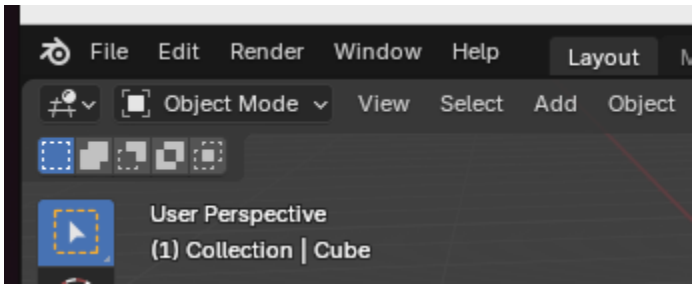
Blender Tips

Useful Controls/Hotkeys

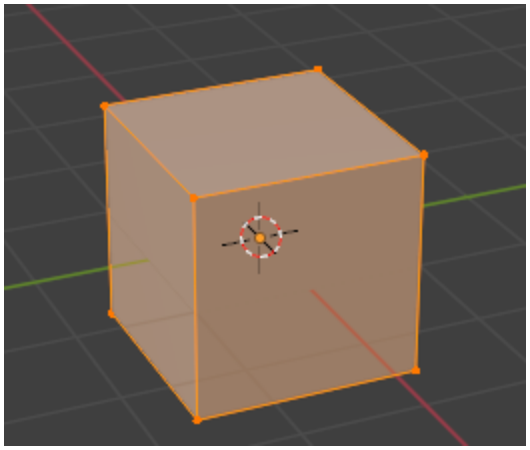
- LClick to select an object



- Ctrl+LClick to select multiple objects
- LClick and drag to box select multiple objects
- RClick to bring up some options for editing the object
- Hold the Middle Mouse Button and drag to rotate your view about the origin
- Mouse Wheel or two fingers on laptop trackpad to zoom in or out
- While multiple objects are selected Ctrl+J will join those objects into one new object
- Press “x” to delete selected objects
- Press “g” to move selected objects
- After pressing “g”, pressing “x”,”y”,or”z” will restrict motion to that axis
- Press “r” to rotate selected objects, pressing “x”, “y”, and “z” after “r” restricts the rotation to be about each axis
- Basically always work in default 3D Viewport window, with Layout tab selected



- Pressing “Tab” will switch to Edit Mode, where you can see/move/add individual vertices of the selected object



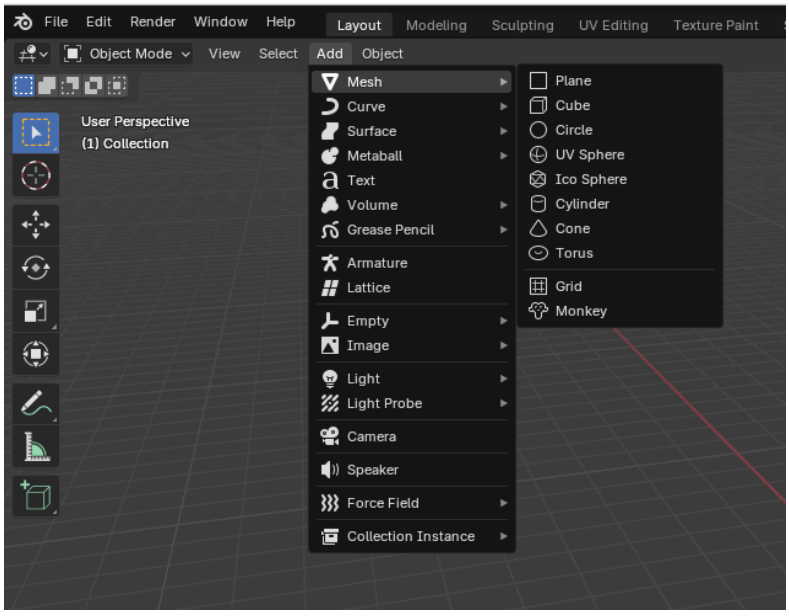
- Ctrl+V copies selected objects and Ctrl+C pastes the copies into the scene

Typical Workflow

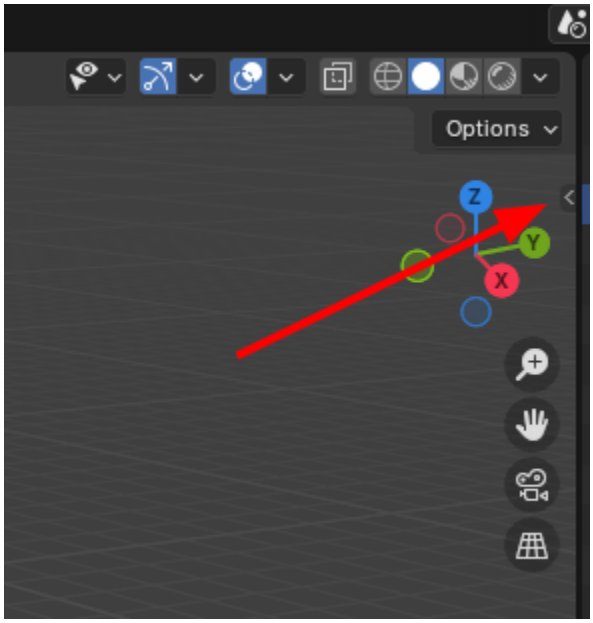
1. Make Objects to be rendered
2. Define Lighting/Background/Cameras
3. Create Materials for the Objects that define their color and whatnot
4. Position Objects and Cameras for rendering
5. Render Image

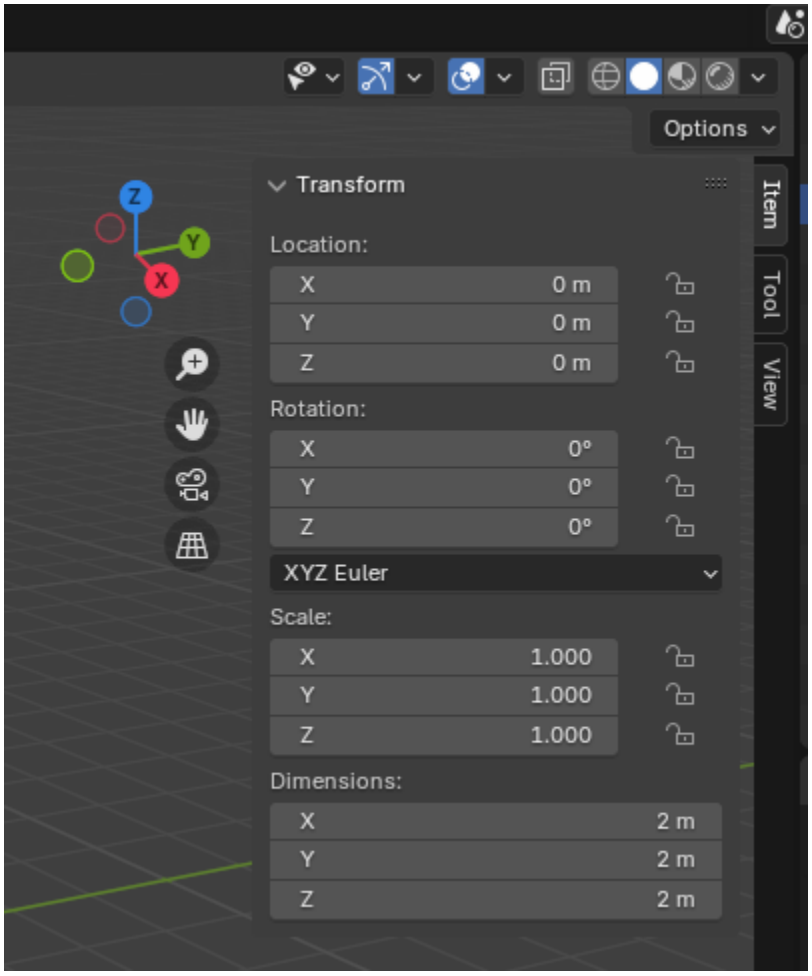
Making Objects

- I typically make my objects in an empty scene. So, delete the default cube, light, and camera after opening blender.
- Basic objects can be added to the scene from the Add menu, typically you want to add a mesh object.

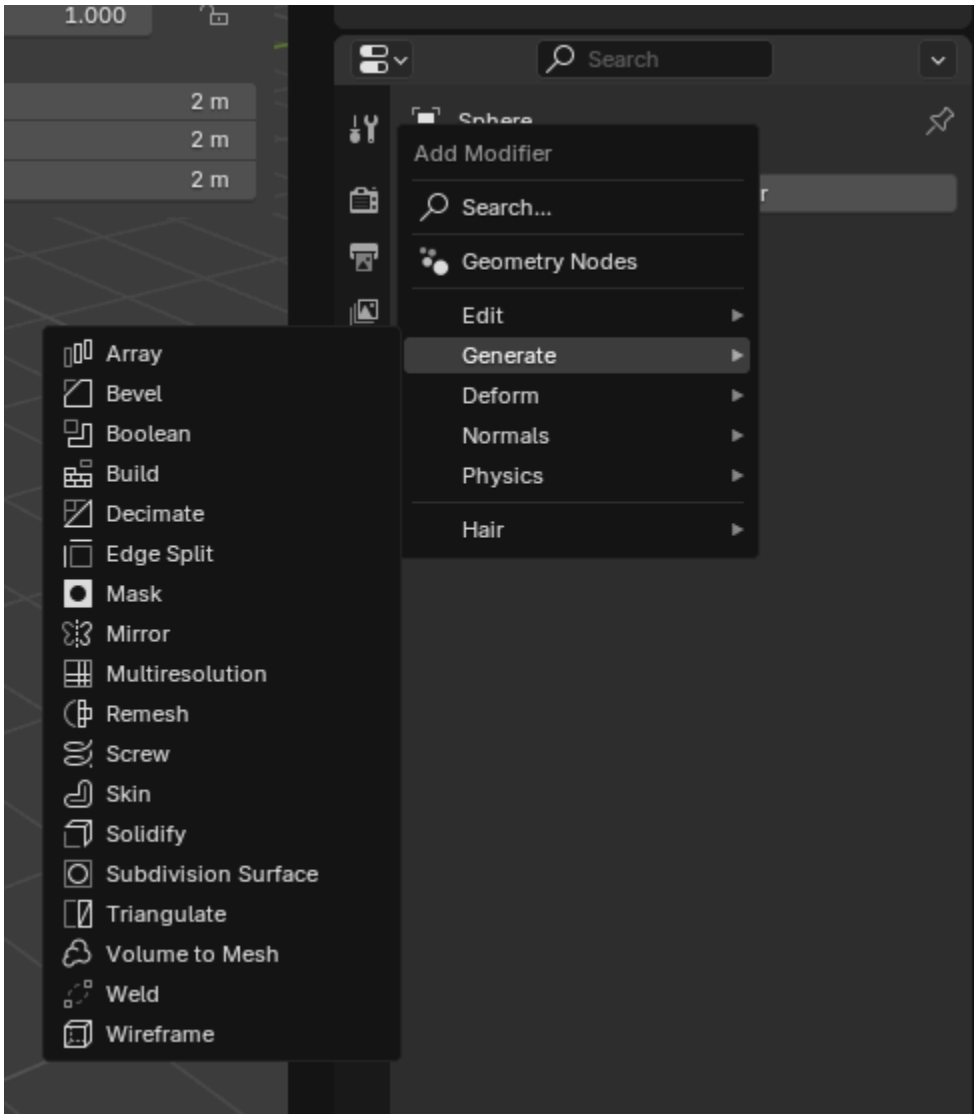


- After adding a basic object and selecting it, you can change its position roughly with “g” and size with “s”, or you can open the item menu on the right edge of the viewport to precisely set the position and size

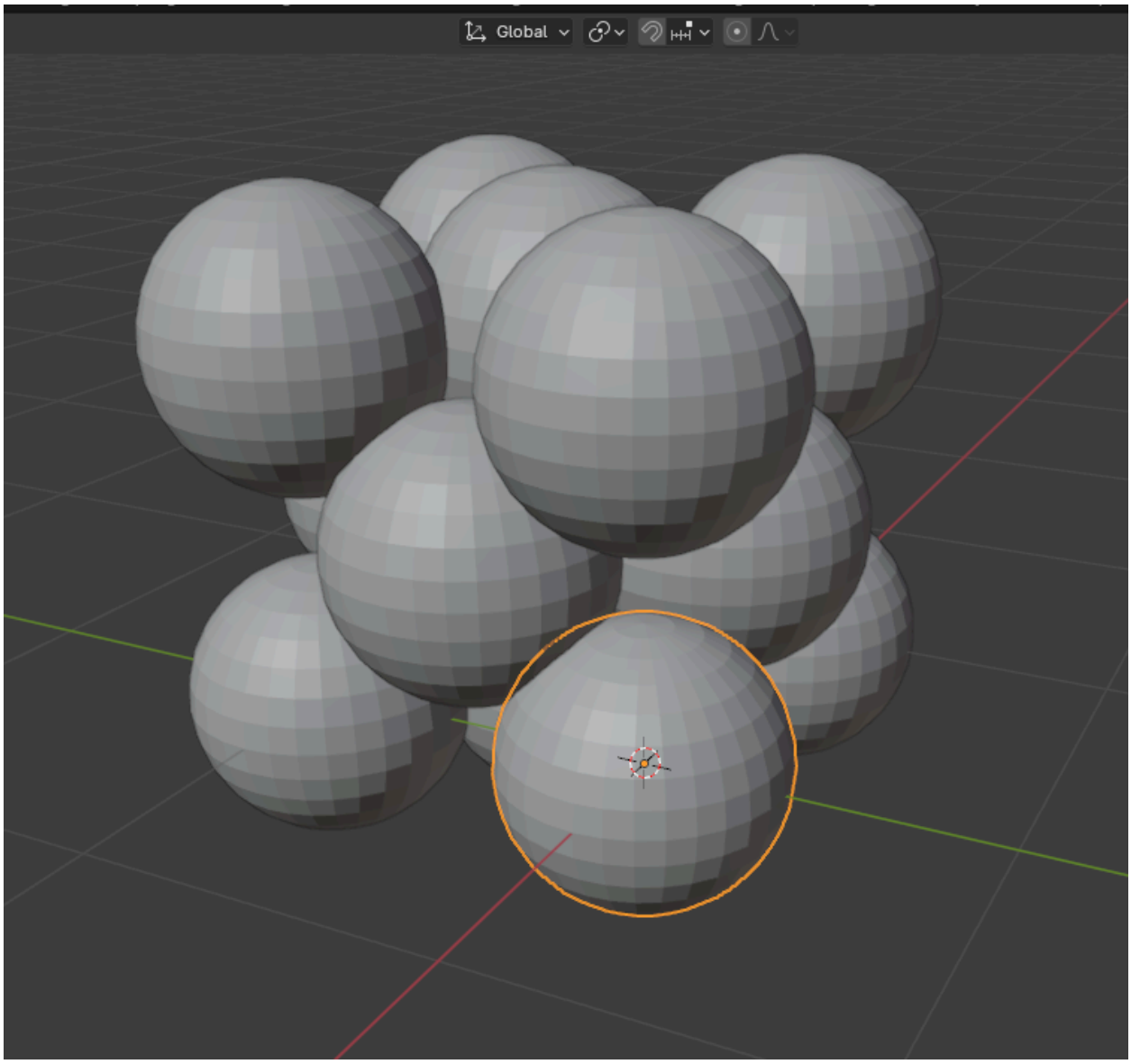




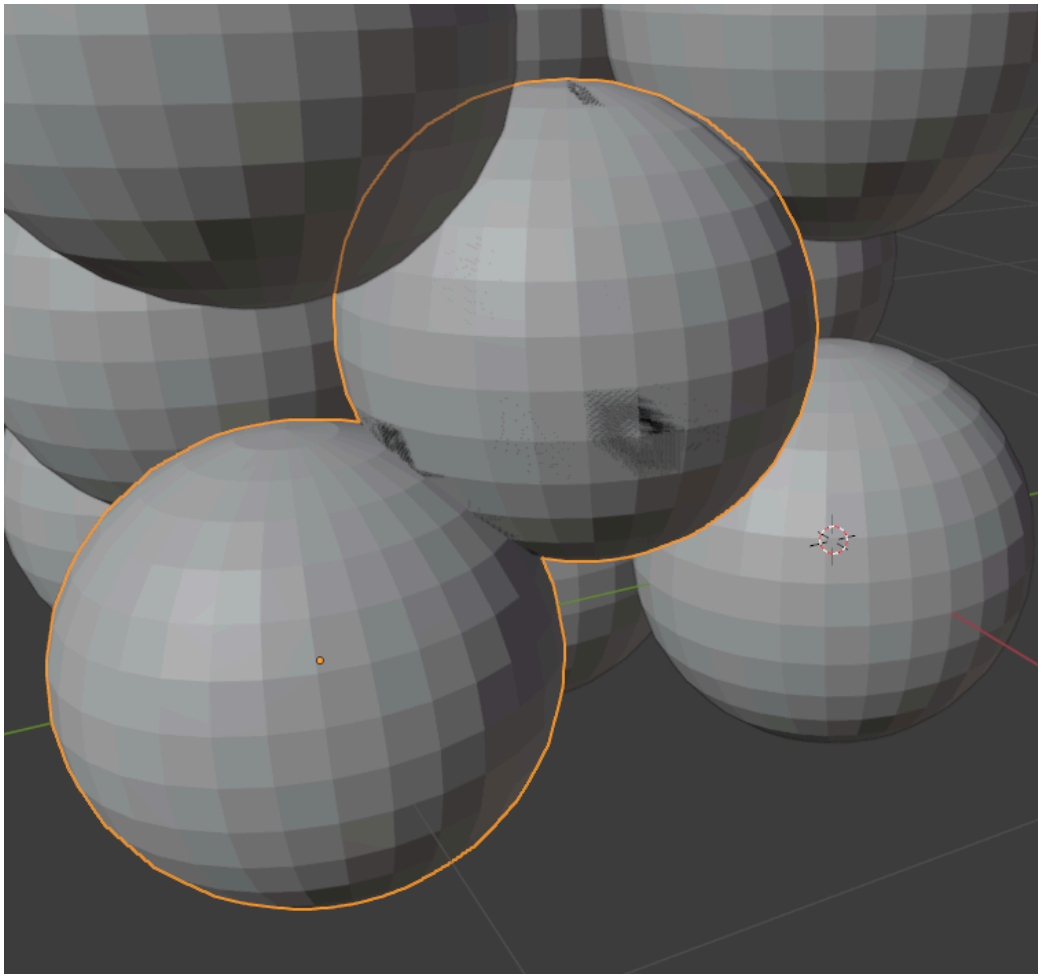
- This is sufficient for positioning a few spheres/cubes/curves but for many objects it is better to use python
- One function I use a lot either for making more complex objects or for making inverse crystals are the boolean modifiers. All modifiers can be found in the blue wrench tab of the right window after clicking “Add Modifier”.

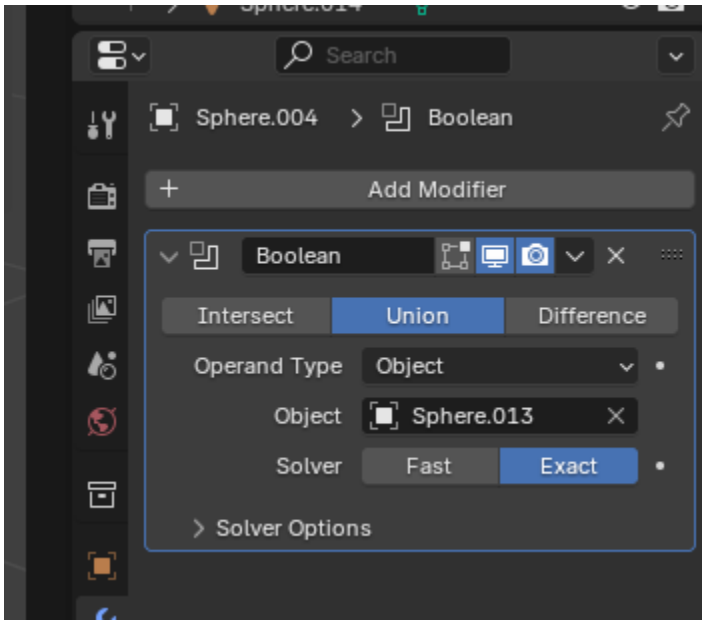


- Boolean modifiers allow you to take two mesh objects and create a new mesh that is either the Union, Intersection, or Difference of the original mesh objects.
- For example, to create an FCC lattice I would add a UV Sphere to the scene, set it to the appropriate size, and position it at the origin. Then, copy and paste the sphere to make the other 13 spheres of the FCC and move each one to the correct position.



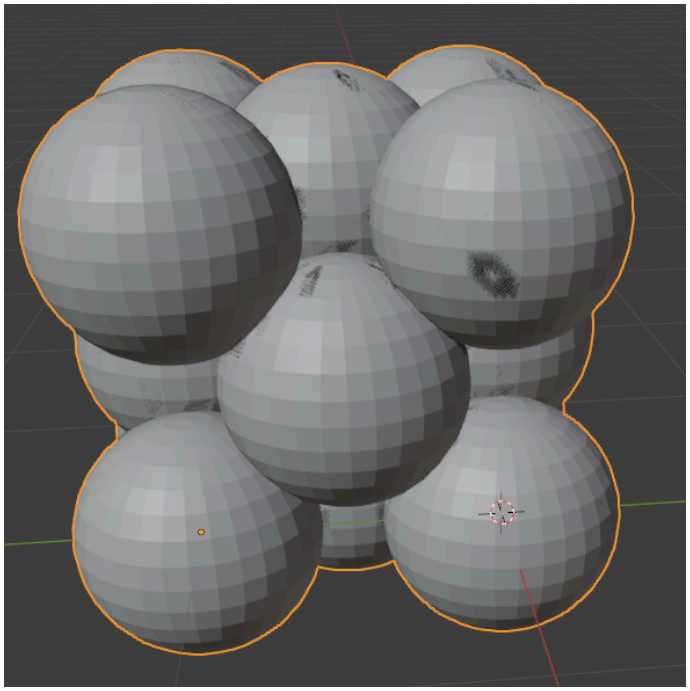
- Now, if I just wanted to render the direct FCC, I would box select all the spheres and join them into one object with Ctrl+J. Then I could set up the rest of the render or copy the crystal and paste it into another blender file that already has the lighting and everything set up.
- For the inverse FCC, I'll take the spheres of the direct FCC and use the Boolean Union modifier on each one to create one nice mesh out of all of the spheres. If you just join them with Ctrl+J, the meshes of the individual spheres are unchanged so there are vertices inside of the spheres and other weird effects that will make things ugly/not work.



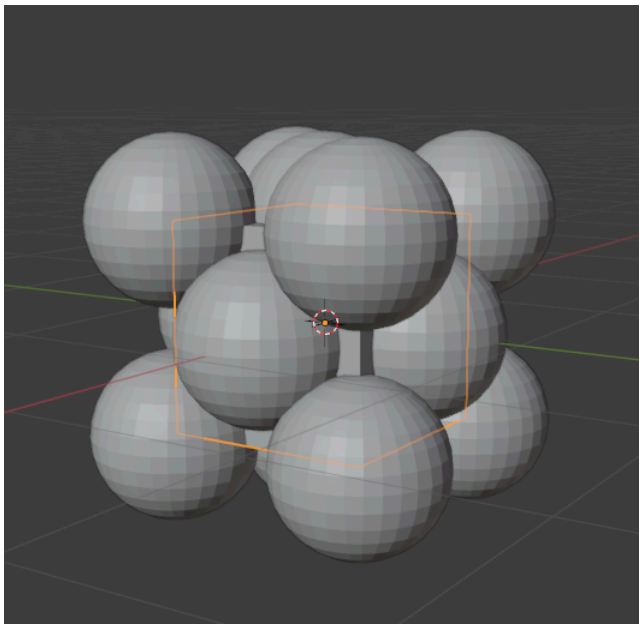


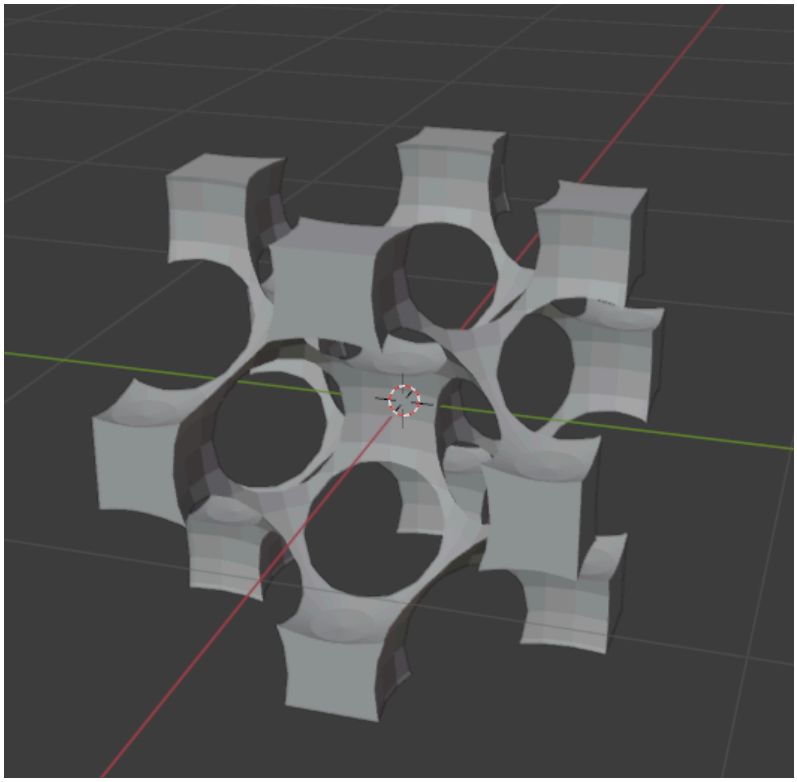
- Apply the modifier to the two objects by clicking the Boolean's dropdown arrow (next to the camera) and hit Apply. Repeatedly add the modifier selecting a different sphere each

time to unionize the whole crystal. At the end, the spheres will have a weird shadow on them because the new unionized spheres are sitting directly on top of the original spheres.



- Now, get rid of the original spheres by moving the unionized spheres to the side and selecting and deleting the original spheres. At this point, I like to set the origin of the FCC lattice to be its center of mass by right clicking and choosing “Set Origin”
- After we have a single mesh object that is the direct FCC, we can make the inverse lattice by taking a cube putting it at the center of the FCC and adding a Boolean Difference modifier to it with the direct FCC.

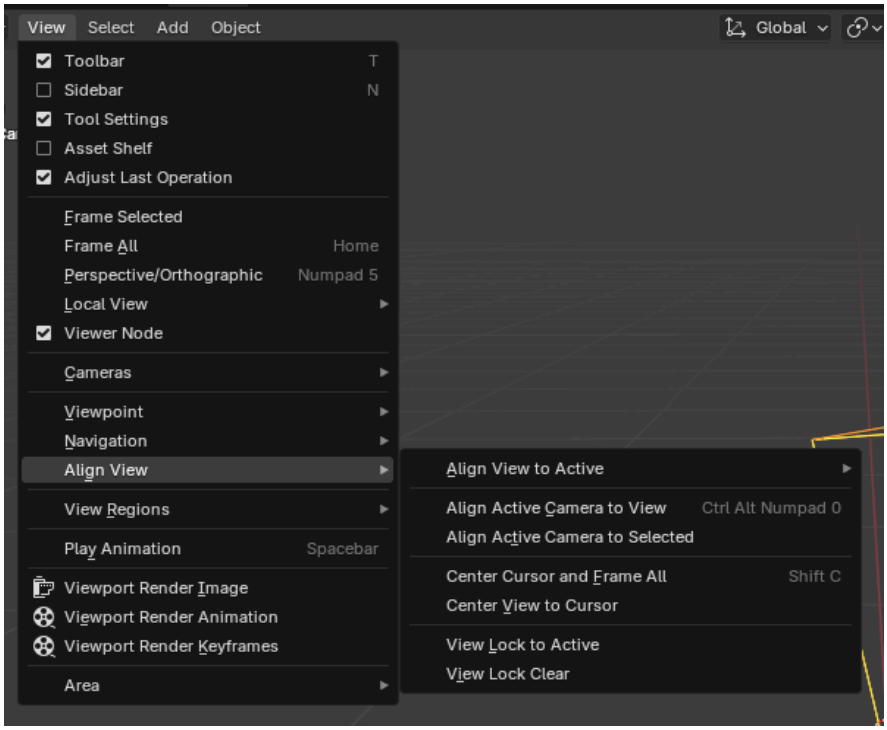




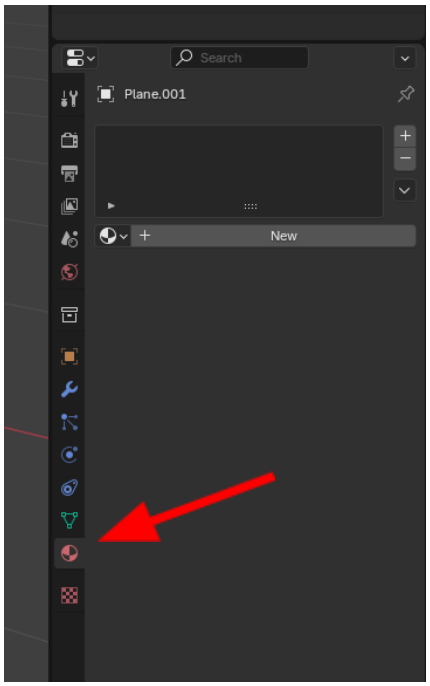
- For making objects more complex than this, use your imagination and google it.

Setting Lighting and Materials

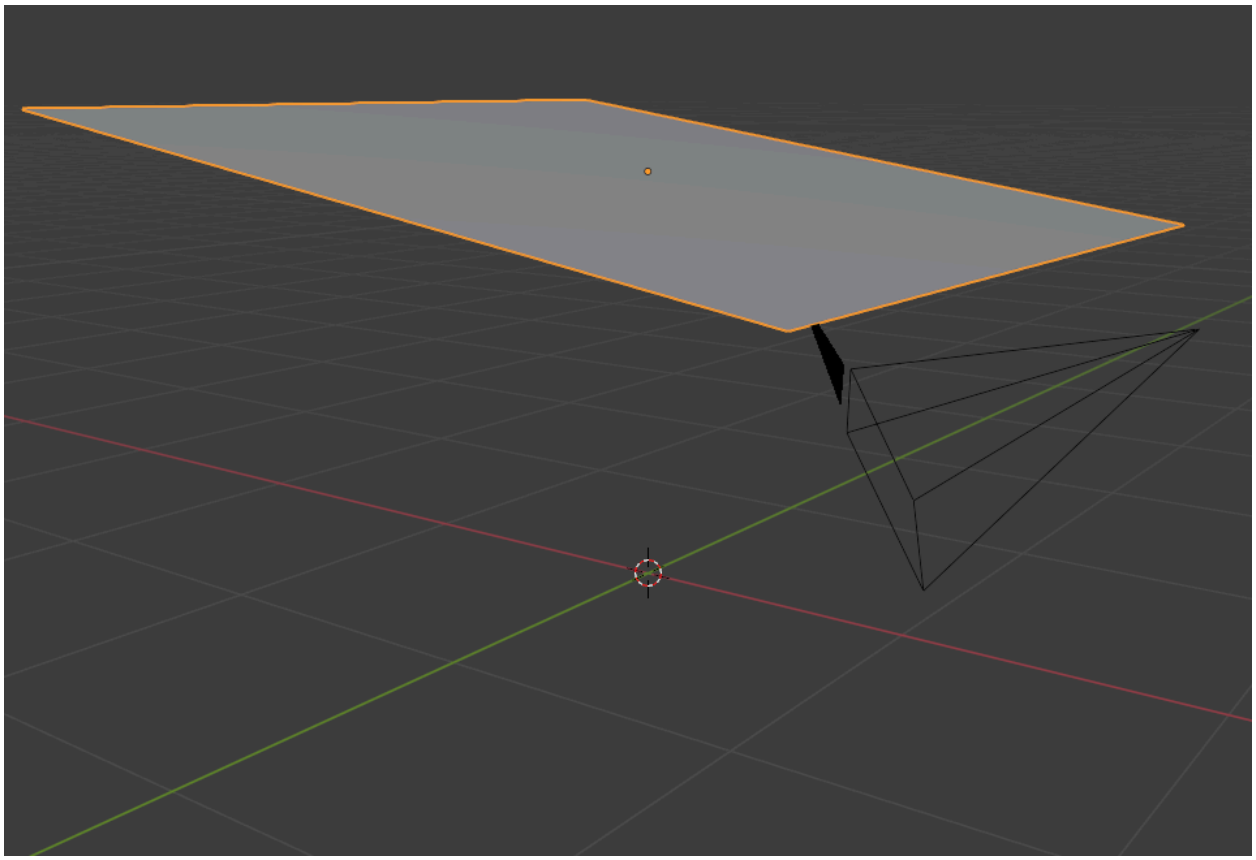
- My typical lighting setup is the blender file name empty_setup.blend. I'll go over how I made this.
- First under Add, choose Camera. After the camera has show up, and in general, I like to position to be aligned with my current view. To do this, click the View dropdown menu, then Align View, then Align Active Camera to View. Ctrl+Alt+NumPad0 if you have a numpad.



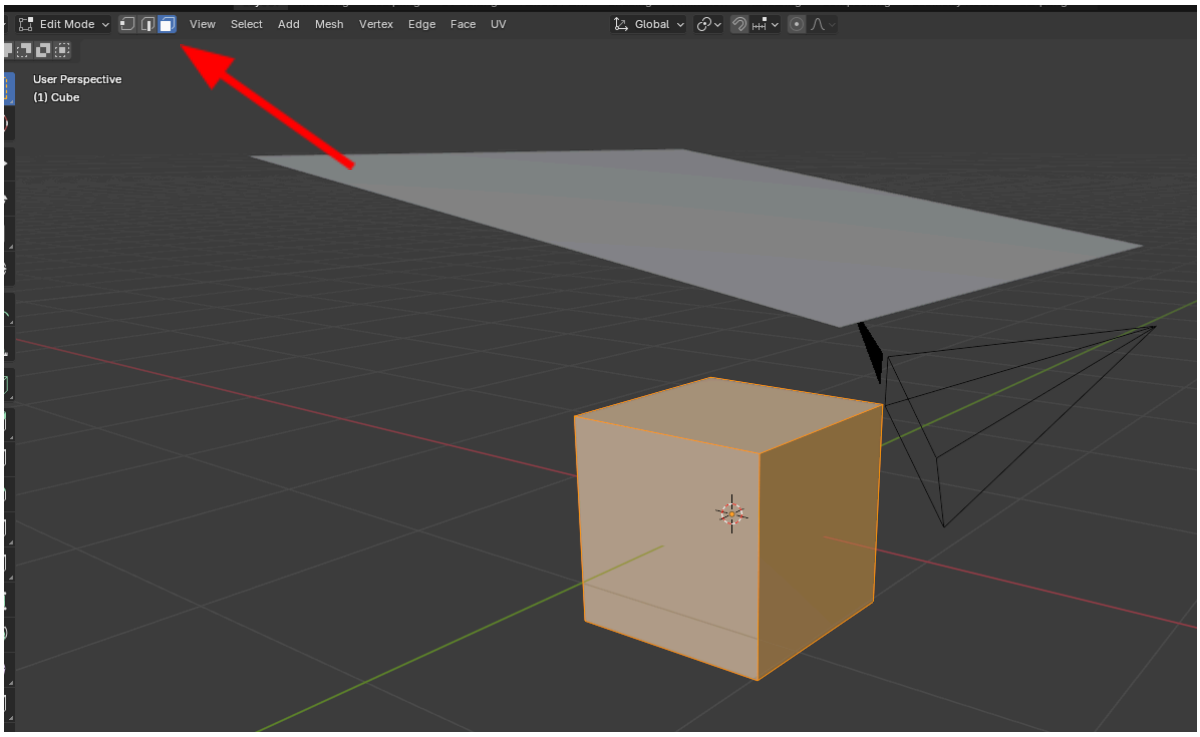
- Next we need a light source, there are a few different types of light sources that can be added from the Add menu, or we can make any mesh object emit light and act as a light source. I will do the latter, but play around with all the default lights too.
- I am basically the Annie Leibovitz of 3d crystals, so I want to use a big plane of light to illuminate my object and cast shadows. First I add a Plane mesh object to the scene.
- Then I set its material from the Material tab in the right window.



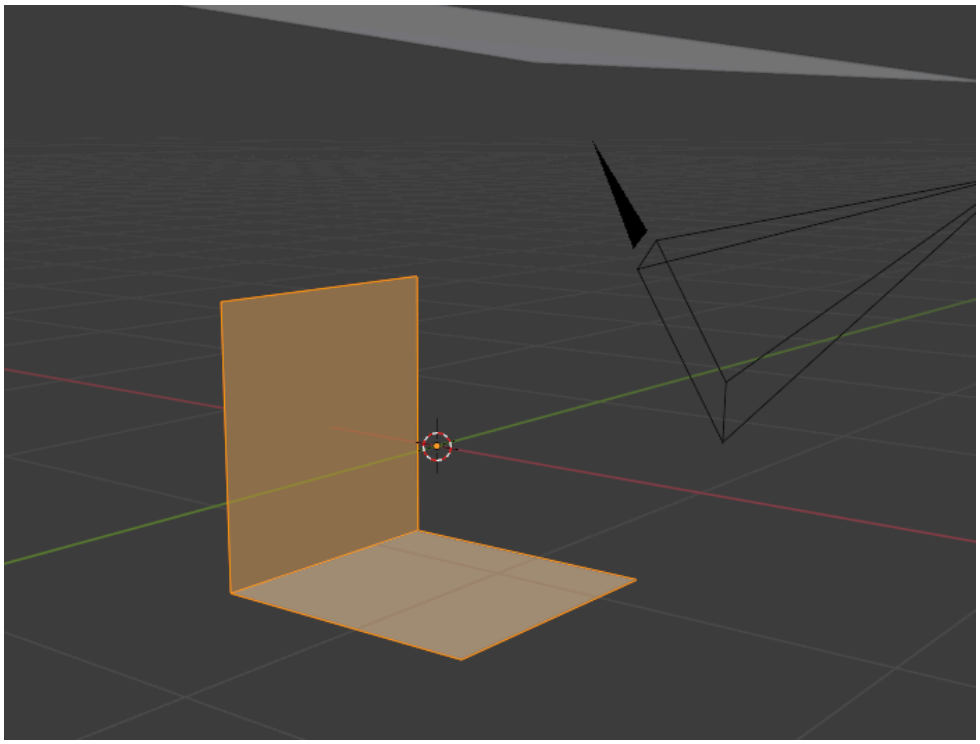
- First hit New to make a new material. Typically, we only care about the surface because our materials won't be transparent and new materials default to Principled BSDF, which is what I basically always use.
- To make this material a light source go to the emission tab and set the emission strength to something non-zero. You can also change the color of the light here.
- Now, this will act as a light source, but once you're ready to render, play around with the emission strength to get the right brightness for your render.



- Lastly I like to have a backdrop so that my object isn't floating in a void. An easy way to do this is to add a cube to the scene, hit tab and in the top left corner of the window choose the option that lets you select faces instead of vertices

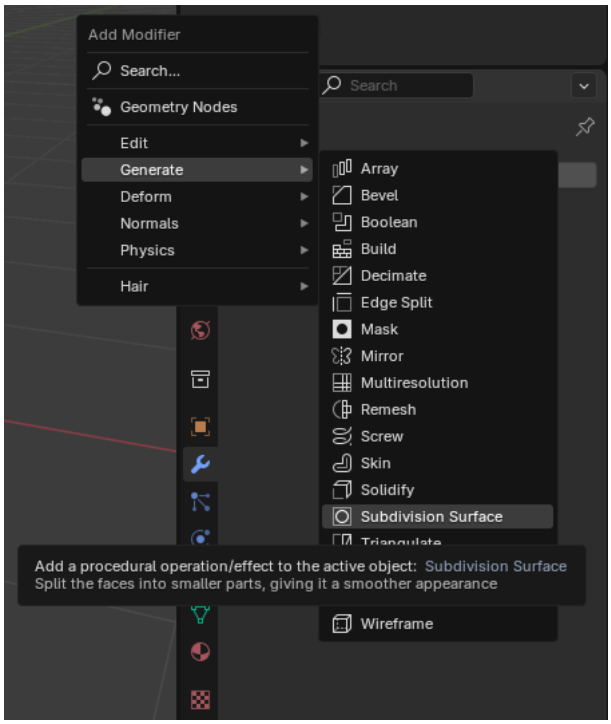


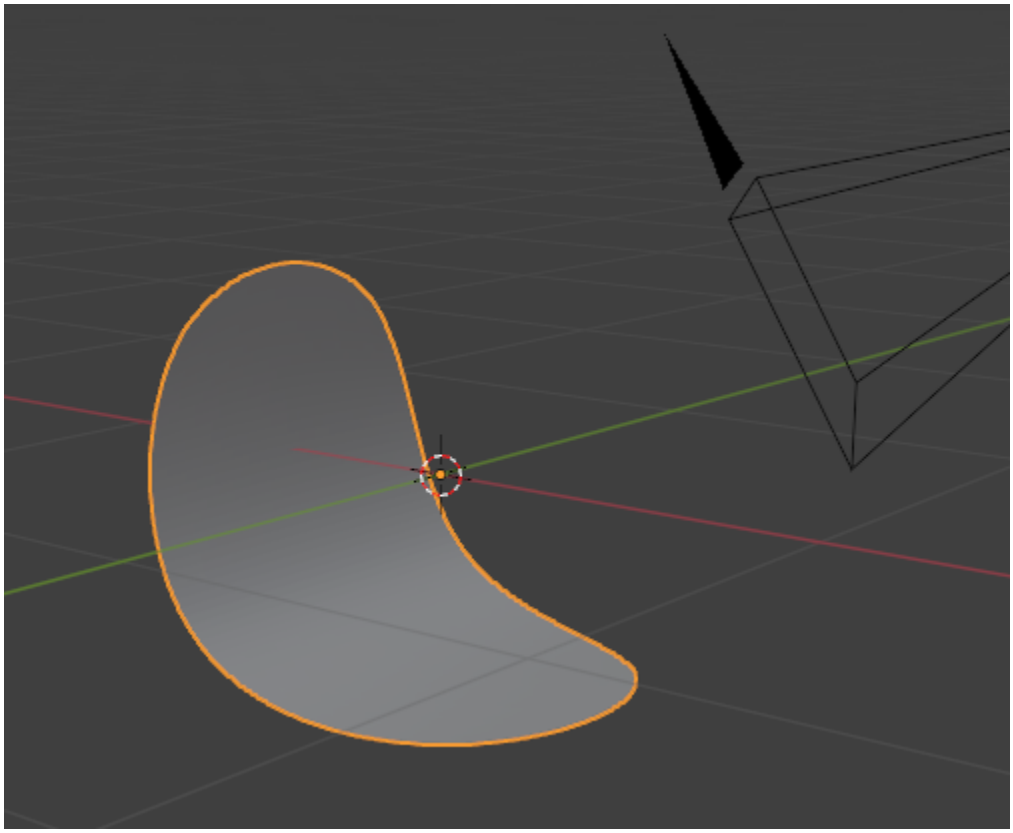
- Now, select all but the back and bottom faces of the cube, relative to your camera, and delete them.



- Hit Tab to exit Edit Mode, and go to add a new modifier. In this case, we will use a Subdivision Surface modifier, which will take the 2 faces our object currently has and break them into many more faces. In doing so, the right angle we currently have is

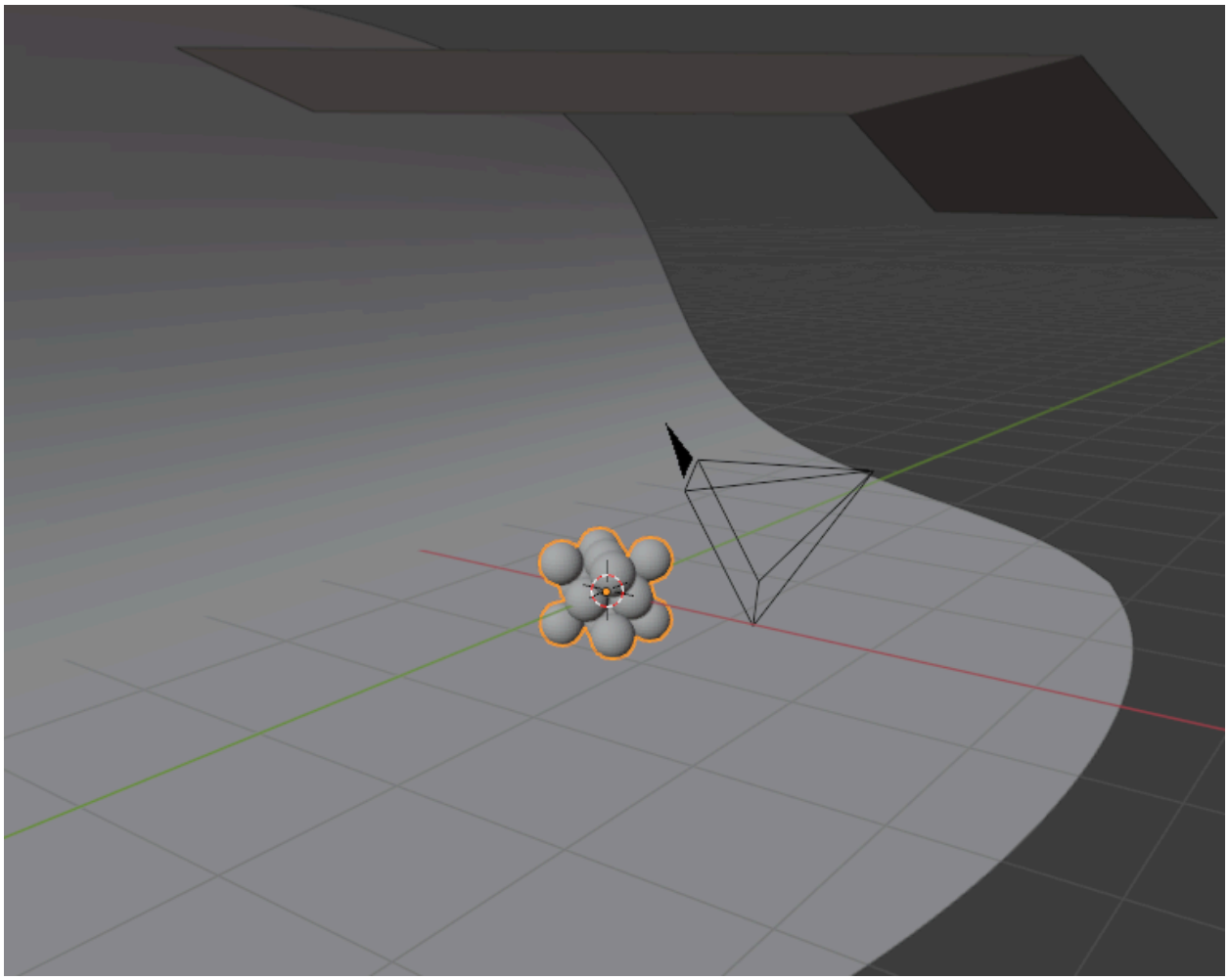
smoothed out into a nice curved surface. By increasing the number of subdivisions, the surface looks smoother, 5 or 6 should be good.



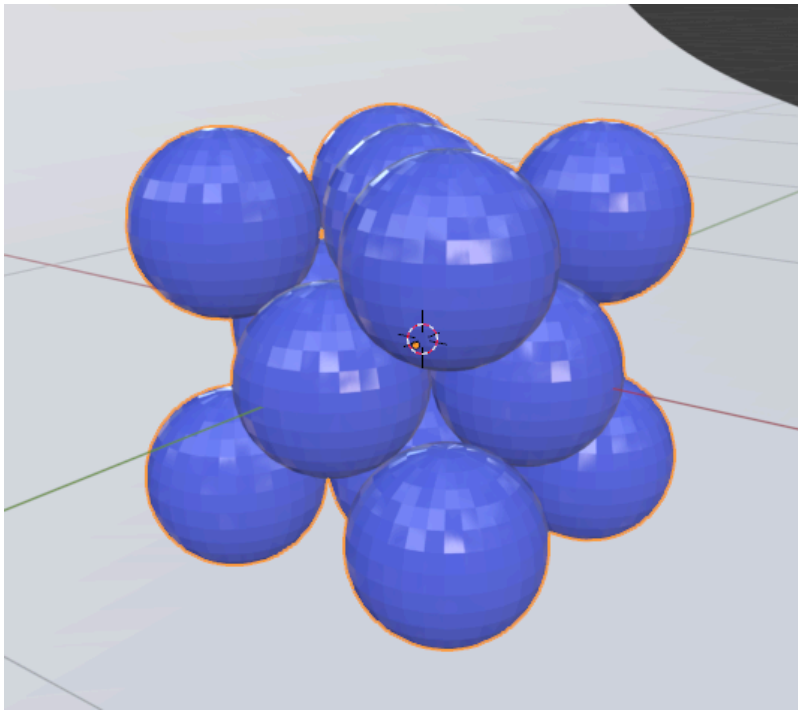


- Then simply use “s” in conjunction with “x”,”y”, and “z” to stretch this curved surface to the appropriate size for your render.

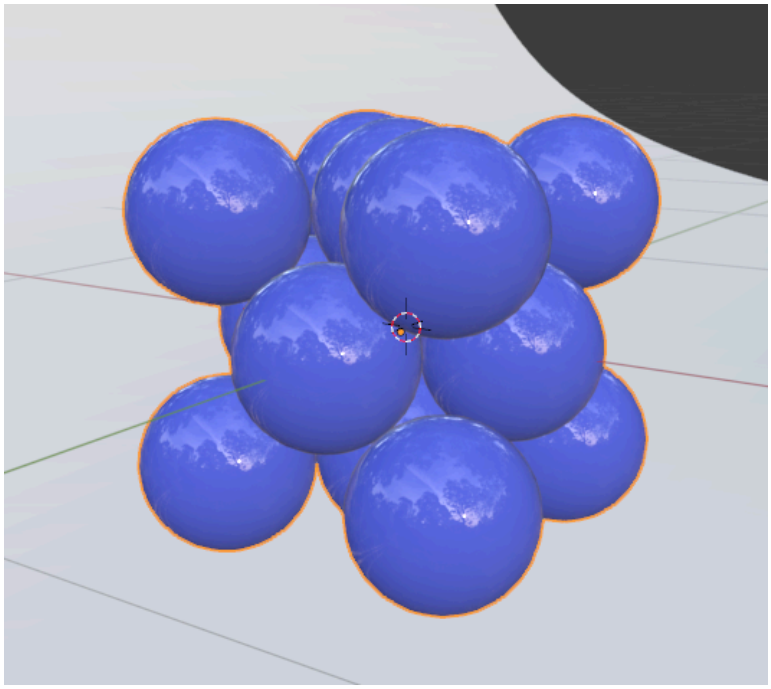
- You now have a camera, lighting and lightbox to photograph your objects in.
- Add an object to your scene. I usually copy it from one blender file, then open empty_setup.blend and paste it in. Scale and move objects appropriately. I like to keep all cameras facing the origin and objects to be rendered centered at the origin.



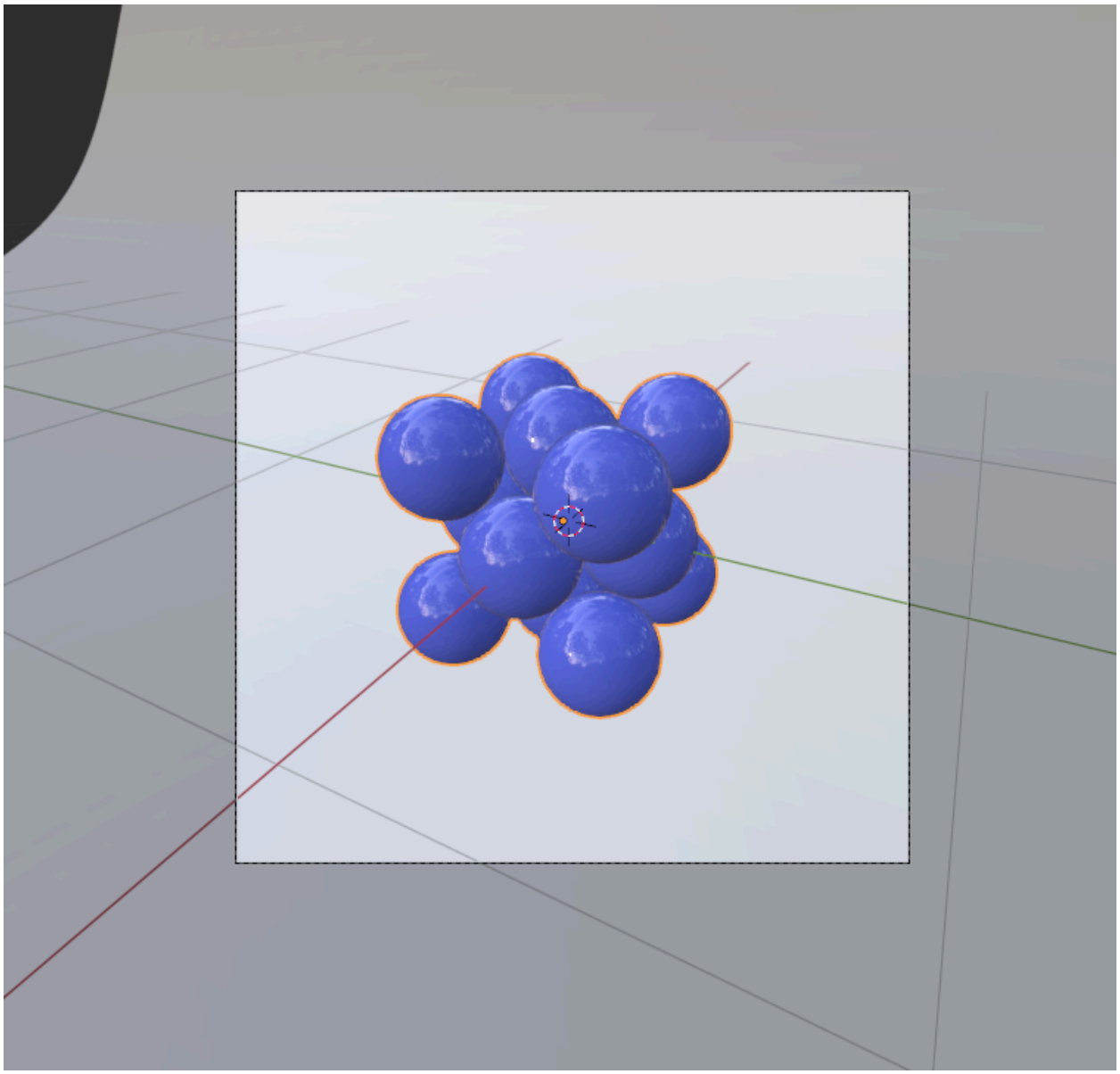
- Now select your object and navigate to the materials tab. Make a new material and keep it as the default BSDF. Simply change the color to your liking. You can also play around with all of the other properties: specular reflectivity, roughness, transparency, metallicness, index of refraction, and so on.
- The material is previewed in the materials tab, but won't change in the viewport unless you hit "z" and choose material preview.



- To get rid of the polygonal-ness of the render, right click on the object and choose Shade Smooth.



- You can make sure that your object is centered in the camera by choosing Viewpoint>Camera in the View menu. Additionally, the camera's resolution and aspect ratio can be changed from the Output tab of the right window.



- Finally, go to the Render dropdown menu at the top of screen and choose Render Image. Once rendering is done, you can quickly save the image by clicking Image>Save As on the Render window.