

Metaballs in Cinema 4D

Custom metaballs

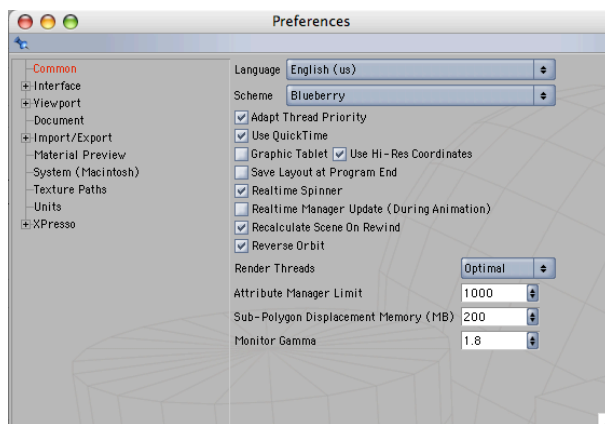
Metaballs are pieces of geometry (balls, cubes, cylinders, etc.) that, in the case of C4D, have attractive 'forces' attached to them. When these metaball objects come into proximity, they stretch their surfaces towards each other – the extent to which they stretch relative to their distance, as well as how smoothly the bridging geometry is created are parameters that the user can control.

We'll begin by creating a simple custom metaball object so that you can become familiar with the metaball concept and controls. Then we'll go over how to import and turn into a metaball a simple PDB file for export to Maya.

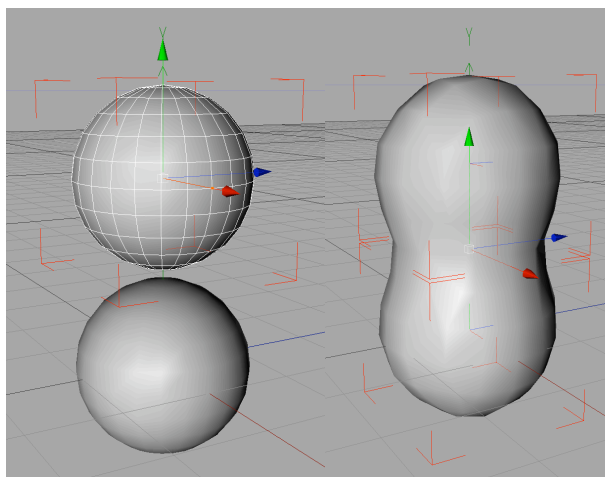
Open Cinema 4D – in order to navigate the viewport as you would in Maya, go to the Edit pull-down menu at the very top of the interface (not the viewport panel Edit!). Go to **Edit → Preferences...**, and in the default "Common" tab (highlighted in red) activate the "**Reverse Orbit**" checkbox. Now, when you are in the main 'Perspective' viewport, you can **alt+RMB to tumble, alt+MMB to move, and alt+LMB to zoom.**

To create a simple metaball object, begin by going to **Objects → Modeling → Metaballs**. You'll notice that this creates an (empty) metaball object that is listed in the upper right-hand corner of the interface (in the "Objects" panel). Now go to **Objects → Primitive → Sphere** to create a sphere (by default it is placed at the center of the viewport and selected with xyz manipulators showing). **Copy (Cmd C) and Paste (Cmd V) the sphere, and move the copy** slightly above the original using the y (green) manipulator. Save the file.

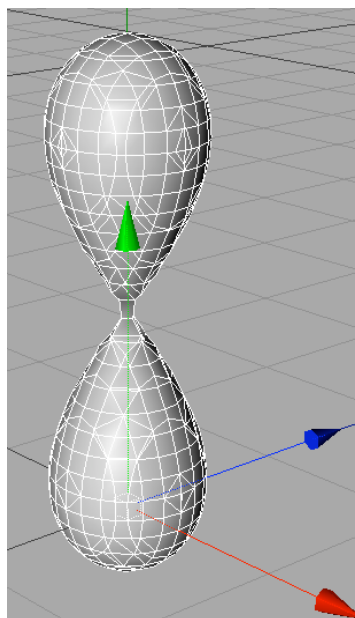
In the upper right "Objects" panel, **shift-select both spheres and drag them onto the Metaball layer** – the 2 spheres in your viewport have now transformed into a peanut. Select the metaball layer in "Objects" panel, and find the "**Object Properties**" in the panel below. Check the "**Exponential Falloff**" box, and lower the "**Editor Subdivision**" value to **10 m**. Notice that this increases the number of "creases" on your peanut (i.e. it increases the tessellation of



Cinema 4D preferences panel



Two spheres in proximity are converted into a metaball.



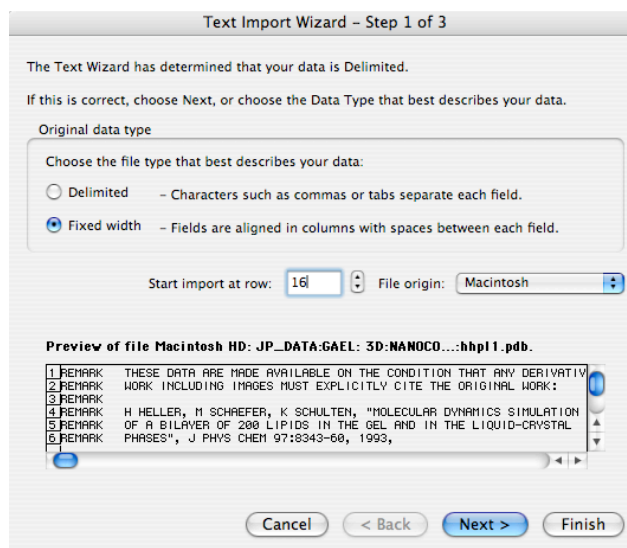
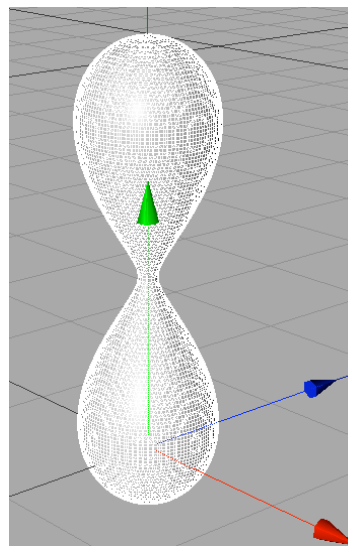
the geometry). Next, increase the **Hull value by increments of 10%** until the balls are no longer connected (probably in the vicinity of 200%). Now select one of the spheres (either by clicking on its layer in the “Objects” panel, or simply by clicking on it in the viewport), and press the “E” key on your keyboard to activate the move tool (i.e. xyz manipulators). Move the sphere up and down to observe the metaball effect in action!

Notice that if you move the sphere such that it JUST connects with the one below it, the geometry at the junction is poor and very faceted. You can remedy this by selecting the metaball object and now lowering the Editor Subdivision (try a value of 5 or even 2!).

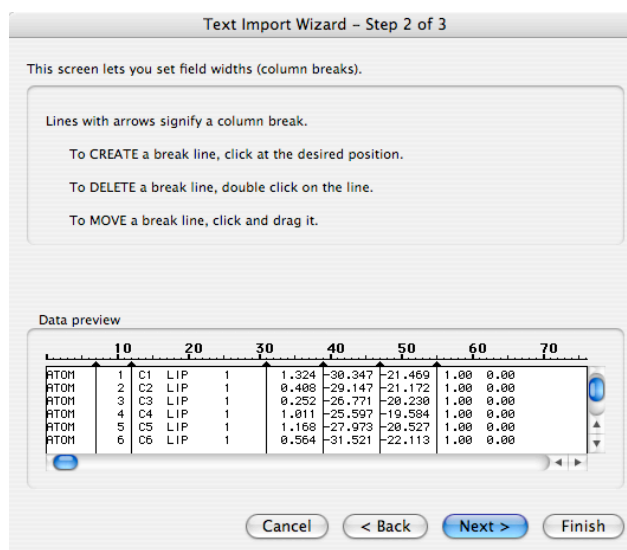
Molecular metaballs

Open the **hhpl1.pdb** file in Excel (won't recognize the file type so switch to 'all documents') – this will bring up the 'Text Import Wizard.' Select the “Fixed width” option and enter 16 for the “Start import at row” (if you scroll down in the “Preview of file” section, you see that line 16 is where our 3D coordinates actually start – i.e. we're not interested in the PDB header for this). Click NEXT. Create column breaks in the “Data preview” window such that the atom number column and the x, y, z coordinate columns are separated. Click Finish. Now **clean up the file such that only the atom number and x, y, z column data remain**. Also make sure that the first line in your Excel file holds some sort of column labels (i.e. like “atom number” “x” “y” “z”) – C4D expects to see column labels and will otherwise chop off your first line of coordinates! Finally, **save as a Text (tab-delimited) file**.

In Cinema 4D, open a new file and create an empty polygon object by going to **Objects → Polygon Object** (notice the “Polygon” layer that appears selected in red in the upper right “Objects” panel). Next to the “Objects” tab, select the “**Structure**” tab, and go to **File → Import ASCII data...** select your Excel-exported tab-delimited text file. The coordinates are now loaded into the “Structure” panel of C4D – notice that the Perspective viewport now shows (in addition to the xyz move-tool manipulators) red corners outlining an invisible rectangular box – this is the “bounding box” for your coordinate cloud.



Excel Text Import Wizard for preparing PDB coordinates

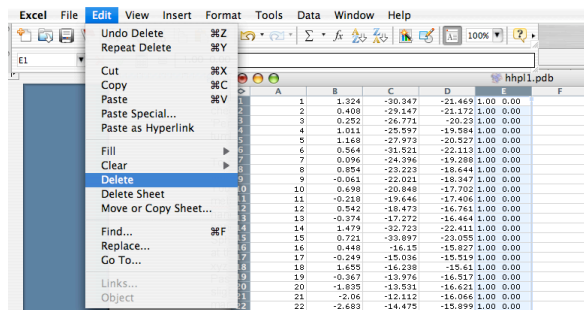


Specifying column breaks

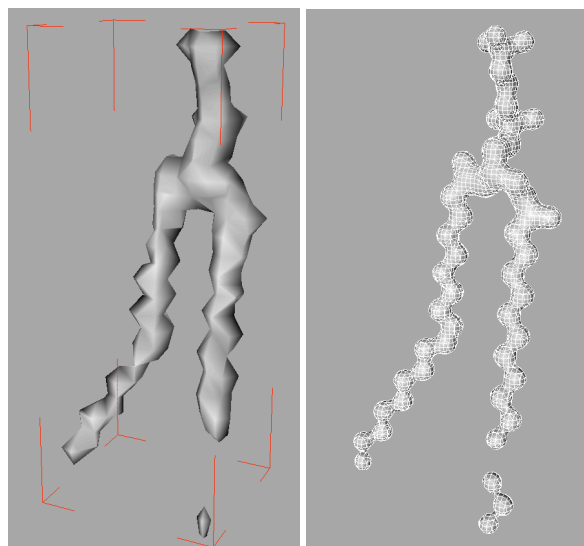
Go to **Objects** → **Modeling** → **Metaball** (the metaball layer appears in the upper right). **Select and drag the Polygon layer onto your Metaball layer** (the former becomes indented under the latter). The Perspective viewport now shows a dimpled sphere: your PDB-derived point cloud has now been converted to metaballs! What remains is basically to adjust the same settings we used in the preceding 2-sphere tutorial... However, one important difference is that the **SCALE** of your Polygon object is crucial in this case (i.e. adjusting the Hull Value and Editor Subdivision numbers alone will still just give you a single sphere at this point). So **select your polygon object** and in the coordinates panel (below the layers panel) **enter a value of 35 in each of the S.X, S.Y, and S.Z fields** (you may need to zoom out the viewport to see your object again)

Now you can select the metaball layer, and begin by reducing the **Editor Subdivision to 10m** and increasing the **Hull Value to 130%**. You are now looking at a phospholipid ☺. Feel free to experiment a little more with the metaball settings and polygon scale.

When you are satisfied with the look and tessellation of your object, select the metaball layer and, in the layer drop-down menu above your layer, click on **Objects** → **Make Editable** (this converts your metaball into a polygonal mesh – even though the layer is still called “metaball” after the operation). You are now ready to export your model to Maya. Go to the upper left and click on **File** → **Export** → **Wavefront** (or FBX).



Cleaning up the coordinate file for Cinema 4D import



Adjusting the Editor Subdivision & Hull Value