

A Guide to the Maya interface and an Introduction to the Modeling Tools for the Beginner

(there are many like it but this one is mine)

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DTC 498

Fall 2014

Washington State University

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Note: the images in this guide are from Maya 2015, depending on your version some of the layouts will be different.

1. Introduction

Welcome to my guide to the Autodesk Maya software for the beginner. The guide is meant to be used in conjunction with Washington State University's DTC 335 Beginning Digital Animation course, or some other comprehensive learning path. Following this guide on it's own will probably not be a waste of time but it is not geared as comprehensive guide to the subject but more as an beginner's reference that focuses on areas that students seem to have questions about or trouble with during when starting with Maya. Essentially it aims to go over the whys and hows for the kinds of things someone will need to know when firing up Maya for the first time. Links to further resources and in depth tutorials will be provided at the end of the guide for those who are looking for a more comprehensive exploration. Additionally some information provided will assume that you are working within the framework of the DTC courses and will not apply in all situations.

2. Quick Look-up & How to

Just looking for one small bit of info? Well, here's a quick reference to all those little bits that you always regret forgetting: (will fill this out after the rest is typed)

- A quick visual of the Maya interface with labels – page 6
- Interface hotkeys – page 17
- Display options – page 24
- Tool hotkeys – pages 25, 32, & 39
 - Note that there is also a complete guide to hotkeys available in Maya's online help directory

A few quick “So you want to...”

- Create a skydome
 - Create a polygon sphere and scale it up until it encloses your entire scene. Delete the faces on the bottom half of the sphere. In the attribute editor under the Render Stats, turn off Casts Shadows, Receives Shadows, and Double sided. Then under the Normals menu select Reverse. Then apply a file texture or an appropriately shaded ramp material.
- Group a set of objects
 - Select all of the objects that you wish to put into a group and hit **ctrl+g** , then name the group in the outliner. Be sure to hit the hotkeys only once for a set of objects or you will end up with nested empty group sets that will clutter your outliner. You can re-center the pivot of the group by going to Modify>Center Pivot
- Place an object in your scene
 - This one seems obvious; you'd use the move tool or the channel box to place your object. However, be sure to change your angle of view as you move objects around in your scene, especially if you are using the central move handle to shift it on all axes. Often you will move an object to what you think is the correct place, but when you change your angle of view you find that it is off in one of the axes.

3. Getting Started with Maya

Before diving into the program itself let's go over a getting the program ready for prime time.

As a class member you will have access to Maya during class hours and whenever you come into the lab to work. What you may not know is that as a university student you can also get a 3-year license of this program and many other neat offerings from the for your personal computer for free. Simply go to the Autodesk Education Community free software website: <http://www.autodesk.com/education/free-software/all>

Select Maya, or any other program that you are interesting in, create an account, and download. To minimize potential future difficulties I do advise that you get the version that you will be using in class if your computer specifications will allow it; if you want a different version on top of that you can download that one too! Maya does share files between different versions but every now and again it can cause some issues that a beginning student may not be prepared to work out. If the thought of a bit of troubleshooting doesn't scare you off, then pretty much any version of the software that Autodesk has available on it's site *should* work.

Note: in order to set up your Autodesk Education Community account you will need to provide your university e-mail address (one with a .edu), along with some other personal information.

If you have difficulties with the download (and as of this writing, there have been some issues with the Maya 2015 download in particular), there are a couple different types of downloads that you can try and Autodesk has some helpful resources and forums that may provide you with a solution:

Here's a link to the Autodesk forum for installation and download questions:

<http://forums.autodesk.com/t5/installation-licensing/bd-p/24>

Alternatively, sometimes downloading via the Virtual Agent can sometimes help if you're having problems.

<http://knowledge.autodesk.com/topics/account-management/software-downloads/download-methods/virtual-agent>

Failing that there's always Google.

A word about your computer and its peripherals:

Apart from simply needing to have the ability to run Maya you will also want to take a look at your personal computer set up. You can use Maya on a Mac or a PC, though for the purposes of this guide instructions will be geared for a PC. Macs may need some extra adjusting as far as hot-keys go in order to work as intended, as well as the usual switching from the Ctrl key to Command.

I also highly advise that you have at least a standard keyboard and 3-button mouse to use with Maya. If you're going to be working on your laptop and all you have is the touchpad, purchase a mouse for it if at all possible. While it is technically possible to work in Maya with only a touchpad, you will be shooting yourself in the foot in regards to your work speed and your ability to learn the program. Once you have a bit more experience with Maya you may wish to change your set-up a bit to take advantage of Maya's scripting and hot-key customization options, but for now this is a good start.

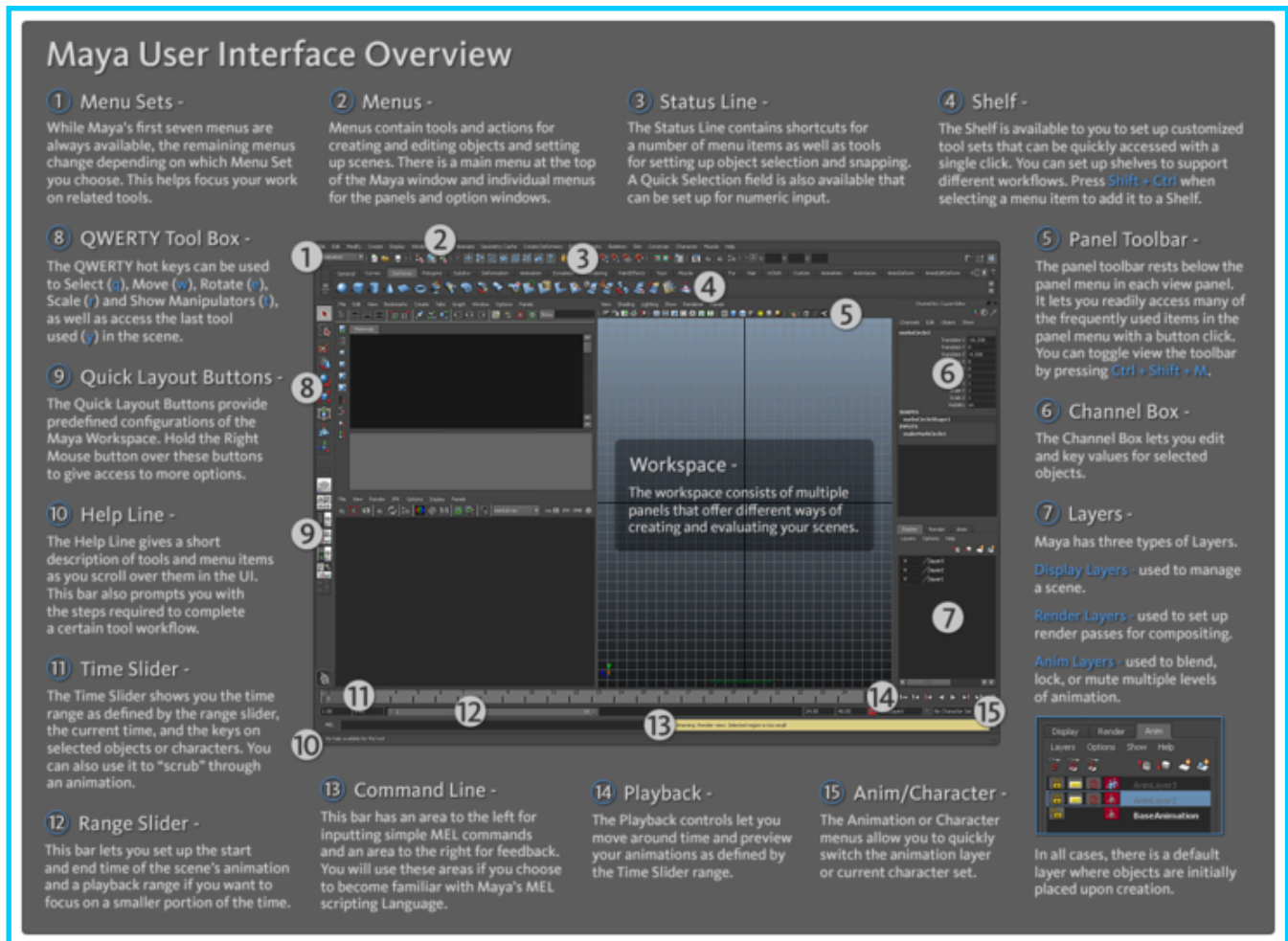
When you start up Maya for the first time you will need to enter the license key to run as anything other than the 30-day trial mode. You should have received this key in an e-mail sent from Autodesk to the e-mail address that you provided during your account set-up. If you didn't or have lost it, you should be able to request another from Autodesk provided that the first one has not been activated.

Congratulations! You now have a working Maya license!

(Unless something went wrong... In that case try checking the Autodesk forums to see if anyone has a solution to your problem. You can also ask Suzanne or one of the TA's for their advice. Some combination of these strategies should get you past most problems.)

4. Your First Project and Scene

Now that you have Maya open and working version of Maya you're probably noticing the weird view-port and all of the buttons and menus and such.

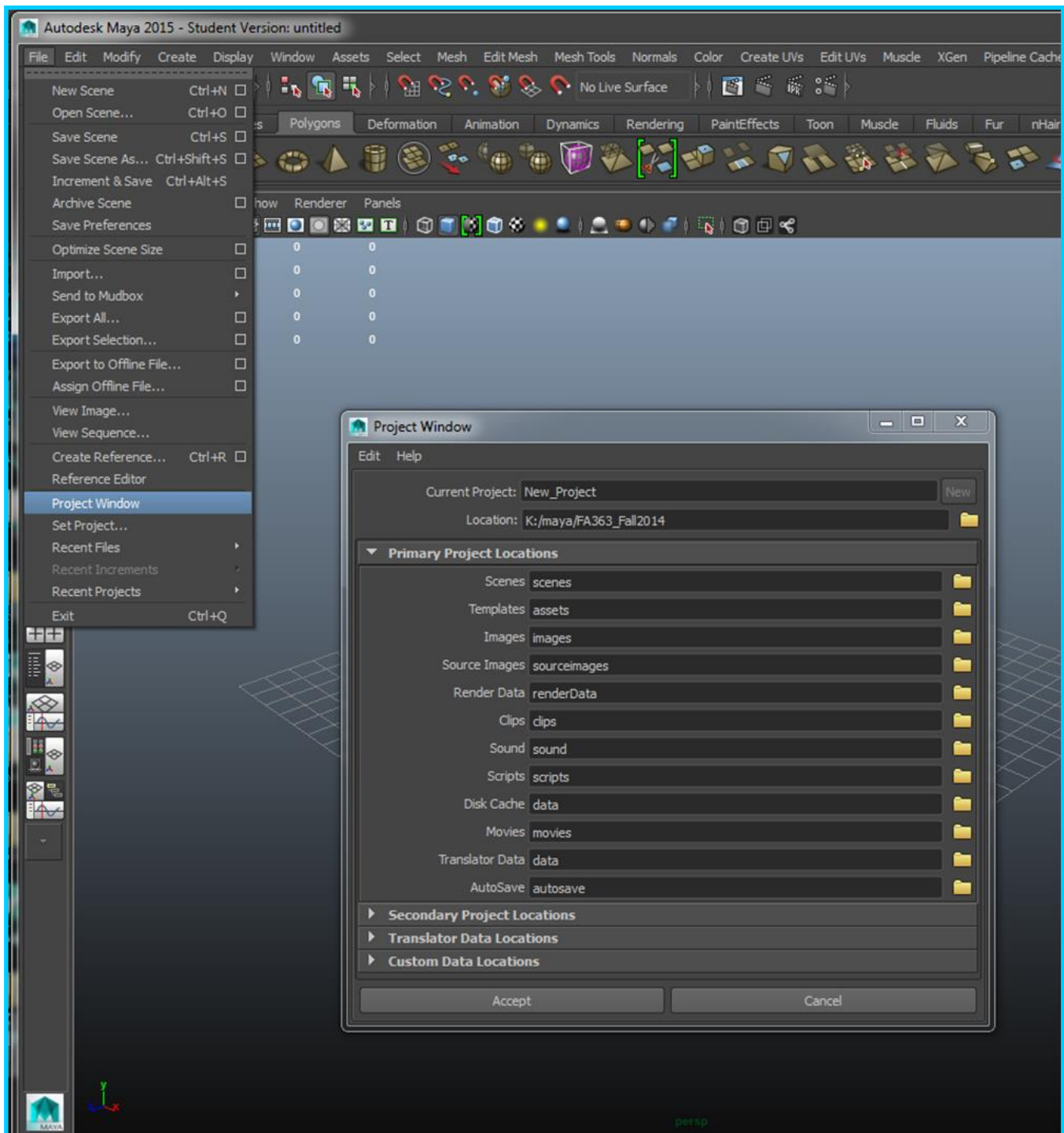


(Labeled image of Maya interface from the [Maya online help site](#))

We'll get to all of that shortly. The first thing that you want to be able to do in Maya is to set up your project folder. Your project folder is where all of the objects, environments (scenes), renders, paint textures, and everything else will be saved. If you don't have the folder set up correctly you will run into a host of irritating problems.

Creating a new project:

- 1) To access the Project Window, go to File>Project Window.
















(The location of the Project Window in the menu and its appearance)

- 2) In the Project Window, next to the “Current Project” field, click “New” to create a new project and type the name you've chosen into the field.

- 3) Set your file's location in the appropriate field. On the lab computers this will be on the X-drive "Turn-in" folder, then within the appropriate class, section, and group sub-folders. On your personal computer this can be wherever you want it.
- 4) Take a look at all of the folders listed under the "Primary Project Location" heading. When you clicked "New" Maya set all of these folders to their default names and settings. You'll want to leave all of these and the information listed below the other headers in this window at their default settings until you are more experienced in Maya.
- 5) Click "Accept"

You should now be able to find your project folder on the X-drive, or wherever you have chosen to save it to on your own computer. It should look very much like this:

Name	Date modified	Type	Size
 assets	12/21/2014 1:20 AM	File folder	
 autosave	12/21/2014 1:20 AM	File folder	
 cache	12/21/2014 1:20 AM	File folder	
 clips	12/21/2014 1:20 AM	File folder	
 data	12/21/2014 1:20 AM	File folder	
 images	12/21/2014 1:20 AM	File folder	
 movies	12/21/2014 1:20 AM	File folder	
 renderData	12/21/2014 1:20 AM	File folder	
 scenes	12/21/2014 1:20 AM	File folder	
 scripts	12/21/2014 1:20 AM	File folder	
 sound	12/21/2014 1:20 AM	File folder	
 sourceimages	12/21/2014 1:20 AM	File folder	
 workspace	12/21/2014 1:20 AM	Maya Script File	3 KB

(Example project folder with all sub-folders and the workspace file)

If any of the files or the default Maya workspace file is missing, then you should delete the folder and go through the steps again. Having the project file properly set-up means that Maya (and you) always knows where to find all of the files you're going to be using.

Creating a new scene:

1. Go to File>New Scene or use the hot-key **Ctrl+n**

Well, that was easy. There are some settings you can access for your new scene by clicking the square next to the New Scene line in the File menu, but you don't need to worry about any of that for now.

Setting your project:

1. Click the main “File” menu again and then “Set Project,” this will open another window.
2. Select your project folder and click “Set”

Why and when should you set your project?

After you have first created a new project, Maya should automatically be set to the correct file. In fact Maya will often keep the project set to the last project that you were working in with no need to reset the project every time you re-open the program.

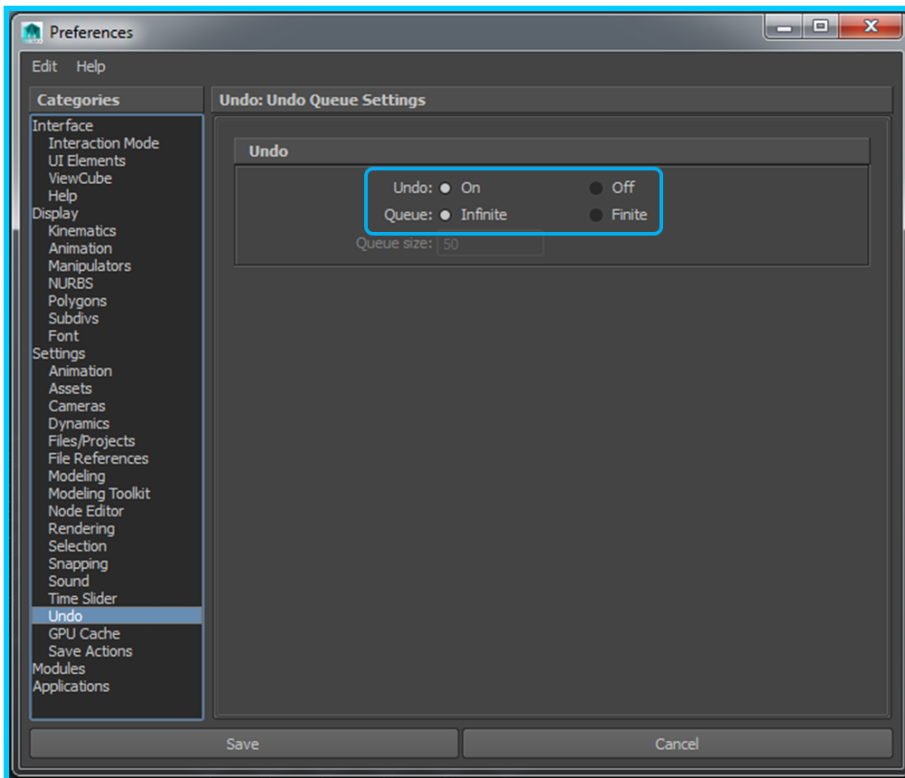
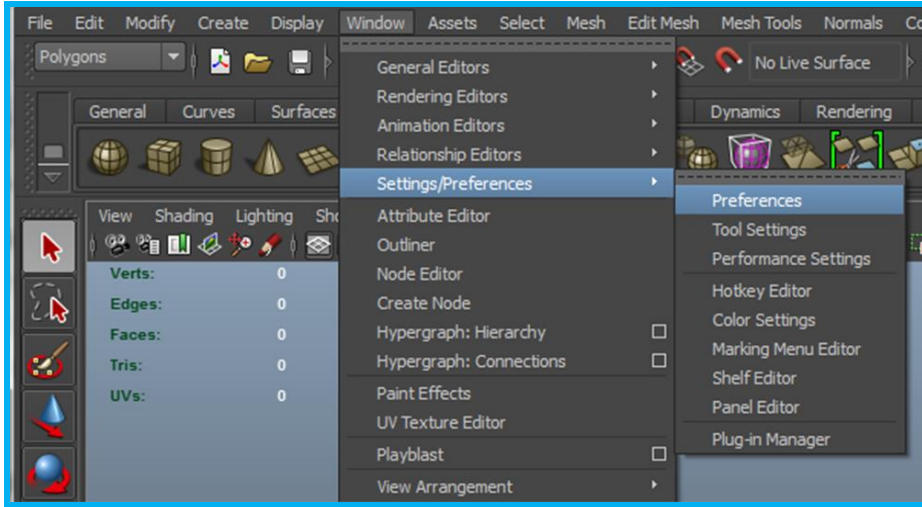
BUT in a lab where many people will be working on the same computer you cannot rely on this. Many students have lost files either temporarily or permanently because their project was set somewhere they didn't expect, which can mean that renders or entire scenes gets saved in inaccessible places.

To make sure that this doesn't happen to you, set your project every time you open Maya to be extra safe. If you think you will forget this step then a good thing to remember is if you go to open a scene and the Scene Window opens to any folder that is not your scenes folder from your project, stop what you are doing then set your project to the correct folder. When you go to open the scene again you should be looking at the scenes from your project!

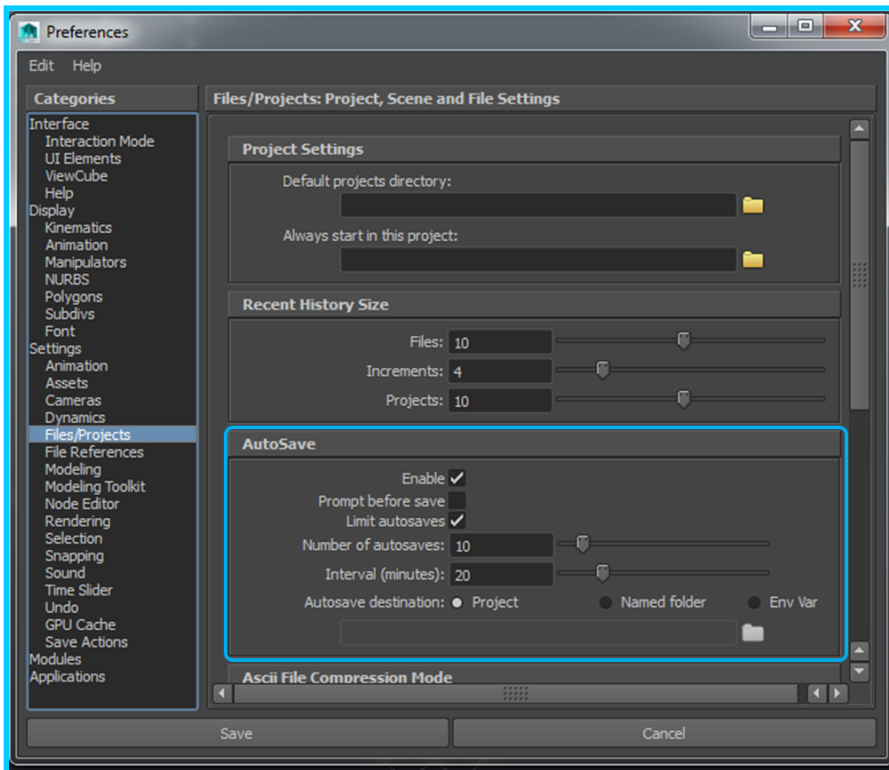
5. Important Settings and Preferences

Now that you have your new project and scene set-up there are still a few things that you need to change before moving on to modeling. Maya has a lot of settings that you can fine tune in order to better suit your work-flow. Most of these you will explore in class, in tutorials, and as you work with Maya on your own. There are a few though that will be very helpful to know about right out of the gate.

1. Click the “Window” menu then go to Settings>Preferences, this will open a new window.

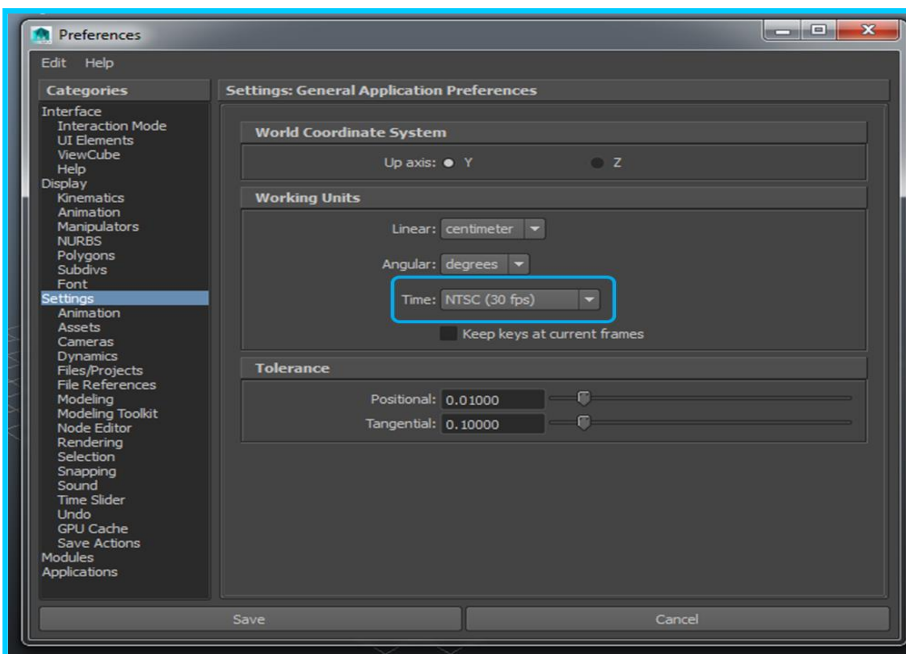


2. Click on “Undo” under the Settings header and make sure that Undo is set to On and that Queue is set to Infinite. Maya will allow to undo nearly anything; object creation, animation effects, selection changes (like, if you accidentally click somewhere you don't mean to and unselect all of the components you've been carefully selecting) so you will be using the undo function a lot and with an infinite queue you can go back as far as you need to.

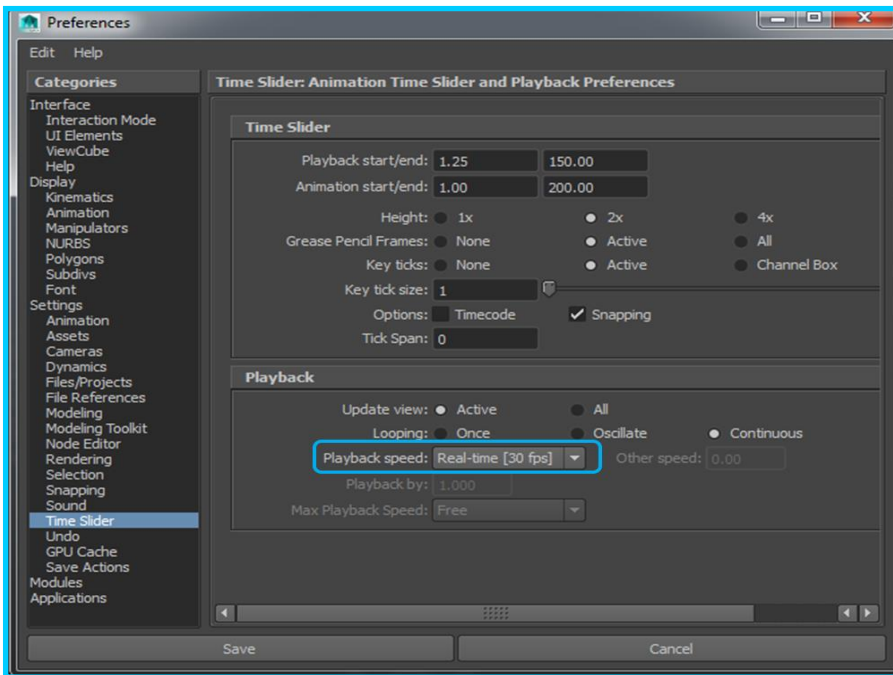


- Next click on Files/Projects, also under the Settings header. Look at the AutoSave section. I highly suggest that you enable autosaving as it is very easy to get wrapped up in a project and forget to save as often as you should, then if your computer goes down you may lose a lot of work. The rest of the autosave functions are largely a matter of personal preference; you can set the number of total autosaves Maya

will create before beginning to overwrite them, how often it autosaves, and where these files will go. Generally unless you have space concerns it's easiest to simply keep them in the appropriate file in your project folder. One thing to note however is that if you are using a student license Maya will prompt you every time the program autosaves.



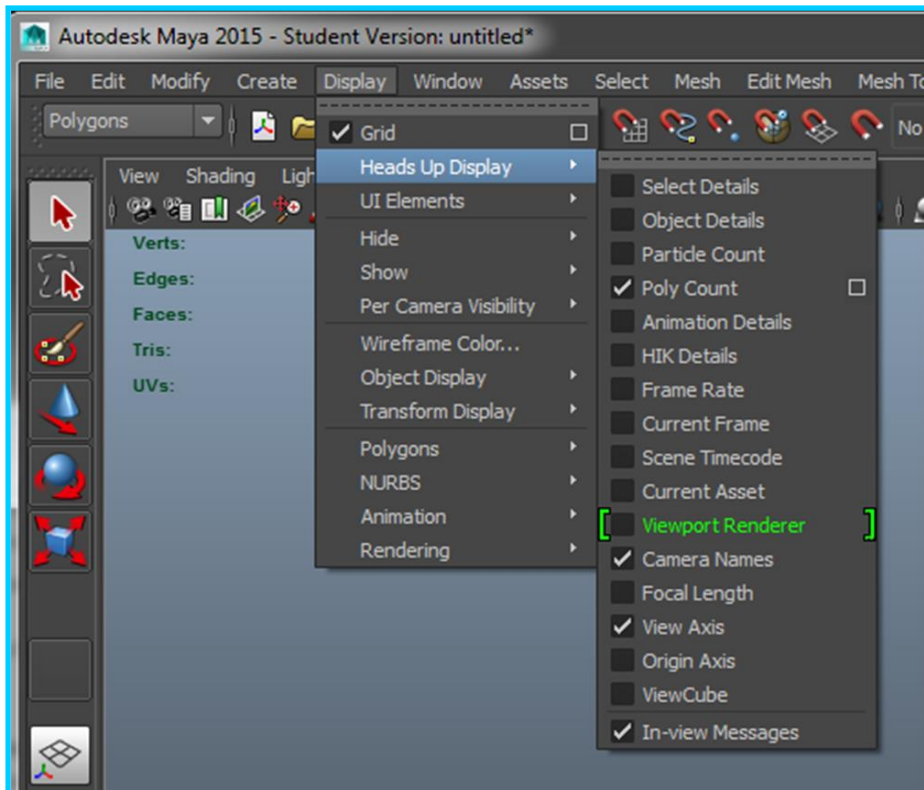
- Now before you save and close out of the Preferences window, click on the Settings header and under “Working Units”, use the drop-down menu to change Time to “NTSC (30 fps).” This is the setting that controls the number of frames per second that will be rendered for animation. There may be situations in which you will use a different setting here but for the DTC 335 class, this is the required frame rate.



5. Then click on Time Slider under the Settings header. For the “Playback speed” drop-down menu, change it to “Real-time [30 fps]” this will ensure that when you preview your animation with Maya's time slider, your playback will match the speed of your intended final animation.

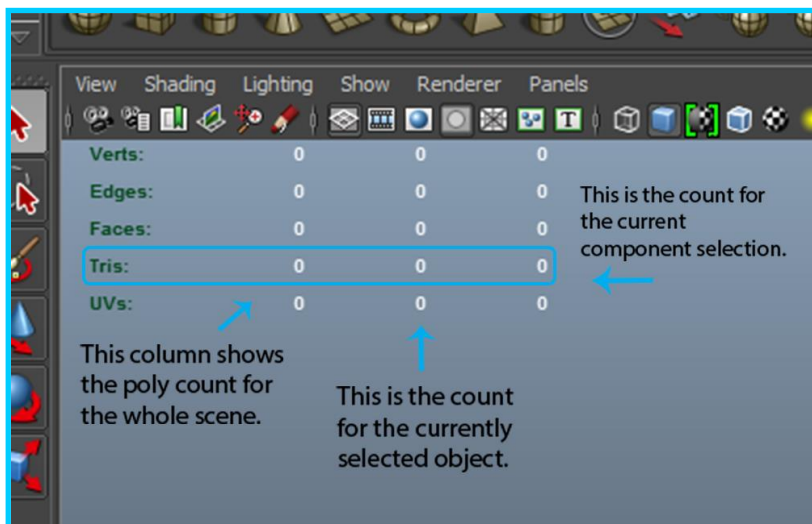
6. The rest of these settings can be left at their defaults for now so click “Save” at the bottom of the window.

Now lets take a look at the Display menu.



1. Click Display and move down to “Heads Up Display.” All of these features will allow you to adjust what shows up in your panel views (the big blue-grey windows with the grid). Again some of this will be a function of your personal preference; you can try turning them on or off by clicking the box next to each one to see what information they give you and decide what you want on. The

“ViewCube” can be especially helpful for the beginner as it always lets you know what direction you are facing and allows for quick view shifts if you click on its surfaces.

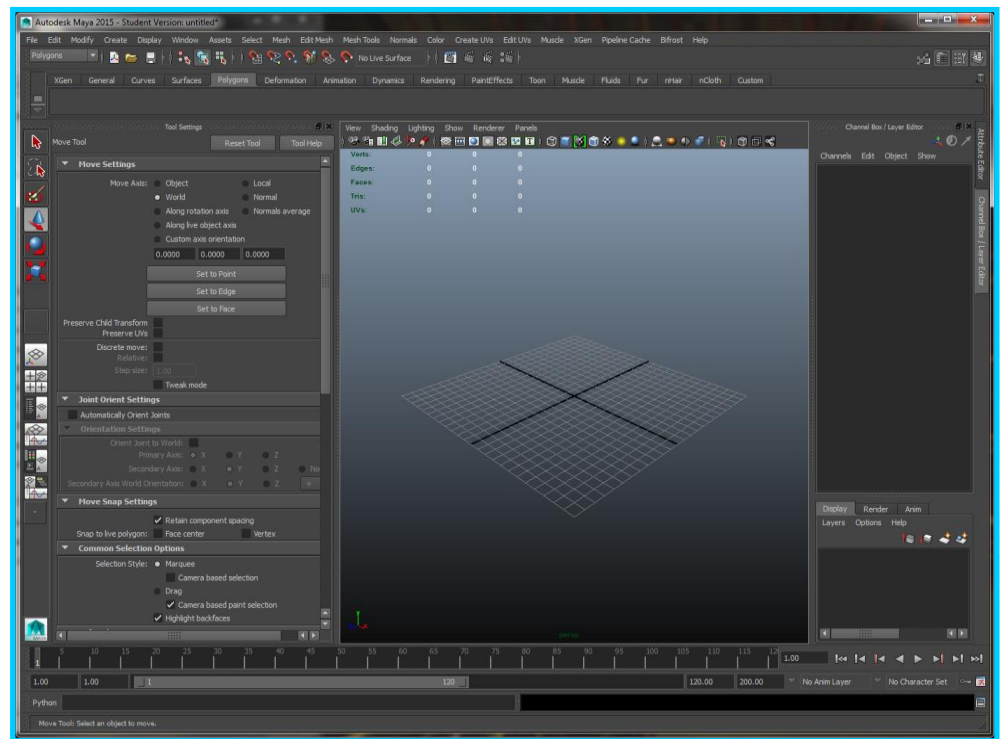


(The poly-count display)

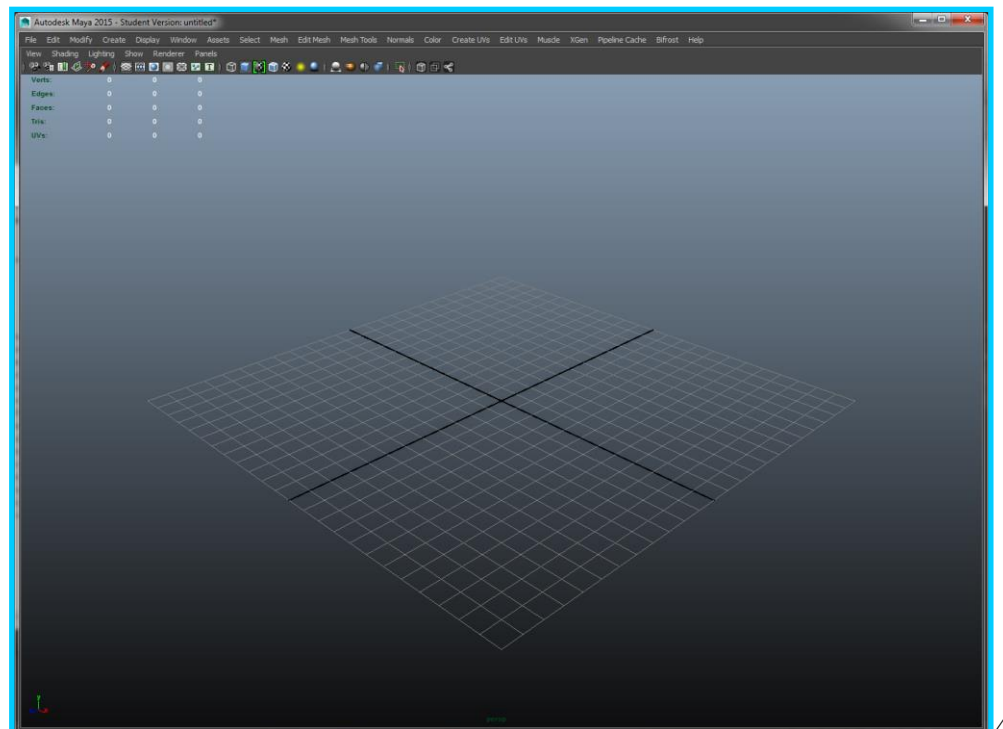
2. Additionally, for the purposes of the DTC 335 class it is important to turn on the “Poly Count” HUD feature which will let you monitor the polygon objects and their components that you have in your scene. Since your class projects will have limit for these, it is helpful to be able to check at a glance how close you are to the limit. The values that you want to watch are the ones in the “Tris” row.

3. Next on the Display menu, take a look at “UI Elements” or “user interface elements.” These features will adjust how many menus, toolbars, and windows show up in the Maya interface. The idea with these is to use as few as you can in order to free up more room for your panel views and other work space features. Compare the image with all of the UI elements turned on with the one with all of the UI elements off.

(Maya interface with all UI elements)



(Maya interface with no UI elements)

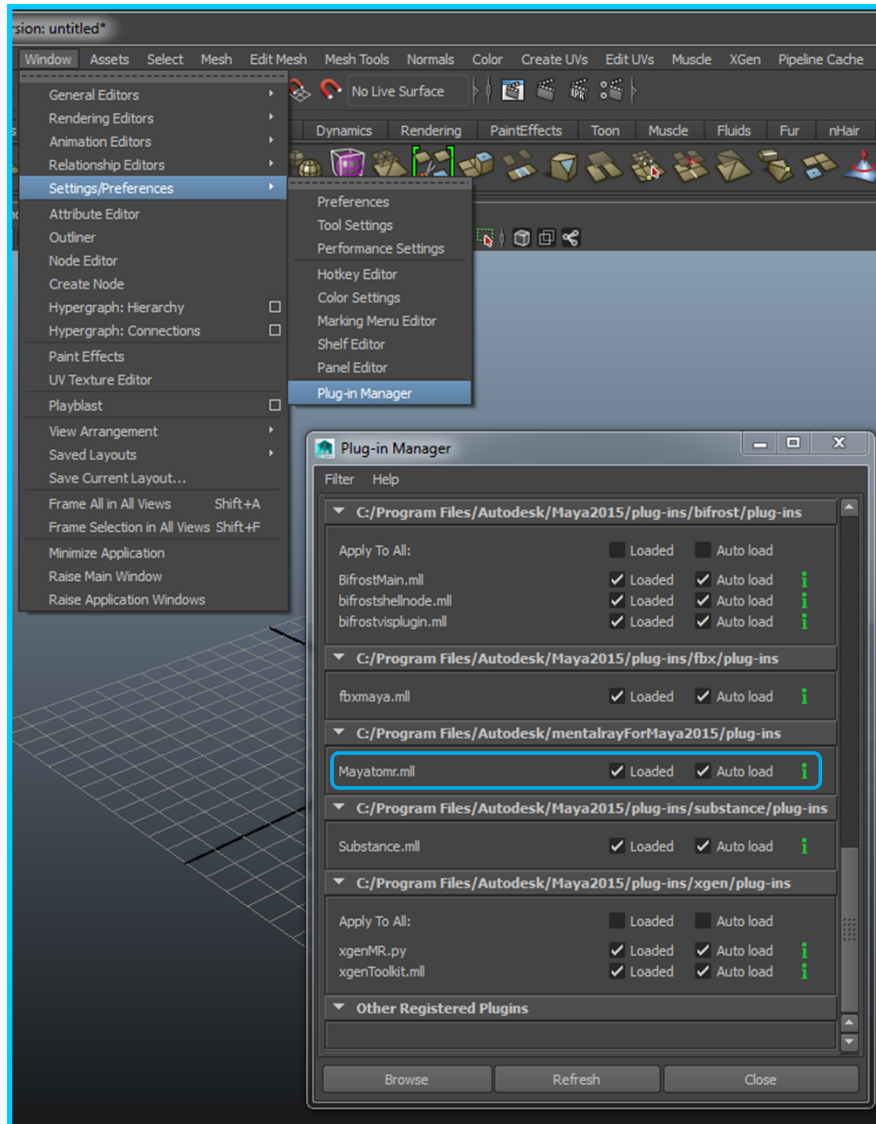


You can see that without the UI elements you have a lot more room to see and work with your panel view. However, until you have a bit more experience in Maya it will be a bit difficult to navigate without some of these features. For a beginner it may be helpful to start with some UI elements and then get rid of them once you are a bit more comfortable with the program. However, you can disable the animation related elements (Time slider and Range slider) during the modeling, shading, texturing, and lighting steps of your project, then re-enable them as you start animation. Additionally, you can keep the tool settings window closed when not in use.

6. Plug-Ins (Briefly)

One last step before getting into navigating is a quick look at the plug-in manager.

1. Click Window>Settings/Preferences/Plug-in Manager. There's a lot of plug-ins here but the only one we're going to worry about right now is the one that enables the Mental Ray renderer, Mayatomr.mll. Scroll down till you find it then enable "Autoload" then "Loaded" to enable Mental Ray. Doing it in this order ensures that mental ray will automatically load when you open Maya.



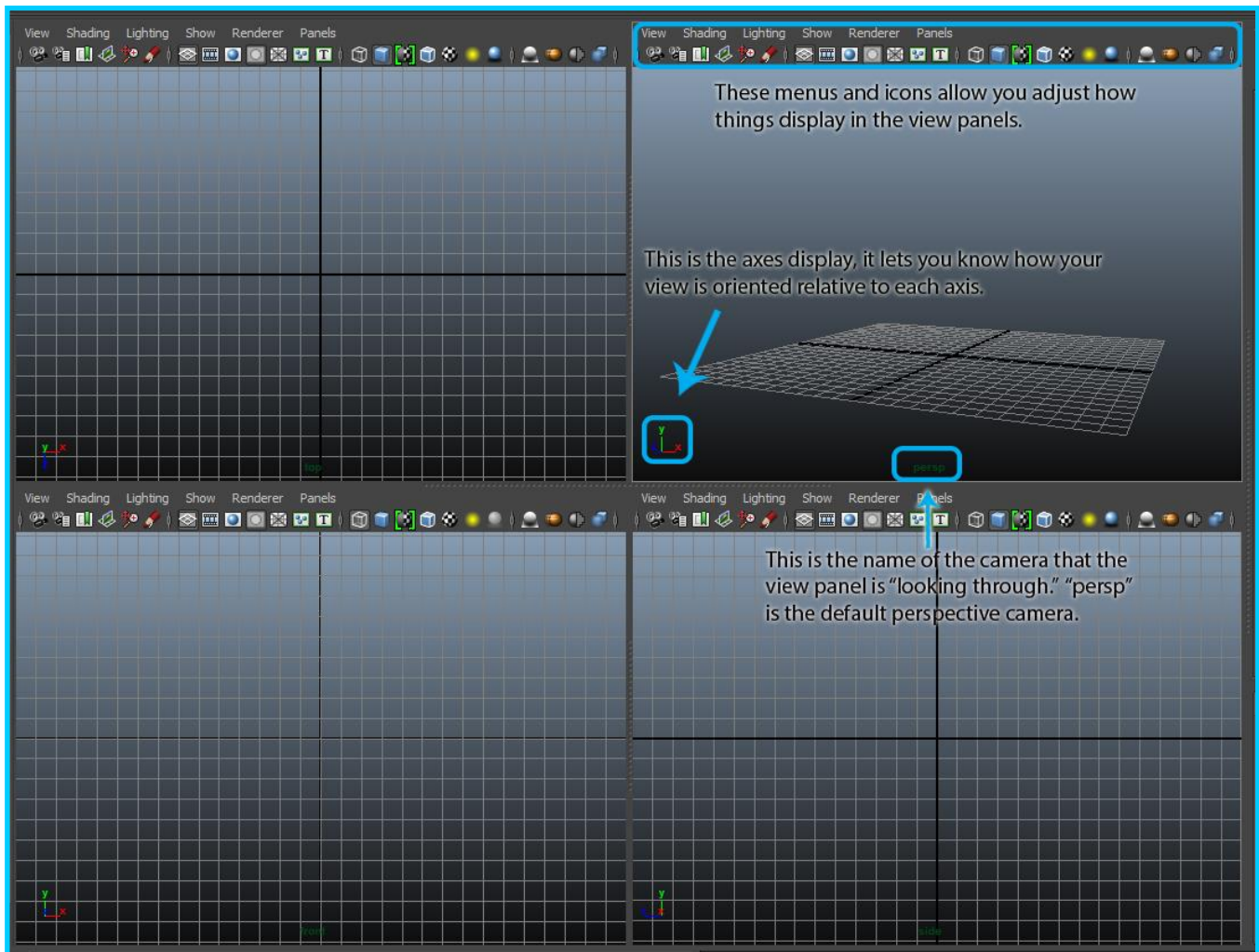
2. Close out of this window and you're done!

7. Navigating the Maya Interface with Hotkeys

Now we're getting a bit closer to the meat of working in Maya. In this section we'll go over how to get around in Maya and cover some of the hotkeys that will make this process easier. It may take a bit of effort but learning and using the hotkeys will really streamline your workflow in Maya.

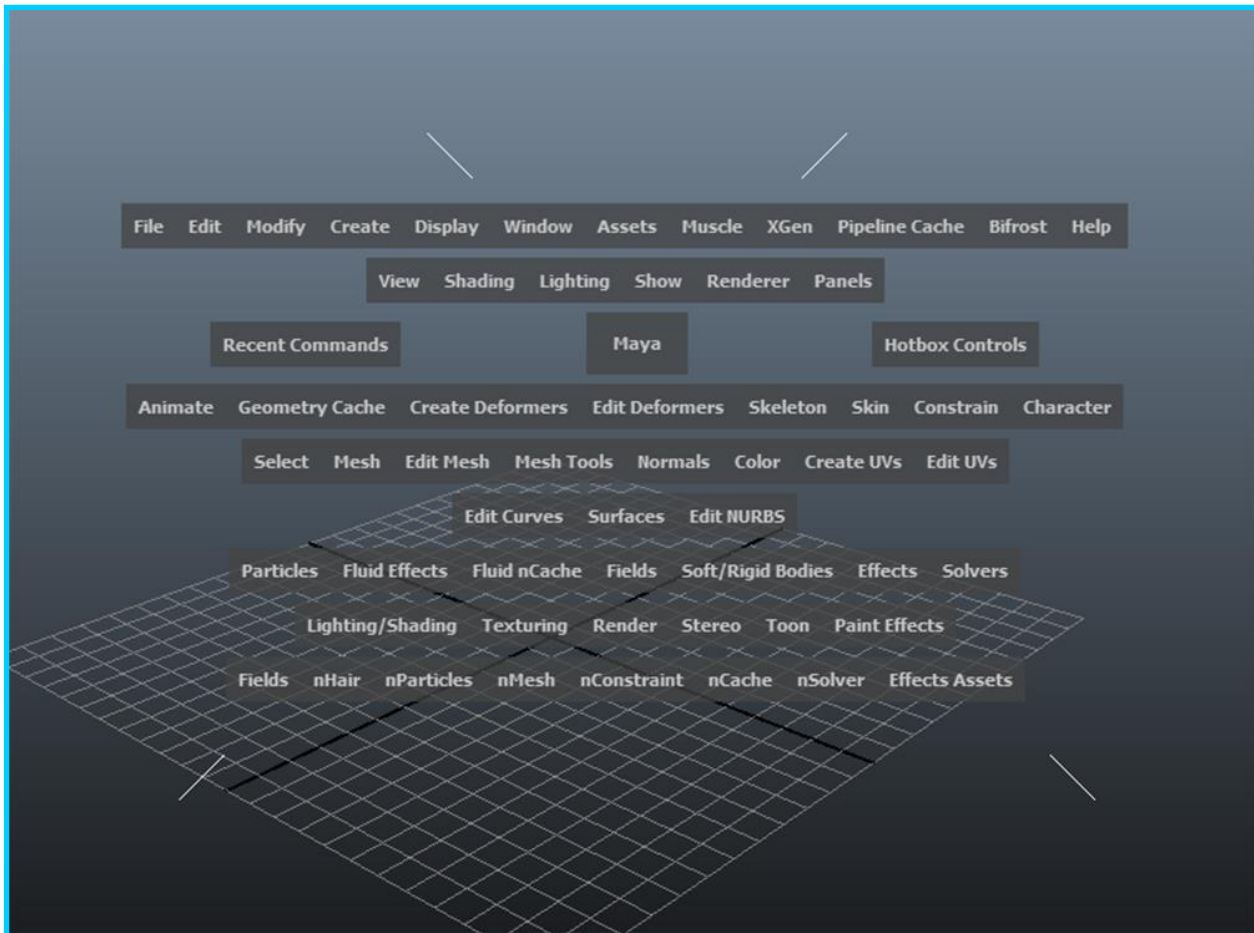
Moving around in the view panels:

1. Move your cursor over the view panel; by holding down alt+mouse buttons you can move your viewpoint around the scene.
 - **alt+left mouse button (LMB)** will let you “tumble” or rotate your view
 - **alt+middle mouse button (MMB)** will let you “track” the view up, down, left, and right
 - **alt+right mouse button (RMB)** will let you “dolly” in and out, this is a bit slower than zoom but with a smoother motion
 - using your **mouse scroll wheel** will let you zoom in and out, this is faster than dolly but less smooth
2. Now press and release the space bar with your cursor over the view panel (the blue-gray window in the center of the interface). This will take you in and out of the various view panels. In the default mode it should take you from your perspective view to a four panel set-up that includes a smaller perspective pane along with one for each of the orthographic views: top, front, and side. By moving your cursor over any of the panels and tapping the spacebar you can move from the single panel view to the multiple panel view and back out.



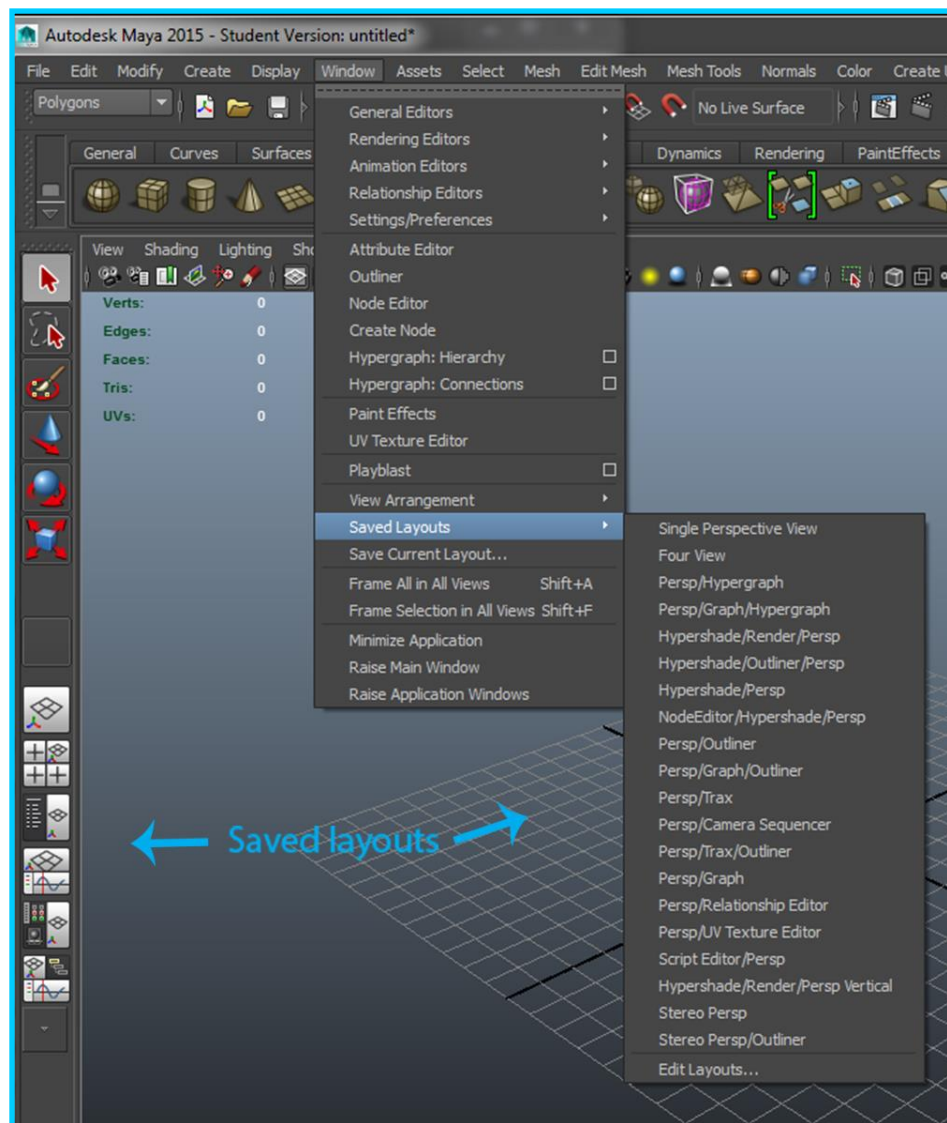
(The four panel view. Clockwise from top right: top, perspective, side, front)

3. Now return to the single panel perspective view then press and hold the space bar, this will bring up a menu call the “hotbox.”

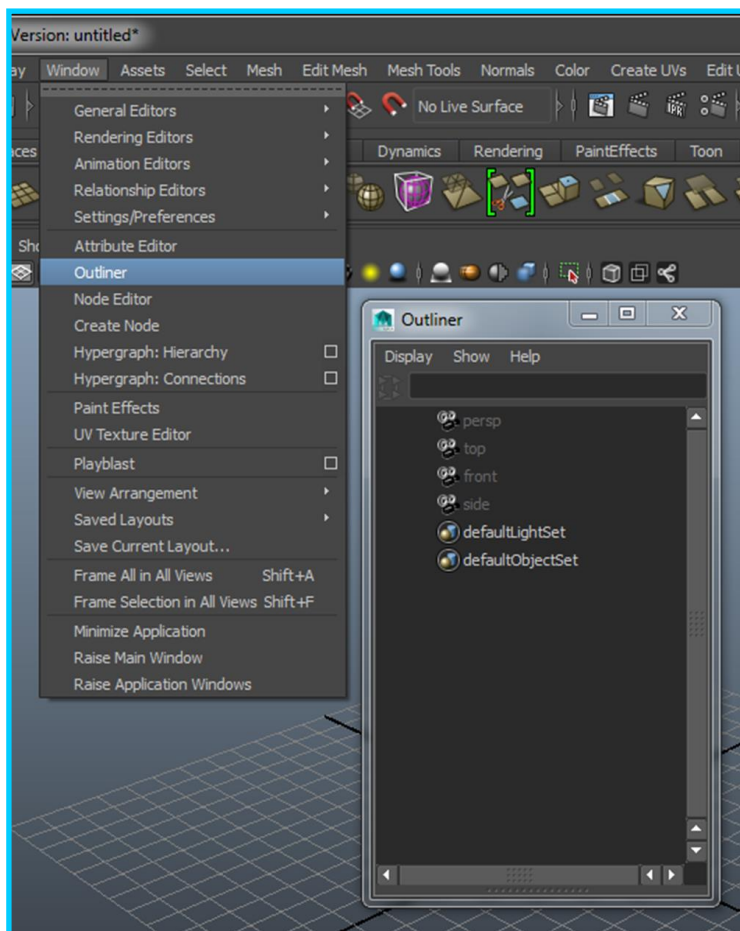
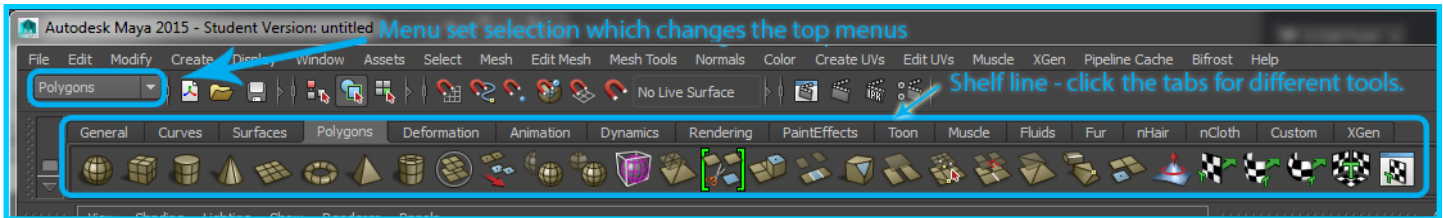


By navigating the hotbox with the mouse you can access all of the UI elements and menus in Maya. There are also hidden menus that you can access by clicking in the spaces between the lines radiating from the corners of the hotbox. If you would like to disable all of the static UI elements (as discussed in the previous section) and only use hotbox you can do so; it will take a bit of practice but is very useful in the long run.

4. There are a number of saved layouts in the Maya interface, and each is helpful for a different aspect of the work-flow. The default perspective/orthographic views pictured above are good for modeling and setting up a scene. Another helpful layout is the Hypershade/Render/Persp that will be useful when you begin shading and texturing your objects. These can be accessed on the sidebar below the tool icons, through the Panel menu in each view panel's top bar, or through the main Maya menu Window>Saved Layouts.

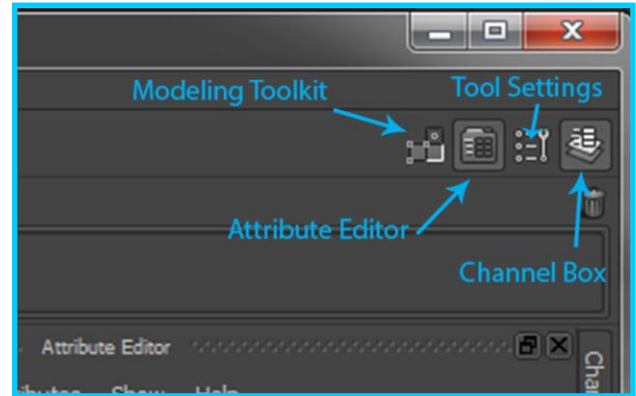


5. Now let's go over the menu sets and shelves. Maya has a dropdown menu in the upper left corner of the interface that allows you to change the menu sets listed at the top of the interface to fit your current task. For beginning modeling the one you will be using most is the Polygons menu set, or the Surfaces menu set for when you work with NURBS or curves. The shelf line in Maya will also allow you to bring up a set of tools tailored for your task at hand by clicking on the appropriate tab. As with the menu sets, the one you will likely use for now is the one for polygons but you can explore some of the other options as well.



6. Another important menu to access is the Outliner, found via Window>Outliner, which will open it as a popped out window. The outliner displays a list of every object in your scene. By selecting specific objects in the outliner menu, you will no longer need to search your scene for whatever you are looking for. If you haven't created anything in your scene yet the outliner will display the four default cameras (perspective, top, front, and side), as well as "defaultLightSet" and "defaultObjectSet" which are created for every new scene.

7. There are two more windows we will cover in this section; the first is the Channel Box/Layer Editor. The channel box is one of the easiest ways to make basic changes to an object, such as altering its scale or rotation, and it also allows you to view the changes you have already made under the “Inputs” header. The channel box is by default located at the right side of the Maya interface, if not it can be accessed by clicking opening it with the button in the upper right, or clicking on the tab along the right side of the screen. It can also be undocked from the side by **click+dragging** on the dotted line along its top border.



8. The last window for this section is the Attribute Editor, which like the channel box is located on the right side of the interface by default (but only one of these windows can be open at a time, unless you undock one). The attribute editor can also be accessed via the button at the top, the tab along the side or by hitting **ctrl+a**. The attribute editor will allow for different manipulations of the elements in your scene than the channel box.

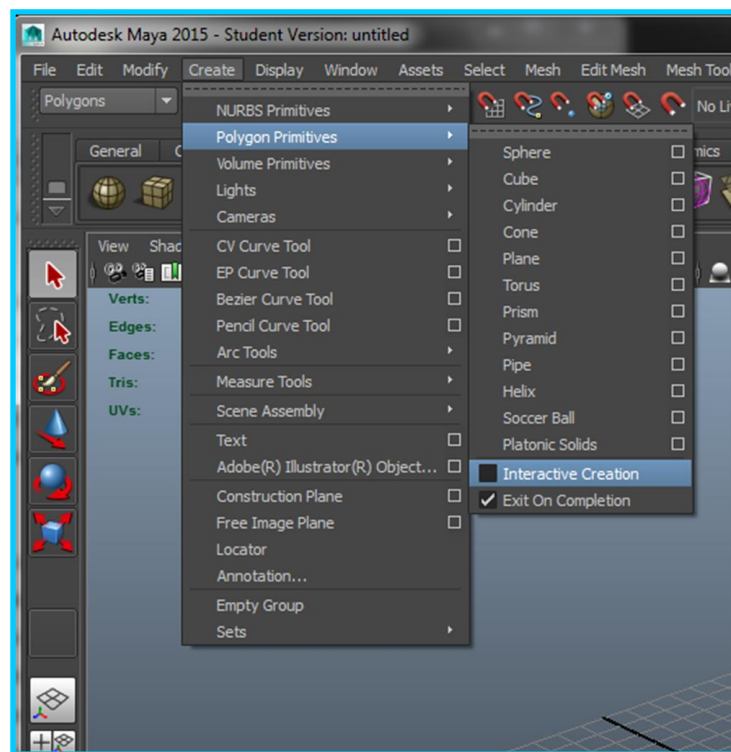
Alright, that's all for this section. In the next section we will start in on creating and manipulating objects in Maya.


8. Polygons, NURBS, and Subdivision Surfaces.

This is the part where we get into finally creating objects for your scenes. Most of this section will focus on polygon objects partly because this is what you will need to use most for this class but it is also the object type that most professional pipelines will use for asset creation. I will not go into the technical aspects of these objects or their definitions as this is something that will be discussed in class.

Polygons

1. To create a polygon object you can access the creation menu via Create>Polygon Primitives then select whichever starting object you desire.



Note also the square icon on each line,  clicking on this will take you to an options window that will allow you to enter specific parameters for the object you are creating. For other menu options, selecting this box will allow you to change tool settings. Keep in mind though that you may need to reset the tool to get it back to defaults after you're done.

Before creating an object, note the check-box at the bottom marked Interactive Creation, this will also be in the menu for NURBS primitives. If interactive creation is enabled then you will be prompted to **LMB-click+drag** on the viewport grid to determine the scale and proportions of your object. If interactive creation is

disabled the object will simply appear at the center of the grid with default specifications. Whichever method you choose is up to your preference, though I will say that turning interactive creation off can make the process a bit quicker. Additionally, many tutorials assume that this function is turned off and will give instructions that require a default primitive shape.

Note: Try to think of these primitive shapes as something like a piece of clay; rather than leaving these objects as is, you will be changing and fine tuning them with a host of tools to create a new, more complicated object.

2. Now try creating a polygon cube primitive. (Create>Polygon Primitives>Cube) Cool! But what now? Let's go over the selection basics, the basic view modes and some of the tools for modeling.

- 1) How to select and deselect things in your scene:

- There are some easy ways to select items in your scene:

1. To select multiple objects you can draw a bounding box by **LMB-click+dragging** around them.
2. Or for more control you can hold down shift and **LMB+click** each object individually.
3. When selecting components of objects such as vertices, you can grow or shrink your selection by holding down **shift** and tapping > to grow the selection or < to shrink it.
4. You can also save a selection (for example a set of faces in an object that you will need to manipulate multiple times) by creating a quick selection set. Select your components, then go to Create>Sets>Quick Select Set... name your selection and hit okay! You can then find your selection under Edit>Quick Select Sets.

- 2) You can change how your objects display in the view ports from wireframe all the way to a lit, textured view:

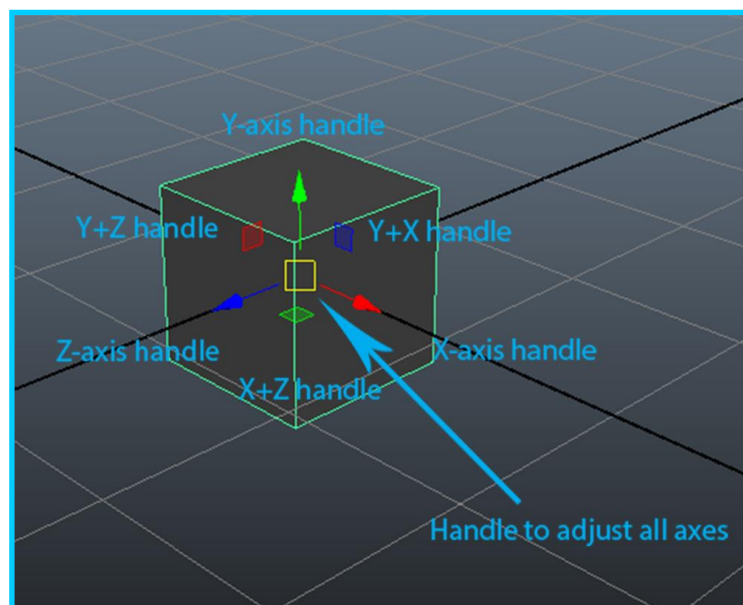
- These are the hokeys you will use to change the view modes:

1. Wireframe display – **4**
2. Shaded display – **5**
3. Shaded display (with texture maps) – **6**
4. Lighting mode – **7** (note that before you add lights to a scene this will simply show objects as dark)

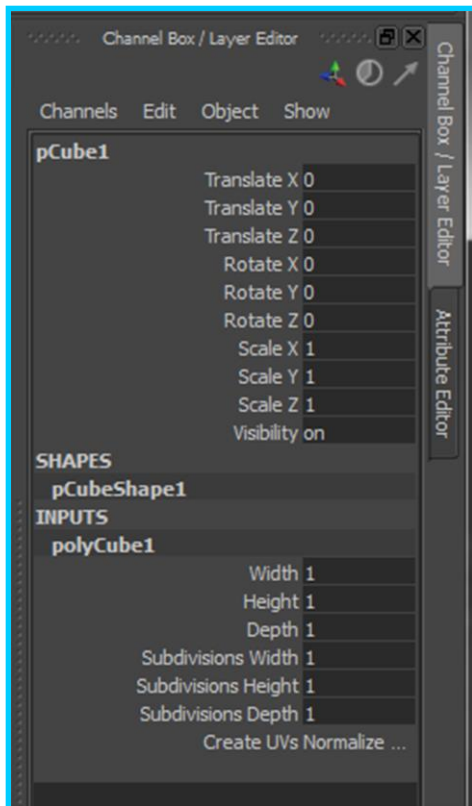
3) The most basic manipulations for an object involve changing its location, rotation, and scale.

- The quickest and best way to access these tools is to use the hotkeys:
 1. access the Move tool simply by hitting **w** while the object is selected
 2. for the Rotate tool hit **e**
 3. for the Scale tool hit **r**
 4. Lastly, the Select tool is **q**

3. Each of these tools will bring up its own manipulation handle, centered on the pivot point of the object, with colored handles to let you alter specific dimensions of the object by **LMB-click+dragging** with the mouse. Green handles affect the Y-axis, blue is the Z-axis, red is the X-axis and the yellow handles will affect all of the axes (though the most currently selected handle will also display as yellow). Newer versions of Maya also have “in-between” handles for the move and scale tools that will allow you to change two of the axes at once.



4. You can also change the translation (placement), rotation, and scale values of an object in the channel box by entering specific values in the provided fields or by selecting an attribute and **MMB-click+dragging** in the viewport. Any of these methods is useful so pick whichever appeals to you most.



it changes the appearance of your cube.

It is helpful to consider what object you intend to create and then adjust these values to help provide you with a starting shape that has the lowest number of divisions needed to create it.

For example, if I was planning on creating a book would start with fewer divisions than if I wanted to create an airplane. It is always best to start with the lowest level of detail and then refine your object as you go; you will have an easier time working with a more basic mesh and you will have better control over how many complex (read: high poly-count) objects that you have in your scene.

Note: You should only change these input values before performing any more complicated manipulations on your object. If you change these values later on it will deform your object in unexpected ways.

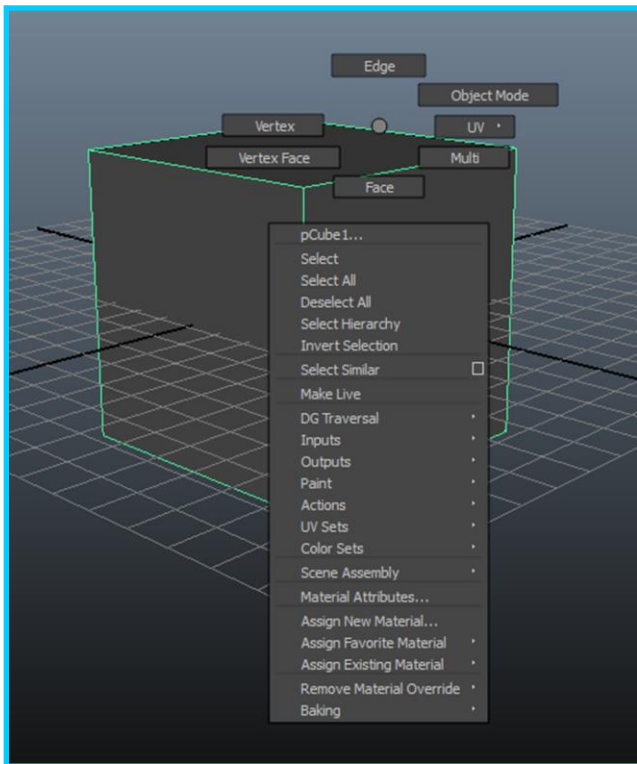
5. Now let's look at the fields in the channel box. Firstly, with your cube selected look to where it says pCube1 near the top of the channel box, this is your object's default name. However, you shouldn't leave it with the default name or your scene will be filled with pCube1 to pCube20 which complicates trying to find a specific object. Click the name header and type in what this object will be. So if this is going to be a book, type "book." This will help later on, promise.
6. Now, with your cube still selected you should be able to click on the polyCube1 sub-header, under the INPUTS line to bring up the initial inputs for this object. For a cube these are its Width, Height, Depth, and then a Subdivisions entry for each of the same. Try typing new values in these fields and see how

7. Now, with your object still selected hit **2** on your keyboard, this will show you a smooth-mesh preview of your object along with the current mesh as a wire-frame around it. Now hit **3**, this is the smooth mesh preview without the current mesh. Hitting **1** will take you back to the basic mesh as it currently exists. While creating complex objects it is good to switch between these views as you model. This is because it is a lot easier to work with the basic mesh and then use the Smooth mesh operation to create a more complex mesh once you are done making your initial changes than it is to work with the complex mesh from the start. This is because with the smooth mesh preview, each component manipulation will be "evened out" over a higher number of hypothetical future

components, resulting in more even, gradual changes in the mesh.

Note: the smooth mesh preview mode (3) is exactly that, a preview. To actually smooth the mesh you will need to perform the smooth operation, by going to Mesh>Smooth in the polygons menu.

8. Now for the various component modes for polygons. Still with your cube selected tap **F8** on your keyboard, this will take you to vertex selection mode. Note that the mesh has turned blue and points where they intersect are purple. These purple dots are your vertices and in this mode you can move them around to change the shape of your object. To do this, use the same move, rotate, and scale tools that we discussed for object movement. The other component modes and their hotkeys are:



(Radial menu for a polygon object)

- 1) Edge mode – **F10**
- 2) Face mode – **F11**
- 3) UV mode – **F12** (this mode is not used for modeling but rather for adjusting the UV layout during shading and texturing)
- 4) To get back to object mode simply hit **F8**, tapping it again will toggle you between object mode and whichever component mode was last selected.

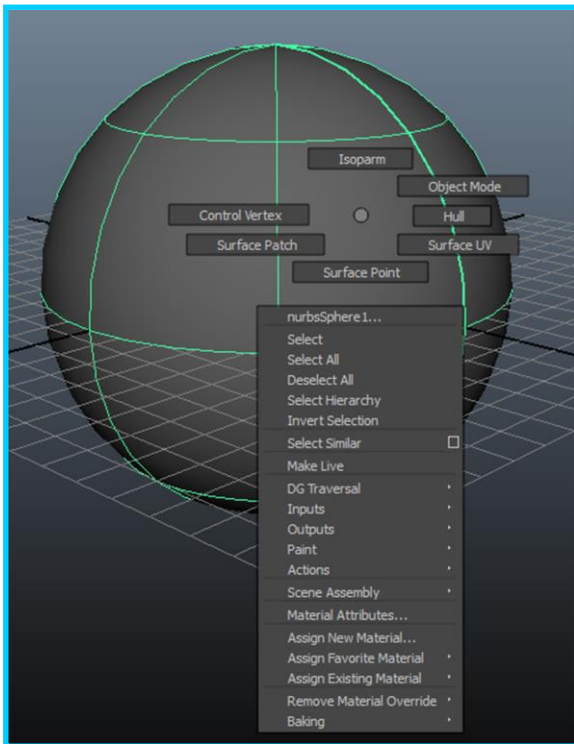
In addition to these hotkeys you can also access the different component selection modes by placing your cursor over your object and **RMB-holding** then moving your cursor over the desired mode from the radial menu that pops up, then release the mouse button.

NURBS

NURBS are another object type in the Maya program. They behave differently than polygons in many types of manipulations and their tool shelf can be found on the Surfaces tab. NURBS will often offer smoother shapes than polygons will, which makes them a good jumping off point for creating organic objects. However, for the purposes of this course you will primarily be using NURBS objects with the goal of converting them to polygons later as they will not be allowed in the final versions of your projects.

The tool hotkeys remain the same for NURBS but the component types differ, and the hotkeys for the component modes will not work for NURBS surfaces except **F8** which will toggle you between component and object mode. You can still access them via the radial menu (remember, **RMB-click+hold**).

1) The different types of NURBS components are:



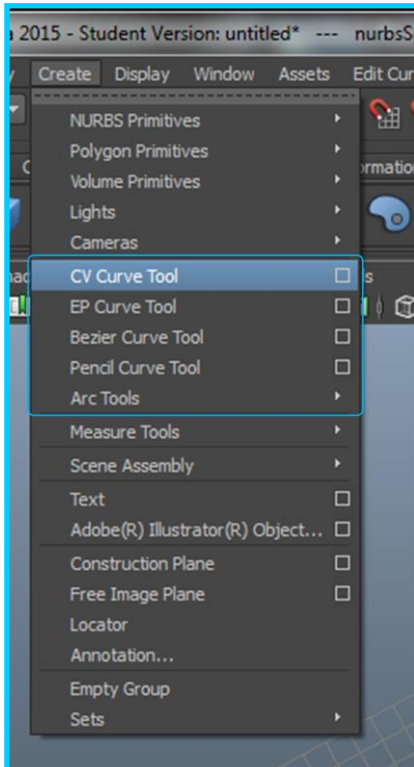
(Radial menu for a NURBS surface)

- Isoparms – these are somewhat similar to edges in polygons
- Control Vertices – again, similar to vertices in polygons, you will notice however, that they do not sit on the surface itself and that moving them will deform the NURB differently than adjusting vertices does in a polygon object.
- Hulls – manipulating these will change large sections of the NURBS surface
- Surface Patches
- Surface Points
- Surface UVs – as with the UVs for polygons this is used in shading and texturing rather than modeling.

Experiment with the different component modes to see the different ways that NURBS can be reshaped.


Curves

Curves in Maya are used for a number of tasks; they can be used to create the framework for creating either polygon objects or NURBS surfaces, as well as being used in a number of animation functions. The curve tools can be found on the Curves and Surfaces tabs in the shelf section of the interface, as well as in the menu section if the Surfaces menu set is chosen from the drop down menu. They can also be accessed in the main Create menu, starting with the CV curve tool down to the Arc tools.



The different curve creation tools will each behave slightly differently and will give you a different result.

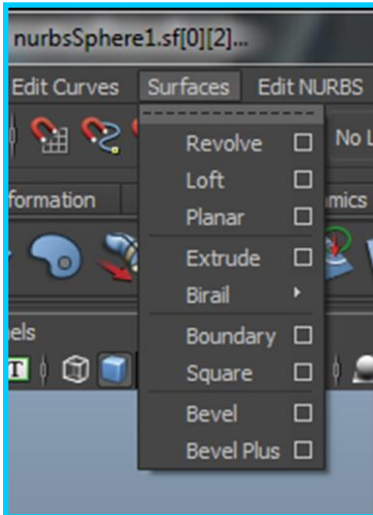
1. Using the CV, EP, and Bezier curve tools you can create a curved line by placing points on the grid while in one of the orthographic views (remember, these are the top, front, and side views). You should do this in one of the orthographic views rather than the perspective view to ensure that all of your curve points are in alignment.
2. With the Pencil curve tool you can freehand draw a curve on the grid instead of placing the individual control points. (Again, stick with one of the orthographic views for curve creation.)
3. The Arc tools will allow you to create arced curves of a specific radius by placing a few points on the grid.

4. By opening the tool options (done by double clicking the tool icon or by selecting the  next to the tool's name in the menu) you can adjust the degree setting of the curve to change the tangent, i.e. how the lines will connect at each curve point. Curves can also be adjusted after their creation by control vertices in the component mode (**F8** or with the **RMB-click+hold** radial menu).

Curve and NURBS Surface tools

These curves can be used to help model certain types of objects more easily than with other methods when combined with these curve/surfaces tools:

- Revolve tool: you can use this tool to easily create objects that have radial symmetry such as wine glasses, knobs, or very simple flowers. This is done by drawing a silhouette of half of your object with a curve, making sure that the start and end points of the curve are on the center grid line. Once you are happy with the shape, select your curve and enter the revolve tool. Then select the correct axis and output information, then revolve!



- Loft tool: with two curves selected you can “loft” a surface between them, this is good for creating specific shapes that you will combine to create a complete object. Draw two curves to define the edges of your desired shape. Select both curves (**shift+LMB-click** to add to a selection), then use the loft tool as with revolve above.
- Planar tool: with a closed curve (i.e. the ends of the curve meet) you can create a plane that conforms to the shape of the curve. Simply draw a closed curve and use the tool.
- Extrude tool: by creating a curve to act as a “path” and another curve to extrude along it you can easily create objects like pipes, necklaces, ribbons or any number of other things. Create on curve that you want to use as the path, then another curve to act as the shape of the desired object (you can simply create a curve circle or square by clicking Create>NURBS Primitives>Circle or Square). Move your closed shape to the origin point of your path curve, you can try to do so with the Snap to Curve feature (**shift+c and hold**, while moving your shape) but this particular tool can be a bit finicky and you may end up having to place your curve by hand. Then rotate your shape so that its orientation is perpendicular to that of your path curve. Keep in mind that you want the central pivot point of your closed shape to align with the starting point of your curve.

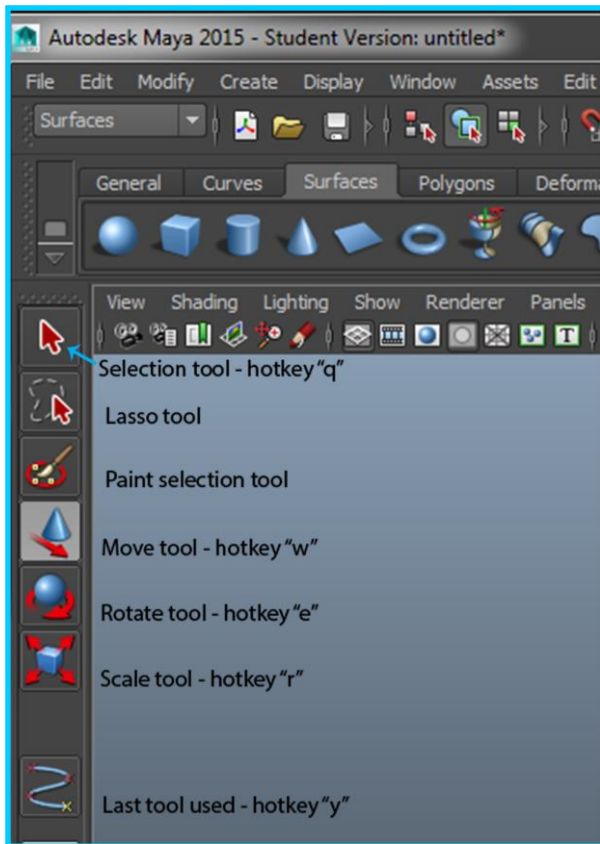
There are a few other tools to use with curves but these are the ones that will be most useful for a Maya beginner.

Subdivision Surfaces

I will only touch on subdivision surfaces very briefly because they will probably not be something you will want to get into for your class projects and they are unsupported outside of Maya so they aren't a learning priority. Subdivision surfaces share some aspects of both polygons and NURBS surfaces and allow you to create areas with different levels of detail within the same model.

If you are interested in exploring subdivision surfaces in more depth Autodesk has a pdf guide available online - <http://download.autodesk.com/us/support/files/subds.pdf>

9. Some Helpful Tools (and tricks for manipulating your objects)



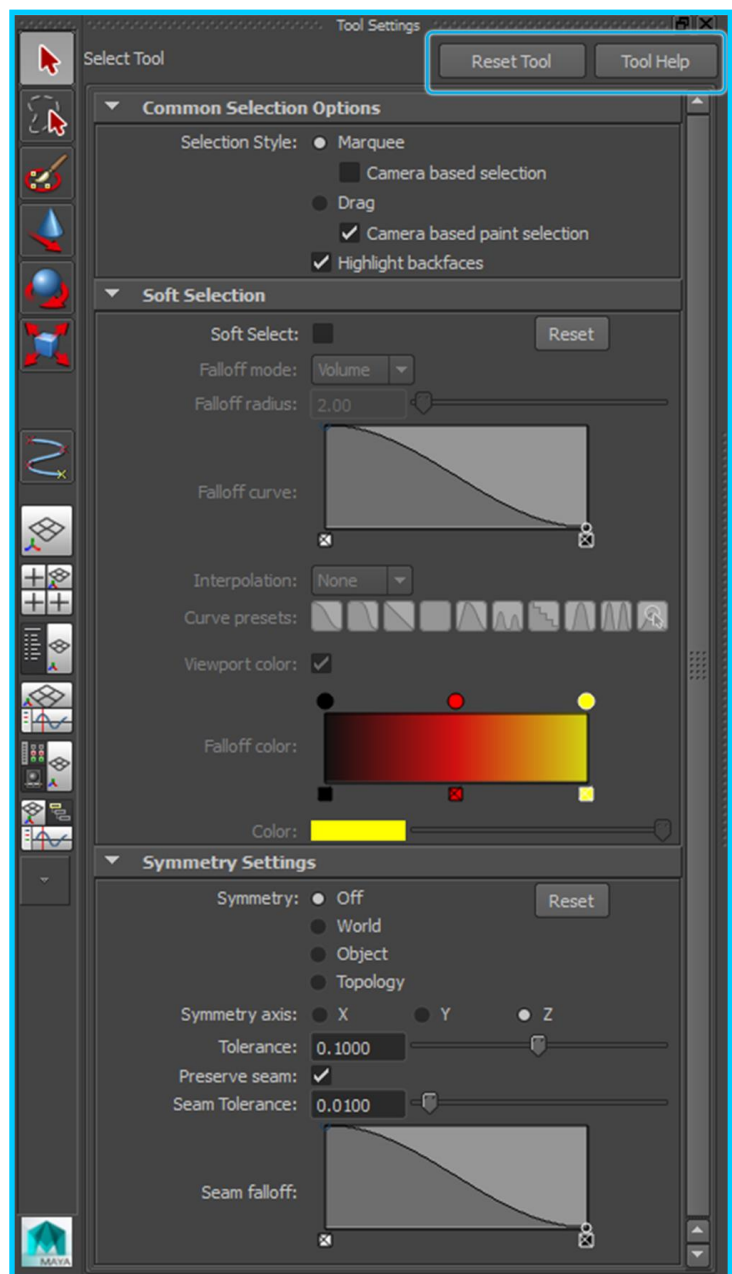
Of specific interest are the **Move/Scale Axis**, **Rotate modes**, **Soft Selection**, and **Symmetry Settings** headers.

Changing the axis for the move and scale tools and the rotate mode for the rotation tool will allow you to quickly change the orientation of the tools' manipulators. In some circumstances you will find that the manipulation or movement you wish to do is awkward or inconvenient with the manipulator's default orientation. By experimenting with these settings you can adjust the manipulator as you wish, make your

Move, Rotate, and Scale in a bit more

detail: These basic tools have a number of attributes that you can adjust to help with your modeling workflow.

The tool setting can be accessed by double clicking the appropriate icon on the left side of Maya's interface. Note the "Reset Tool" and "Tool Help" buttons located at the top-right of the settings window.

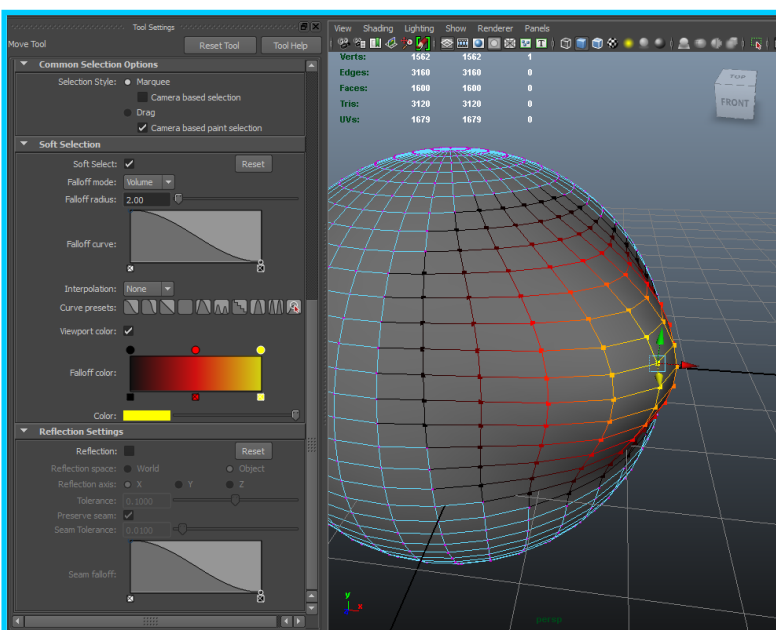


adjustments, and then easily return the manipulator to its default placement by simply resetting the tool.

– Now for a brief overview of pivot points. When you select the move, rotate, or scale tool the tool manipulator is centered on the object or component's pivot point, which by default is located at the center of the object. During some operations however, the pivot point will be moved, usually to origin point of the grid. For a number of reasons this can complicate using these tools. Fortunately re-centering the pivot point is very easy. Click the main menu **Modify>Center pivot** and you're done! This can also be used to put the center of a group's pivot near the center of the grouped objects (more on groups later).

– There will also be times when you want to manually place the object's pivot in a specific place to make certain manipulations or animations easier. In order to move the pivot point manually simply **press and hold d** then use the manipulator's handles to move the pivot to its desired location. As with the usual tool modes, the differently colored handles are for movement in each axis and the yellow node in the center will move it along all axes. If you wish to change the object's orientation click the blue icon that appears below the manipulator (while pressing **d**) which will switch to the rotate mode then adjust accordingly. **Note: you will need to reset the tools to return the pivots to their original orientation if you do so.**

The Discrete move/rotate/scale checkbox is located just below the change axis settings. By checking this option you can adjust your tools to move in specific, discrete values. For example you can check this box for the rotate tool then enter in a Step size of 30 and the tool will then turn your object in 30 degree increments. This can be very helpful when you have specific motions you are trying to animate or for other functions. Be sure to turn this setting off when you are done with it.



Soft selection is an excellent way to reshape your object in an easier and more organic way than the movement of individual components. By changing to one of your object's component modes (I prefer to use vertex mode for polygons, or control vertex for NURBS) and then selecting one (or a few) components (i.e. a single vertex point) and then enabling soft selection you can make it so that any manipulations done with that component will affect nearby components within an adjustable radius. The color gradient seen in the picture

shows the falloff radius of the tool. Create a polygon sphere, switch to component mode and try experimenting a bit with this tool to get a feel for how the changing the settings affects the tools influence on your model. Be sure to turn it off when you're done.

The Symmetry Settings are extremely helpful for when you want to make changes to a model with symmetry along one or more of its axes. With this setting turned on you can make changes to one side of your model (i.e. moving vertices, scaling edges and so on) and the tool will mirror these changes on the opposite side of the model. Keep in mind what axis symmetry your model follows then choose the correct axis in the tool's settings. Note that the previous manipulations you have performed on your object may affect its symmetry. Before making too many changes you should double check with a couple components selected to ensure that this function is behaving as expected. As with the soft selection function, be sure to turn this off when you are done with it.

There are a few other settings that can be adjusted for the move, rotate, and scale tools but these are the ones that will be the most helpful for a beginning modeling class.

The Lasso Tool

As the name suggests, this tool will allow you to select objects or components by drawing a free form lasso around them. You can adjust the Draw style and Component selection attributes to suit your needs. Note that like the move, rotate, and scale tools this tool also has soft selection and symmetry settings that you can enable.

The Paint Selection Tool

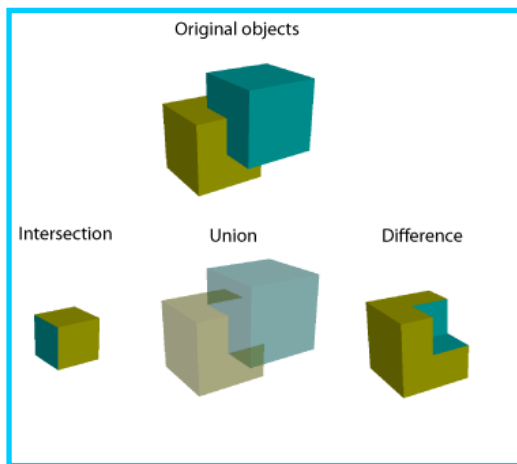
This is another tool that you can access by clicking on its icon on the left toolbar. This tool will allow you to “paint” a selection of components rather than **LMB-clicking** on them one by one, or by **LMB-click+dragging** to create a bounding box selection. To adjust your brush size you can adjust the Radius(U) and Radius(V) values or, with your cursor over the viewport, you can hold down **b+LMB-drag** to change it more quickly. The other settings for this tool will allow you to change the brush profile, whether you are selecting, unselecting, or toggling with the tool, adding this new selection to a current selection, as well as a few other settings in the sub-headers that will allow you to fine tune the brush's behavior.

Some polygon specific tools and operations:

There are many different tools that you can use to change your polygon objects; I will go over only a few of them here.

Boolean operations:

The Boolean operations (found on the Polygon menu set, Mesh>Booleans) allows you to combine objects in three different ways. These objects must be overlapping or intersecting in some way. To select multiple objects or components hold **shift+LMB-click**.



Boolean Union: the two objects selected will be combined into a single object. All of the objects' internally overlapping sections will be deleted.

Boolean Difference: the second object that you select will be subtracted from the first object. This is a very useful tool for creating holes in an object.

Boolean Intersection: only the space where the two objects overlap will remain, the rest of the objects will be deleted.

(Boolean image from [Maya online help](#))

Be aware that Boolean operations are somewhat “fiddly.” With complex geometry they may fail to work at all or may cause both objects to disappear entirely. If this happens to you might try deleting the history of the objects (Edit>Delete by type>History with the objects selected). You should also delete the history of the objects after you are satisfied with the result of the operations to avoid difficulties with them later on.

If deleting the objects' history doesn't work you can try adjusting the Boolean's settings by clicking on the options square next to each one in the menu. There are only a couple settings so feel free to try adjusting any of them to see if it helps. You can return the operation to its default settings by clicking Edit>Reset Settings in the operation options window. If none of this helps you may simply need to try with different objects or try to figure out another way to get the same effect.

A note on History: Maya will track all of the changes that you have made to an object since its creation and you can access and change them by clicking on the object's Inputs section in the channel box. Once you are done with each aspect of modeling it is a good idea to delete the history, as this will keep your scene size down and will let Maya run a bit faster. If you are going to use these deformations for animation then leave them be.

Combine mesh: (Mesh>Combine) this tool allows you to combine two or more polygon objects into a single object without changing its shape at all. This means that there may still be significant space between the components of the new object but it will still be considered a single object by Maya. Note: this is not at all the same thing as grouping or parenting objects which will only adjust the objects place in the hierarchy and its relations to the other objects.

Extract: (Mesh>Extract) this tool performs essentially the opposite function of Combine. By selecting one or more faces on an existing object and then performing the extraction you will end up with two polygon objects, one with the original geometry minus the extracted face(s) and one comprised only of the extracted face(s).

Mirror Cut and Mirror Geometry: these tools both serve a similar function with slightly different features to adjust.

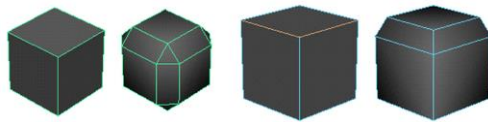
Mirror Cut (Mesh>Mirror Cut) is very helpful for when you have been making changes to only one side of what should be a symmetrical object. This tool will allow you to create a sort of reflection plane along a specific set of axes (which can be adjusted by selecting the tool's option box and choosing the desired settings). Anything on one side of the plane will be mirrored to the other and anything that had been on that side will be deleted from the object. The mirror cut is a select-able object and can be moved to change where the reflection occurs. The mirrored geometry will be merged with the original and any overlapping geometry will be deleted. Once you are happy with the way the geometry is mirrored you should select your new object and delete its history (remember: Edit>Delete by type>History), then delete the mirror plane. Be sure to delete your object's history before the mirror plane or else the tool will not work properly.

Mirror Geometry (Mesh>Mirror Geometry) is similar to the mirror cut tool but without the cut part. Mirror geometry is useful for when you have an entire shape that you want to mirror (as opposed to half of one). This tool will simply reflect the selected geometry in the direction of the selected axis (adjust these values by clicking the menu's options box). The resulting geometry will be combined with the original as with the Combine mesh tool, so there may be space between the two but they will be considered one object. If you do wish to merge the original mesh with the mirrored copy, you can select this feature in the options window and choose whether you want to merge the vertices or the border edges. This may create some odd connections so be prepared to adjust the topology manually.

A few more:

Bevel (Edit Mesh>Bevel then to the options box) will let you add faces along an edge. Since most of Maya's polygon primitives, by default, have edges that come together at very sharp angles it is good to soften them a little to make them look more like real world objects. This is because, in real life, even objects that seem to have sides that meet at a very sharp angle have some gradation to the corner if you look closely enough. This is where the bevel function comes in. Take a polygon such as a cube or something similar and go to edge mode (hotkey **F10**). Select the edges that you want to bevel, it's best to do all of the edges that you wish to bevel at the same time, the resulting mesh will work a lot better that way. Then with the edges selected go to the bevel operations option window by clicking the box next to its menu entry. From here you can adjust the size of the width of the bevel and the number of segments. There are some other settings but these are the ones that will be the easiest to use at first. You can try out a couple of different settings combinations until you find one that you like.

(Polygon cubes with and without beveling. Picture from [Maya Help](#))




Delete Edge/Vertex (Edit Mesh>Delete Edge/Vertex or hotkey **ctrl+del**) this one is pretty straightforward; it will let you delete specific edges or vertices. Most objects and components in Maya you can delete simply by pressing the delete key, this will work for faces just fine. However, if you try to delete an edge or vertex just by pressing delete you may end up with some problems with your mesh, it can disrupt the flow of other edges and edge loops or leave stray vertices in weird places. So, use this specific function for deleting edges and vertices.

Extrude (Edit Mesh>Extrude [note that there is an extrude tool under the sub-header for Vertices, Edges, and Faces, the instructions below are for face extrusions] or Mesh Tools>Extrude which will take you to the Modeling Toolkit version of this tool, more on that later) is an extremely useful tool and is used extensively for what is called build out modeling, by which you can create complicated models from simple polygon primitives. You can extrude both faces and edges, though for beginners it is usually best to stick with faces, as it will be easier to create a complete object with out any holes or non-manifold topology (which is a mesh, or topology, that cannot be unfolded to lie flat, which will be important once we get to shading, texturing, and rendering). To use the extrude tool, go to your polygon's face component mode (hotkey **F11**), select the faces that you want to extrude and select the extrude tool, for more customization, bring up the tool's options window by clicking on the box next to its menu line. Once you've started the tool (automatically if you just select extrude or once you click apply in the option window), it will bring up a manipulator with handles for

moving, rotating, and scaling your extruded face. In the options window you can also adjust other settings like the number of divisions created for the new faces, or if you are extruding more than one face at a time you can change whether they extrude as a single piece or separately. Try experimenting with this tool to see what you can do.

Insert Edge Loop (Mesh Tools>Insert Edge Loop Tool): sometimes when you are altering your model you will decide that you want to adjust the general shape of your object or add some segments to the mesh in a specific area. This is an area where the Insert Edge loop tool can be very helpful. An edge loop is a series of connected edges that encircles your object, or a part of your object depending on the mesh. You can select an entire edge loop by **LMB-double-clicking** on an edge while in edge mode (**F10**). With the insert edge loop tool enabled you can **LMB-click+drag** on an edge *perpendicular* to the direction that you want to insert your new edge loop. When the edge loop is placed where you want simply release the mouse button to complete the tool; your new edge loop will be inserted in your mesh. **Note:** The **Offset Edge Loop Tool** (Mesh Tools>Offset Edge Loop Tool) will allow you to insert edges as with the previous tool, but rather than clicking on an edge perpendicular to where you want to add your edge loop, **LMB-click+drag** on an edge that is *parallel* to where you want the edge loop and it will insert two new edge loops, one to either side of the edge you clicked on.

Sculpt Geometry Tool (Mesh Tools>Sculpt Geometry Tool>) This tool will allow you to interactively sculpt a polygon object's mesh to alter its topology, it can achieve results similar to the soft modification tool, but the method is a bit different.

When you open the tool settings window for this tool you will see a layout a bit similar to the paint selection tool discussed above, but the sculpt geometry tool has a number of additional settings.

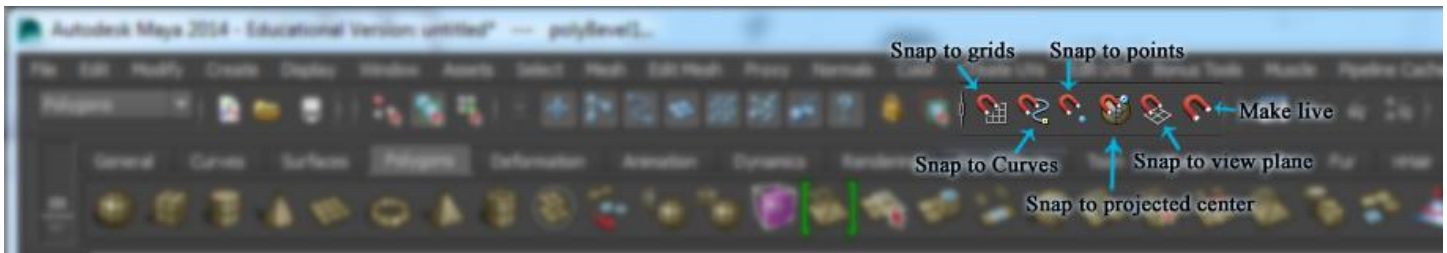
- The opacity will adjust how much effect each stroke has on the mesh you're sculpting, while if the accumulate opacity box is checked it will add the effects of each stroke on the mesh, rather than just the first stroke.
- Under the Sculpt Parameters sub-header you will be able to choose which type of sculpting you will perform, such as Push, Pull, or Smooth.
- You can also perform the function evenly over the entire surface by clicking the “Flood” button at the bottom of this subsection.
- Another useful setting is the reflection option under the “Stroke” sub-header, which will function like the reflection setting on the move, rotate, and scale tools.

- Most of the rest of the settings aren't something you will want to use for beginning modeling, or will only be needed if you are using a stylus instead of a mouse.

Note: the sculpt tool can only alter the “weights” between each of the vertex points, so for a really smooth sculpt you will need a correspondingly high poly-count object. These tools are still very useful for things like terrain, or cloth to a degree, but keep in mind your project's poly-count limit when you are using it.

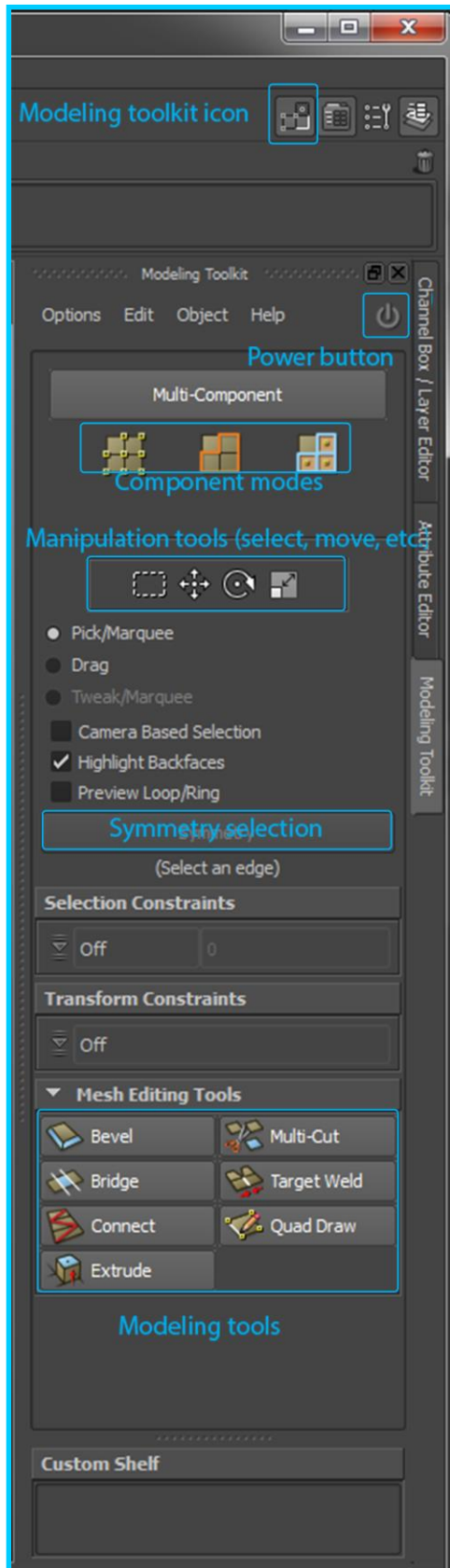
Snap settings:

Snap settings will allow you to “snap” an object or component to something else in the scene. The icons for the snap tools can be found near the top of the interface.



- Snap to grids – this tool will snap things to the nearest grid intersection, hotkey **shift+x**
- Snap to Curves – this will snap to the nearest curve – hotkey **shift+c**
- Snap to Points – this will snap to the nearest control vertex or pivot point, hotkey **shift+v**
- Snap to Projected Center – this will snap to the center of the selected object
- Snap to View Plane – snaps object to the nearest view plane
- Make live – this will make the object a “live” surface for use with tools such as quad draw (discussed below)
- For the move, rotate, and scale tools you can also hold **j** and then manipulate the handles for discrete snapping of the attribute.

10. The Modeling Toolkit



The modeling toolkit was only added to Maya 2014 and later versions and provides a slightly different way to interact with some of the modeling tools, such as **beveling** and **extruding**, as well as some new ones like **multi-cut**, **target weld**, and **quad-draw**. The toolkit can be accessed by clicking its icon in the upper right corner of the Maya interface.

In addition to the tools themselves, the toolkit also has a multi-component interaction mode which, when activated, will allow you to adjust all of the components such as edges and vertices without having to switch between modes.

There is also a symmetry function for the toolkit, which can be enabled by selecting the edge that you want to act as the center line of the object, then by clicking the Symmetry button at the bottom of the component section. You can turn off the symmetry feature by clicking the button again. (Insert image of toolkit with all parts labeled)

Be sure to use the power button in the upper right hand corner to turn the toolkit on when you want to use it and off when you are done.

When each different mesh editing tool is selected a section will open below the tools, with various attributes for each tool that you can adjust, either by inputting a value in the field or by clicking the button next to it and MMB-dragging in the view pane. Maya will remember the last settings used for that tool but you can always return them to the defaults by clicking the reset button at the bottom of the sub-section.

Modeling tools in the toolkit:

Bevel – this is like the tool found in the Mesh Tools menu but it allows for a bit more on the fly interaction. I prefer to use the bevel in the toolkit rather than from the mesh tools, personally.

Bridge (only in the toolkit 2015 on) – this tool will allow you to connect two border edges on the same polygon object, as well as the number or divisions on the bridge. This tool is useful for filling holes or connecting parts of multiple meshes that have been combined into a single object.

Connect – this tool will connect any selected components by inserting edges. **WARNING: this tool can yield some extremely odd and poorly laid out mesh topologies. Use this tool with caution or not at all until you are more familiar with what constitutes a “good” polygon mesh.**

Extrude – like the bevel tool, this is also like the extrude tool found in the Mesh Tools menu. Personally, I find the toolkit version of the tool much easier to use in terms of fine tuning how I want the mesh to look but this will largely be a matter of personal preference.

Multi-Cut – this tool will allow you to fine tune the topology of your mesh by letting you interactively split the faces with inserted edges. **LMB-click** on an edge or vertex to begin your cut then click on the next edge or vertex that you want your new edge to go through. By holding down **shift** as you click you can snap the desired placement in increments of 10 degrees. You can also adjust the location of the last placed cut point along an edge (but not if it is on a vertex) by **MMB+dragging** it to the desired location. When the cut is arranged how you want hit **enter** (or simply **RMB-click** in Maya 2015) to complete the cut. **WARNING: this tool can yield some extremely odd and poorly laid out mesh topologies. Use this tool with caution or not at all until you are more familiar with what constitutes a “good” polygon mesh.**

Target Weld – this tool will allow you to merge two edges or vertices together. To experiment, try creating a polygon primitive and going to its edge mode. Then, with the tool on **LMB-click+drag** on one edge and pull it to another to merge the first edge into the second. If you simply **LMB-click and release**, it will merge the component to the nearest other component of that type. **WARNING: this tool can yield some extremely odd and poorly laid out mesh topologies. Use this tool with caution or not at all until you are more familiar with what constitutes a “good” polygon mesh.**

Quad Draw – This tool can be used to interactively create polygons based off of another object, which can be useful for creating objects whose shape should conform to a polygon primitive or similar object, but whose topology should differ. To use this tool, first make your source object live by **RMB-holding** over it and then selecting Make Live from the menu, or by selecting the object then clicking the icon in the top toolbar.

This will render the object “live” and you will no longer be able to select it, but when you activate the quad-draw tool, you will be able to draw polygon faces directly onto its surface. Simply **LMB-click** along the surface to draw a vertex point, then **shift+LMB-click** to create each face once you have drawn four points along the surface. Turn off the quad draw tool once you are happy with the shape that you have created. You can then disable the live object function by clicking the Make Live Icon again.

The End?

This is as far as I will go with this guide but there are many more areas of Maya to explore. The information provided above is only the tip of the iceberg for what you can accomplish with this software. For some more resources to check out see the section on the next page.

I wish you good luck and happy modeling!

11. Further Resources

From the class resources:

- Lighting (X:\Help and Tutorials\Tutorials\Lighting)
 - This is an excellent guide to lighting. You will probably be going through this one in class but if you wish you can get an early start.
- Rigging (X:\Help and Tutorials\Tutorials\SkeletonRigging)
 - Creating a character with a moveable skeleton is a daunting task. If you think this is something that you would like to use in an animation I suggest getting started as soon as possible.
- UVs (X:\Help and Tutorials\Tutorials\UVTuts)
 - This will help explain the UVs that will determine how shading and texturing materials appear on your models.
- Aesthetics of Maya (X:\Help and Tutorials\Tutorials\AOM)
 - This is a great, all around guide to Maya. Even if it is geared for an earlier version, it really lets you know what's possible.

Outside resources:

- [The Maya Learning Channel on YouTube](#)
 - There are a lot of great video guide here. Specifically, consider checking out [this video series](#) on Shading, UV mapping, and Rendering.
- [Stuart Christensen's Youtube Channel](#)
 - He has a lot of excellent video tutorials for many different aspects of Maya
- <http://3dtutorials.michaelorourke.com/>
 - This site offers a lot of Maya tutorials as downloadable pdfs. The ones that I have checked out have been well put together and straightforward, though there are geared specifically for earlier versions of Maya (2011, 2012)
- [Digital Tutors](#)
 - You need to purchase a paid membership for this site, but if you are really interested in expanding your digital media skillset it offers a lot of resources.