

- I. Lighting - The most critical aspect of a scene. In order to see, that is "to render" a scene or any object within that scene, you must define lights.
- A. Common Light Parameters..
- i. Location - x,y,z coordinates in world space. They have a location, but no physicality during rendering.
 - ii. Intensity - Defines the strength of illumination of a light. The higher the number the brighter the light. Value must be set to work with the scale and size of the scene being modeled.
 - iii. Color - Adding color can create a subtle lighting effect. Defaults to white.
 - iv. Shadows - Can be turned on or off for all lights. In addition, objects can also turn on and off their ability to cast shadows. (*Very useful tool*)
 - v. Decay (Falloff) - Light doesn't travel forever, but fades with distance. A decay value of zero means the light doesn't fade with distance, that there is no decay. higher values cause the light to fade more quickly as it moves away from the light.
- B. Types of Lights
- i. Ambient - Simulates the overall amount of daylight (or lack of daylight), in the world around you. (no equivalent lighting scheme in nature.)
 - a. Non-directional, often used as secondary light source to balance off more directed/intense light.
 - b. Fills in the dark areas with light.
 - c. In the real world, there isn't an Ambient light source. The sun fills the sky with light, see directional below.)
 - ii. Directional - Simulates sun light.
 - a. Directional.
 - b. The light is located infinitely far away.
 - c. Resembles Ambient light, but has no location, and it has directionality(Parallel rays of light all follow the same direction).
 - d. Advantage - Very easy to get a reasonable rendering with only a single light.
 - iii. Point - Simulates the effect of a bare light bulb hanging from a wire.
 - a. Non -directional - light is emitted in all directions equally.
 - b. Faster to render.
 - c. Decay factor determines drop off rate from light source.
 - iv. Spotlight - Simulates a spot light.
 - a. Directional - light is thrown in a cone-shaped beam, and varies in width.
 - b. Cone Angle - Measure of the angle from edge to edge of the spotlight's beam.
 - c. Penumbra - Controls dropoff of the spotlight intensity towards the edge of the cone. (Softer edges can be made using this parameter).
 - d. Decay - Rate at which intensity decreases from the center to the edge of the spot.
- C. Shadows
- i. Illuminate by default - this links the light to all renderable objects in the world. *See light linking below.*
 - ii. Raytrace Shadows
 - a. Use only for rendering shadows of object that otherwise can't be rendered using depth maps. (e.g. transparent objects.)
 - b. Must select Ray Trace Shadows in the light's attribute editor.
 - c. Must turn on Raytracing in the Raytracing Quality section of the Render Globals.
 - d. Light Radius - used to soften the edges of a raytraced shadow.
 - iii. Depth Map Shadows
 - a. Creates a depth map for shadow projection once, and then references it during rendering.
 - b. Objects when moved, need to have their depth maps recalculated.
 - c. Dmap Resolution - Controls softness of shadows. Lower values are faster to render and produce soft smooth shadows. Higher values render crisp sharp shadows.
 - iv. For faster rendering - turn on Depth Map shadows, and turn Cast shadows off for any objects that don't need to cast shadows.
- D. Opti FX - collection of atmospheric effects for spotlights, etc.
- i. Creating an Optical light effect.
 - a. Select the light you wish to add the effect.
 - b. In the light's attribute editor, click the map button next to the light glow attribute.

- c. Maya automatically creates an optix node, connects it to the light, and opens it's attribute editor.
 - ii. Popular optical effects.
 - a. Glow - An illuminous effect surrounding a light. Has no effect on lighting the scene at all.
 - b. Halo - A ringlike effect that surrounds the light source.
 - c. Lens Flare (cheese-o-rama) - Simulates a lens flare when your camera points its virtual lens toward a light.
 - iii. Illuminated fog - in the real world, when light passes through the air, it often illuminates fine particles like smoke and dust, or fog.
 - a. Select the light you wish to illuminate fog.
 - b. In the light's attribute editor, click the map button next to Light Fog.
 - c. Change the fogs parameters in the Attribute Editor after it is opened on the light fog's node.
 - E. Linking Lights - illumination of objects is controlled by a relationship between a light and the objects in the world.
 - i. Illuminate By Default - selected light illuminates all objects in the world.
 - ii. **Lights -> Make/Break Light Links** - to create exclusivity between an object and a particular light. Selected objects and lights are linked together, or links are broken.
 - iii. Relationship Editor - can be used to view the relationships between lights and objects in the world.
 - 1. Light Centric Light Linking - organizes the lights and objects in the relationship editor with a focus on the lights.
 - 2. Simply select a light to view the objects it illuminates.
 - 3. The highlighted nodes under illuminated objects are objects that will be lit by the selected light.
 - 4. To link a new object to the light, simply select an unselected object.
 - 5. To break a link, simply select a linked object, it will become deselected, indicating it has been unlinked.
 - F. Working with lights in Maya's UI.
 - i. Transforming lights - you can move, rotate and scale lights in the modeling world just like any other object.
 - ii. Selecting lights - in Object select mode, use the render object selection mask to select objects. (*The sphere icon toward the left of the menubar.*)
 - iii. To interactively change light parameters - use the Manipulator tool, **t**, to access the cycling index.
 - a. Cycling Index - a little blue circle with a line that acts as a switch between different a light's manipulator tools.
 - b. Center of Interest - move two parts of the Center of interest manipulator to change the location and direction of light.
 - c. Pivot Manip - used to move the pivot point of the light, or center of interest for future transformations. click the pivot manip again to disable the pivot point.
 - d. Cone angle - use the small dot around the cone angle circle to make the spread wide or more narrow.
 - e. Penumbra - interactively decrease or increase the brightness along the edge of the cone angle.
 - g. Decay regions - can be used to separate a spot lights decay region into regions that are illuminated, and those that are not.
 - iv. **Panel -> Look Through Selected** - will allow you to look through a light and interactively place it using the manipulator tools, and transform tools.
- II. Lighting Concepts
- A. Lighting Diagram
 - i. Extremely helpful when creating your set/scene.
 - ii. Real diagram usually consists of these things -
 - a. Placement of light in relation to subject. (Where and how many feet away).
 - b. Direction of light, and angle of fixture.
 - c. Type of fixture it is. (Omni, Spot, Arri, Kino).
 - d. Type of lamp in the fixture. (600w tungsten, 3200K/5600K fluorescent)
 - e. Camera F-Stop and Light meter readings at key positions in the scene.
 - iii. Virtual lighting diagram should hold relevant information such as -
 - a. Placement of lights in relation to subject. (Where and far away).
 - b. Direction of light, and angle (if applicable).

- c. Type of light involved, and a listing of it's parameters. (Color, Glow, Intensity...)
 - B. Cinematic Conventions
 - i. Key Light - The main source of illumination in a scene.
 - a. It typically lights the subject, or the focus of the scene.
 - b. Generally has an identifiable source, whether on screen or off. It looks like it is coming from somewhere.
 - c. Generally placed in the front and to the side of the subject based on the camera's position.
 - ii. Back Light - Used to separate the subject from the background.
 - a. Light generally is coming from no logical source.
 - b. Placement is usually a little less than 180 degrees from the camera.
 - c. The light adds a thin line of illumination to the dark side of the subject that separates it from the background.
 - iii. Fill light - Meant to fill in the dark areas left by the key light.
 - a. Generally you want some definition in shadowy areas, so the fill is usually never more than half the intensity of the key.
 - b. Placement is usually 180 degrees rotated from the key light.
 - c. Typically the fill light is placed opposite of the key. If the key is high, the fill will be set low.
 - iv. Kicker - A small lamp that is used as a very directed back light. Aimed at small problem areas where larger fixtures wouldn't work.
 - v. Eye light - A small lamp that is directed toward the eyes allowing for that Hollywood sparkle.
 - a. It is typically set low on the set, and pointed upward toward the eyes.
 - b. Aids in smoothing out the shadows from a harsh key light on the face.
 - vi. Set Light - Are used to illuminate the set.
 - a. Most lights are used to define and light the subject.
 - b. Lighting the set separately allows you to highlight the portions that are relevant to the scene.
 - c. Can be used to separate the background from the subject.
 - d. Usually less intense than the key light.
- III. Rendering
 - A. Render Globals - used to set global parameters for rendering.
 - i. File Name - Name of the output image.
 - ii. Image format - File format of output image. (Use Tiff)
 - iii. Renderable objects - Render All.
 - iv. Camera -used to select a view point to render from. (persp, or your main perspective window.)
 - v. Channels - what will be rendered. RGB, Alpha, or Z-Depth.
 - vi. Render Resolution - Resolution of render, 640x480 = NTSC video, we will render at Full 1024.
 - vii. Anti-alias Quality - determines the smoothness of jagged edges.
 - a. Preview Quality- used for preview rendering.
 - b. Production Quality- used for final render.
 - viii. Raytracing Quality - used to turn on raytracing. Use the smallest numbers possible in any raytracing dialog to limit render time.
 - B. Rendering
 - i. Use **Render -> Save Batch Render** - to save your render file, and start the render.
 - ii. From the shell, you can type Render, and get a list of switches that allow you to run the Render outside of Maya.
 - iii. Render files can be found in **project -> render**.
 - iv. Output images can be found in **project -> images**.
 - C. Renderview - used for interactive rendering of your scene.
 - i. Parameters set in the IPR Render Globals.
 - ii. Click drag a box around a region you wish to render, then render region. This avoids rendering portions of the scene you know are fine.