

CS125: Introduction to 3D Computer Animation  
Fall 2009

Lighting Assignment

Date	What should be done	Handin name	Files to handin
Oct 28, 10am	All reading, lighting tutorials (1 and 2)	light_tut1	<ul style="list-style-type: none"><li>o &lt;login&gt;_light.mb</li><li>o &lt;login&gt;_light_image.tif</li><li>o &lt;login&gt;_3point.mb</li><li>o &lt;login&gt;_3point_image.tif</li><li>o REPORT.txt</li></ul>
Nov 2, 10am	more lighting tutorials (3 and 4)	light_tut2	<ul style="list-style-type: none"><li>o &lt;login&gt;_layers.tif</li><li>o &lt;login&gt;_ao.mb</li><li>o &lt;login&gt;_ao.tif</li><li>o REPORT.txt</li></ul>
Nov 2, 10am	Progress: do as much of the lighting as you can	light_progress	<ul style="list-style-type: none"><li>o &lt;login&gt;_light_progress.mb</li><li>o &lt;login&gt;_light_image.tif</li><li>o texture images, if any</li><li>o REPORT.txt</li></ul>
Nov 6, 10pm night	Final lighting	light_final	<ul style="list-style-type: none"><li>o &lt;login&gt;_light_final.mb</li><li>o &lt;login&gt;_light_image.tif</li><li>o texture images, if any</li><li>o REPORT.txt</li></ul>

**Goals and introduction**

The goal of this assignment is to learn how to design and implement lighting in Maya. Lighting is the most important element in defining the look and mood for your projects. Setting up lights is technically easy, but figuring out what ones to use, how they should be positioned, their settings, and global render settings takes *a lot of finessing*.

**Renderers**

As with shading, you have the choice of Maya software renderer, mental ray, or Renderman for this assignment. If you use mental ray, you can use Global Illumination and/or Final Gather which simulate light in a more physically accurate way, but you must use some direct lighting in addition (more details below). We will introduce you to these topics, but not cover them in depth, so you should consult one of the references (Birn, Lanier, Introducing Maya 2009, mental ray book, or maya help) for more details. Just like with shaders, mental ray offers more types of lights, but they are more narrowly defined. mental ray will also render Maya lights; it uses the attributes you set in Maya

and you can also adjust additional mental ray-only attributes. If this is confusing, stick to Maya lights and the Maya software renderer.

As always, meeting the design goals trumps the complexity of the techniques you use.

## Reading

This assignment requires a lot of reading, but it is *absolutely necessary* to understand the underlying principles in lighting.

Read Birn, Chapters 1-5, 8, 11.

Read the “tutorial” at this website.

<http://www.itchy-animation.co.uk/tutorials/light01.htm>

It reads fast and has fantastic pictorial examples.

Use *Introducing Maya 2009*, Chapters 10 and 11 as a reference for how to work with Maya’s lighting tools, but try not to look too carefully at the pictures. The examples generally do not show good lighting.

## Tutorials

1. Do Lesson 3 through the shadow section Getting Started with Maya>Rendering>Lesson 3. The source file for this tutorial can be found in /course/cs125/asgn/light\_tut/getting\_started. For this tutorial, hand in your maya file and a single rendered frame. The default resolution of 320x240 is fine.
2. Do the three point light tutorial by Jeremy Birn found here <http://www.3drender.com/light/3point.html> For this tutorial, you can light the scene found in /course/cs125/asgn/light\_tut/teapot\_3point/ or create your own very simple scene. If you choose your own scene, it should have a backdrop and single object. You may also use the teapot scene, but replace the teapot with your mug or the object you modeled.

The teapot folder includes some textures. Make sure your key light casts shadows. Hand in your scene file and a 640x480 render. Optional: add more rim lights and kickers to give the object additional form.

3. Render Layers tutorial in *Introducing Maya 2009*, p. 508-516. The initial scene is in /course/cs125/asgn/light\_tut/render\_layers/ or you can get it off your book CD. After you load the still life scene and before you start the rest of the tutorial, open Render Globals. Under the Common tab, in Render Options, uncheck “Enable Default Light.” This turns off default lights so you will only use the lights defined for the scene. The final step of the tutorial is to batch render the animation. You do not have to do this. Just render one frame.

4. Add ambient occlusion to the fruit picture from the previous tutorial. Instructions are on the Google website.

### **Optional tutorials**

The following are not required, but are more tutorials to help you get started with additional tools.

1. Getting Started with Maya Global Illumination and/or Caustics tutorials. Global illumination, or GI, is a way to simulate the way that light bounces off many surfaces to light objects. It is only available using the mental ray renderer. Caustics are the light that is reflected from shiny surfaces onto diffuse ones after being refracted. It causes the wavy lines in the bottom of sunlit swimming pools and pools of light next to glass bottles.
2. Global illumination with mental ray in *Introducing Maya 2009*, p 456 (which refers to a pdf on the book CD). This will introduce you to using some GI options in mental ray.
3. Read Shadow chapter from Lanier book (under Lectures on website).
4. Read or do Bounce Lighting tutorial on Google Site. This is an advanced tutorial that is usually offered to CS128. It explains how to use direct lighting with mental ray raytracing to achieve a reasonably natural look for bounce lighting without using global illumination or ambient occlusion.

### **Lighting design**

*Art is not what you see, but what you make others see.* – Edgar Degas

You will light Jeremy Birn's kitchen scene from the Lighting Challenge #2 from his website, 3drender.com. The scene is available in /course/cs125/asgn/lighting/kitchen.mb.

Your lighting will create a focus point in the kitchen. This means that the lighting will direct your audience to what is important for them to see. Not everything will be lit equally; there will be some areas that are brighter and some that are darker. It can help to think of a dramatic moment that has or is about to occur.

The view of the kitchen you choose should be more than a small still life. For example, don't just light the fruit on the counter – you will need more than 3-point lighting of a few objects. But you don't have to use the entire room. Take into consideration practical light sources even if they are not in your view. The kitchen model doesn't include geometry for light fixtures, but you can imagine that there might be recessed ceiling lights, a light as part of the fan, or lights under the upper cabinets. You don't need to make geometry for these as they are hidden or offscreen. In addition to practical light sources remember that most surfaces reflect at least some light onto other objects.

Unless you use global illumination, this has to be faked by putting in extra lights. Area lights sometimes work well for this, or try the bounce lighting described in the Google site tutorial.

None of the objects in the scene have shaders or UV maps. You do not have to add shaders to the model, but if you do, please spend only minimal time setting up a few fairly generic shaders. This assignment is about lighting and that is what you will be evaluated on.

You must have these elements:

- camera view that shows that this room is a kitchen and/or dining area
- lighting that creates a focus for the image
- shadows, including contact shadows or ambient occlusion
- if you use GI, you must also include direct lighting
- if you don't use GI, you must include some source of "bounced" lighting

Additional design goals:

- good composition
- lighting and shadows should help break up 3d space to help define what is close and what is far
- lighting should define forms and separate them from their backgrounds if appropriate

### **Tips**

- Birn, Chapter 4, pp 96-108 is your best reference for learning to light using practical lights, windows, and bounce lighting.
- Try working on each light separately. Figure out what you want it to do and then work with all other lights turned off until it is doing what you want. Make sure each light contributes to the look. You can use light-linking to make lights apply to some objects and not others. After working on a complicated scene, it is not unusual to find a few lights that don't seem to be contributing.
- Use the light manipulators and look through functions to help you place your lights accurately.
- Try assigning temporary bright colors to your lights so that you can better see their effect on objects.
- Not all lights should cast shadows – usually only key lights do. Pay close attention to shadow quality.

- Lighting can be a very creative part of the animation process. The tools are not as difficult to learn as the modeling tools, but they produce a wide range of effects. Because subtleties in lighting are what make it interesting, the tweaking takes a deceptively long time. Allow yourself enough time to experiment.
- Use light effects like glows and fog sparingly.
- Make a new camera called render\_cam. Use this camera when rendering your final image. Then you can use the persp camera to tumble around and look at your scene without having to find the beauty view again. Read the Maya help section on cameras to find out how to change attributes. The most common attribute you might need to change is the focal length. This determines whether the camera is using a wide angle lens, a normal lens, or a telephoto lens. The default is 35mm, which is a medium wide angle.
- When adding color, think about relationships between colors more than the colors themselves. Will they all be similar hues (analogous colors) or complementary hues (red/green, blue/orange, purple/yellow), pastels or deep shades?
- There should be no completely shadowed or black areas. Likewise, there should be no completely white or blown-out areas. Both the darkest and lightest areas should still have surface detail.
- If you render in separate layers, you may use photoshop to composite, but don't add new elements in photoshop.

### **Technical requirements**

Hand in your Maya file and a single rendered tif frame, 1024x768.