Shading Your Models

While geometry defines the shape of a model, shading defines how the model's surfaces react to light and details such as color, transparency, and texture.
Maya uses Shading group nodes to tell the renderer which materials, textures, and lights will affect the final look of a surface. Shading networks are made up of nodes that define the final look of a rendered surface. Learning the proper role of each of these nodes will ensure that you build shading networks that render successfully.

Material Qualities

Before actually looking at a more complex shading network, it is useful to consider the various material qualities that you will be trying to achieve. A basic understanding of how an object is shaded can be translated into attributes on shading network nodes in Maya.

The geometry shown as a wireframe becomes more realistic with the addition of shading networks that add color and texture.

Basic Shading

Shading shows you how the surface appears when illuminated. As light hits a surface, it defines a gradation from light to dark that makes the surface's 3D qualities apparent.

Highlights and Reflections

As a surface becomes shinier, it begins to show highlights and reflections. Specular highlights show the hotspots where the light sources are reflected, while reflections simulate light bounced from surrounding objects.
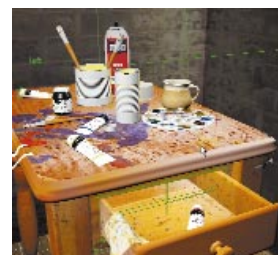
Specular Highlights

Reflections

Transparency

It is possible to see through transparent areas such as the glass on this jar, while opaque areas such as the label, cap, and paint remain solid. Transparent surfaces such as glass can also bend light. This is called refraction and can be achieved in Maya using Raytracing.

Surface Relief

Surface relief, such as bumps and scratches, helps add a realistic look to a surface. This effect can be achieved with special textures called *bump* and *displacement* maps.
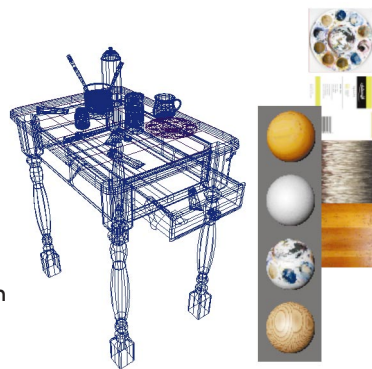
Evaluating Shading Networks

To preview shading networks and texture maps, set up a camera, then illuminate your objects with lights and render. Hardware rendering can be used to quickly preview textures and some lights while software rendering is required to explore all shading situations. More in-depth discussion of rendering types is found in the Rendering chapter. Lighting and camera information is found in the Digital Cinematography chapter.

Hardware Rendering

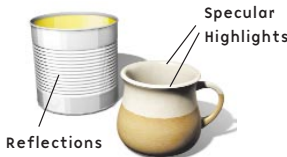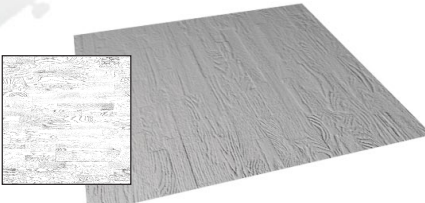It offers a preview of the color of textures and up to eight lights.

Software Rendering

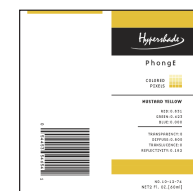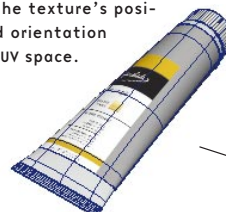It is capable of rendering all shading effects such as bump, specular, shadows, and all lights.

The Anatomy of a Shading Network

Shading networks are built as nodes that control specific aspects of the shading effect. These networks define how various color and texture nodes work with associated lights and surfaces. The placement of textures on surfaces is also controlled by nodes within the network.
There are several ways to view shading networks in Maya. The Hypershade window lets you easily connect nodes and view the connected attributes. You can also double-click on any node to open the Attribute Editor. Along the way, you can zoom in and out in the Hypershade to get the complete picture. You can also view shading networks in the Hypergraph window but this view does not give you swatch images.

2D Texture Placement node

A texture is mapped in 2D space when it is mapped to the UV space of the geometry. This node is used to define the texture's positioning and orientation within the UV space.

3D Texture Placement Node

This node lets you define a position in 3D space for your texture and makes it easier to texture multiple surfaces as if they were one. The icon in the modeling views can be used to interactively establish the texture's position in world space.
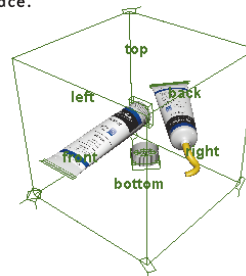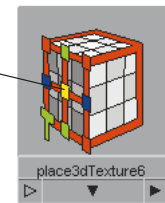
File Texture Node

File textures are bitmap images imported into Maya that can be used for texture mapping attributes such as color, bump, or transparency.

Shading Group

This node is the root of the shading network. It sends information about materials and textures, lighting, and geometry to the renderer. In most cases, you will not have to work directly with the Shading group node because the Material node is where you will make most of your texture connections.
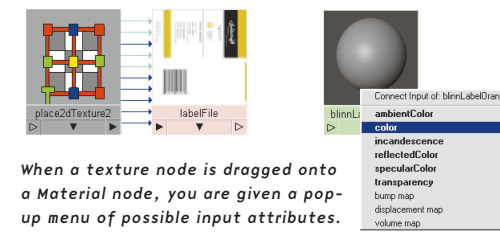
Material Node

Material nodes define how the surfaces will react to light. The term *shader* is often used to describe the role played by the Material node. In general, this node will be the focus of your work as you build up all of your shading networks.

Environment Texture Node

An environment texture is used to simulate reflections on the surface. This node might be shared among several shaders and have an affect on many surfaces.

Shading Network Connections

Shading network nodes have input and output attributes. Texture mapping involves making connections between these input and output attributes. One way to connect them is to drag one node onto another in the Hypershade window. You are then offered a list of input attributes to map to. In this case, the output attribute is a default attribute such as out color. For more complex mapping, the Connection Editor allows you to select input and output attributes directly.

When a texture node is dragged onto a Material node, you are given a pop-up menu of possible input attributes. This makes it easy to connect two nodes together. You can also drag nodes directly onto attribute names in the Attribute editor to connect them.
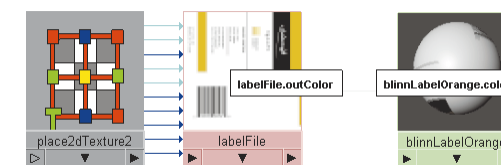
Placing the cursor over the line that connects two nodes gives you information about the connected input and output attributes. You can use this information for future reference. You can select this line and delete it to break the connection.
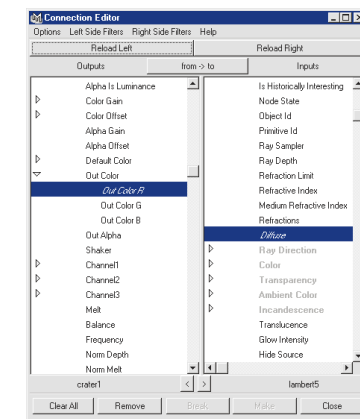
The Connection Editor can be used when the desired attribute is not available in the pop-up menu or when you want to make a special connection such as the **Out Color R** of the one node to the **Diffuse** of another.