**MATERIALS - 1**

**What is color?**
What we perceive as color is the reaction of parts of the retina of the eye to particular wavelengths of light, from red (the longest visible wavelength) to violet (the shortest visible wavelength). When equally balanced, all the wavelengths of visible light make up white light. White light can also be simulated by using just three carefully chosen red, green, and blue light sources – the basis of the RGB additive color system that is the basis of projectors, monitors, and spotlights.

(Note that there is another system, the subtractive Cyan-Magenta-Yellow-black system of inks and paints where adding all the colors makes black. CMYK relates to printing and graphic design, and is not relevant to this course though it is important to be aware of it).

**The material tab v. the texture tab**
The color of an object in Blender is largely defined by these two tabs. You can think of Materials as being Object mode and Textures as being Edit. In other words Materials deal with the overall appearance of the object (green, shiny, reflective, transparent) whereas textures provide subobject detail (graphics, irregular surface, glowing center). There is one exception, the multimaterial option, and let’s look at that now.

**A multimaterial cube**
We can use only materials to make a cube that has different colors on each face. It is possible to apply up to 32 materials to an object – with 32 textures associated with each one – but clearly there would be no point to this if only one material was visible at a time. The way to show more than one material on an object is to assign different materials to selected faces in Edit mode.

Start by creating a simple cube and give it a white material, naming the material White.
Create a new material by left clicking on the + button and the New button will appear.

Click this button and make and name this new material Red.

Note that the color of the cube does not change; the top material in the list paints over all those below it. Now do the same again to create a Blue material.

Go into Edit mode. Note that three new buttons have appeared: Assign, Select, and Deselect.
Go into face select mode and pick one of the visible faces. Then, with Red selected in the list, hit Assign.

The face will preview red. Do the same for one of the other faces with the Blue material. (The Select and Deselect buttons are for selecting faces based on color and will not be used in this exercise).

Now render the cube; you do not need to be in Object mode to render.
With the blue material chosen go down to the Mirror panel. Check the box and open the panel by clicking on the small triangle. You may want to move the panel up to just under the preview window by holding the cursor on the small hatched area top right and dragging. Give it about 0.400 reflectivity and 0.900 gloss (nothing is ever perfectly reflective).

Go back into Object mode. Since the reflective blue material has nothing to reflect use Shift-D to duplicate the cube and move the copy along the X axis. View them through the camera (View – Camera or Keypad-0) to make sure they will render properly.

Now we’re going to make the front cube transparent, but before we do so be warned: when you duplicate an object in Blender (unless you change this option in user preferences) the mesh is copied but the materials and textures are instanced. This means that you can move vertices in one cube and it will not affect the other, but if you change the material or textures on either that change will also be carried out on the other. You can tell that a material is being used by more than one object because it has a number next to it:
With the front cube selected click on that number and it will disappear; the name of the material will also change, in this case to White.001. Now, with the front cube still selected, delete the Red and Blue materials (they will remain as part of the back cube). Rename White.001 to Glass.

Slide the Transparency panel up until it is just below the Preview. Check the box and choose Raytrace. Make the Alpha about 0.200 and the IOR (index of refraction) about 1.100.

Note that transparency is not shown in the solid preview mode. Now render again. Because of the reflection and transparency this will take longer than before.

I have the background set to transparent, and you can see the checkboard pattern that is the marker for transparency showing through in this render (to make the edges clearer I’ve checked Edge in the Post Processing panel under the Render tab).
If this is saved as an RGBA type PNG image file two or more can be layered over each other in an editing program like this:

Note the perspective isn’t quite correct; this isn’t an accurate substitute for a proper 3D scene. But if you’re placing something in a photograph, or compositing layers in a scene which each need separate control of intensity and color, saving files out as RGBA is the way to do it.

**Image formats**

Blender gives you a lot of choice regarding the type of image formats you can save in. There are several things to consider when choosing one, including:

- do I want the file to be compressed to save space at the cost of losing some quality?
- do I want more better color information (16 instead of 8 bits/channel) despite a larger file size?
- do I need to save transparency information?

In most cases the PNG (Portable Networks Graphic) format will do all that you need. “Ping” files can be compressed to varying degrees in the same way as JPGs, but unlike the JPG format they support a fourth channel, the Alpha channel, which holds transparency information. This four channel option is often referred to as RGBA (Red Green Blue Alpha).

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