Color Mapping

- An object can be colored with more than one color at the same time
- Defining repeating patterns of color for your object
- The `pigment` clause allows you to define color patterns
checker

box{<-1,-0.1,-1>, <1,0, 1>
    scale <6, 1, 6>
    translate <2, 0, 1.5>
    texture{
        pigment{ checker White, Blue }
        finish{diffuse 0.6 ambient 0.4 }
    }
}

Why?
brick

box{<-1,-0.1,-1>,<1,0,1>  
scale<6,1,6>  
translate<2,0,1.5>  
texture{  
    pigment{brick White, Blue  
        brick_size<2,0.5,3>  
    }  
    finish{diffuse 0.6 ambient 0.4}  
}

hexagon
box{<-1,-0.1,-1>, <1,0, 1>
scale <6, 1, 6>
translate <2, 0, 1.5>
texture{
    pigment{ hexagon White, Blue Red
    }
    finish{diffuse 0.6 ambient 0.4 }
}
Color maps

- You define smooth transitions of many colors that gradually change from one point to the next.
- You define a pattern to follow, along with the color map.

```plaintext
gradient

sphere {
  <0,1,2>, 2
  pigment {
    gradient x       //this is the PATTERN_TYPE
    color_map {
      [0.1  color Red]
      [0.3  color Yellow]
      [0.6  color Blue]
      [0.6  color Green]
      [0.8  color Cyan]
    }
  }
  finish {ambient 0.3}
  translate 1*y
}
```

```
gradient x
```
gradient \( y \)

Sharp changes at 0.0, 1.0, 2.0

Smoother

```plaintext
pigment {
  gradient <1, 0, 0>
  color_map {
    [0.0  color Yellow]
    [0.5  color Magenta]
    [1.0  color Yellow]
  }
  scale <2,2,2>
}
```
How to do stripes?

marble

- Similar to gradient x
- The difference lies on the way it blends the colors
marble
sphere {<0,1,2>, 2
texture {
  pigment {
    marble
    color_map {
      [0.0 rgb <0.8, 0.8, 0.6>]
      [0.8 rgb <0.8, 0.4, 0.4>]
      [1.0 rgb <0.8, 0.2, 0.2>]
    }
  }
  finish (ambient 0.3)
  translate 1*y
}
marble (with turbulence)

sphere {
  <0,1,2>, 2
  texture {
    pigment {
      marble
      color_map {
        [0.0 rgb <0.8, 0.8, 0.6>]
        [0.8 rgb <0.8, 0.4, 0.4>]
        [1.0 rgb <0.8, 0.2, 0.2>]
      }
      turbulence 1
    }
  }
}
finish {ambient 0.3}
translate 1*y

radial

- Creates bands radiating from the y axis
radial
box{<-1,-0.1,-1>, <1,0, 1>
  scale <6, 1, 6>
  translate <2, 0, 1.5>
  texture{
    pigment{
      radial
      frequency 10
    }
    finish{diffuse 0.6 ambient 0.4 }
  }
}

radial
box{<-1,-0.1,-1>, <1,0, 1>
  scale <6, 1, 6>
  translate <2, 0, 1.5>
  texture{
    pigment{
      radial
      color_map{[0.5 Black][0.5 White]}
      frequency 10
    }
    finish{diffuse 0.6 ambient 0.4 }
  }
}
bozo

- This pattern is a very smooth, random noise function that is traditionally used with some turbulence to create clouds

```plaintext
box{<-1,-0.1,-1>, <1,0, 1>
   scale <6, 1, 6>
   translate <2, 0, 1.5>
   texture{
      pigment{
         bozo
      }
      finish{diffuse 0.6 ambient 0.4 }
   }
}
```
The agate pattern is a banded pattern similar to marble.

It uses a specialized built-in turbulence function that is different from the traditional turbulence.
agate

box[<-1,-0.1,-1>, <1,0, 1>  
scale <6, 1, 6>  
translate <2, 0, 1.5>  
texture{
  pigment{
    agate
    agate_turb 1
  }
  finish{diffuse 0.6 ambient

agate

 cells

- Fills 3D space with unit cubes
cells

box([-2,-2,-2], [2,2, 2])
texture{
  pigment(
    color_map{
      [0.1 Red ]
      [0.5 White]
      [0.7 Blue]
    } )
  finish(diffuse 0.6 ambient 0.4) 
} }

onion

- The onion is a pattern of concentric spheres like the layers of an onion
onion

\[
\text{difference:}
\begin{align*}
\text{sphere} & \equiv (0,0,0,1.0) \\
\text{box} & \equiv (-5,-5,-1.1) \times (5,5,-0.6) \\
\text{onion} & \equiv (0,0,0) \\
\text{pigment:} & \equiv \text{onion} \\
& \equiv \text{color map:} \\
& \equiv [0.0 \text{ color Red}] \\
& \equiv [0.25 \text{ color Red}] \\
& \equiv [0.75 \text{ color Yellow}] \\
& \equiv [0.75 \text{ color Green}] \\
& \equiv [0.95 \text{ color Green}] \\
& \equiv [0.95 \text{ color Magenta}] \\
& \equiv [0.99 \text{ color Magenta}] \\
& \equiv \text{finish:} \equiv \text{ambient 0.3 diffuse 0.7}
\end{align*}
\]

onion

onion
```plaintext
#declare wood_log = cylinder [<0,0,0>, <0,0,4>, 1
pigment {
    wood
    //turbulence 0.1
    color_map {
        [0.0 color rgb <0.90, 0.80, 0.30>]
        [1.0 color rgb <0.50, 0.30, 0.15>]
    }
    //scale <0.1,0.1,1>
}
}

Wooden log

leopard
sphere [<0,0,0>, 2
    texture {
        pigment {
            leopard
            color_map([0.1 Red]
                [0.5 White]
                [0.7 Blue]
            )
            turbulence 0.5
        }
    }
    finish {ambient 0.3}
}
In addition to specifying blended colors with a color map you may create a blend of pigments using a pigment_map. The syntax for a pigment map is identical to a color map except you specify a pigment in each map entry (and not a color).

```
pigment_map {
    [0.1 wood scale 0.2]
    [0.3 wood scale 0.2]
    [0.3 Jade]
    [0.6 Jade]
    [0.6 marble turbulence 1]
    [0.8 marble turbulence 1]
    [0.8 color rgb <.7, .0, .7>]
    [0.99 color rgb <.7, 0., .7>]
}
```
For more...
- See “textures.inc”

Next week
- More pigment mapping
- UV mapping
- Bump mapping