3D Texture Mapping

Color Mapping

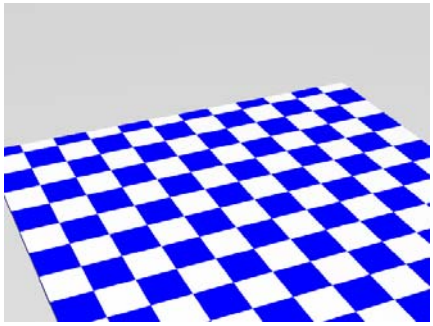
Color Mapping

- 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

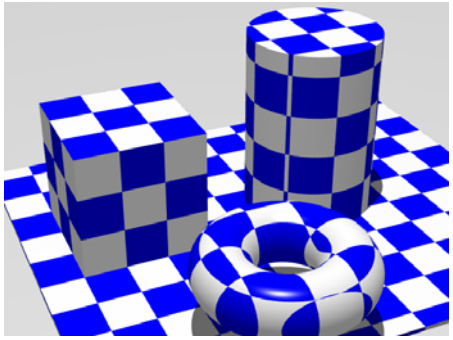
checker

```
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 }
    }
}
```

checker



Why?

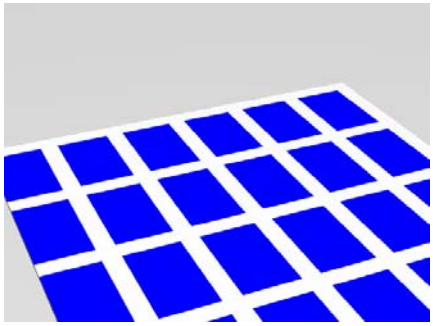


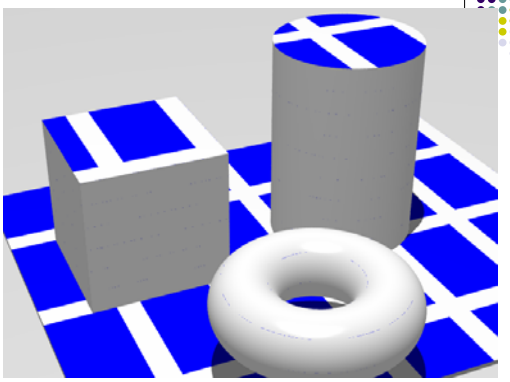
brick

```
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 }

    }
}
```

brick



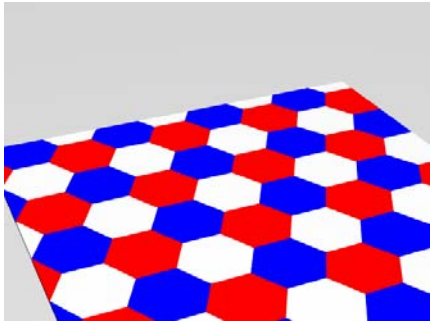


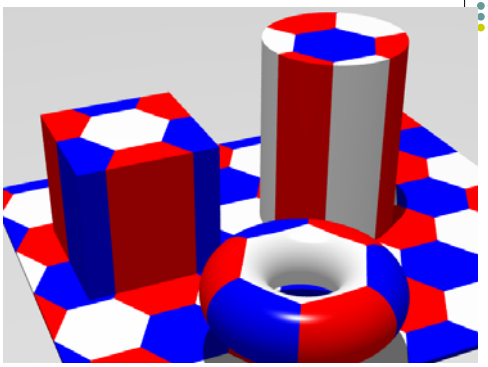
hexagon

```
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 }

    }
}
```

hexagon





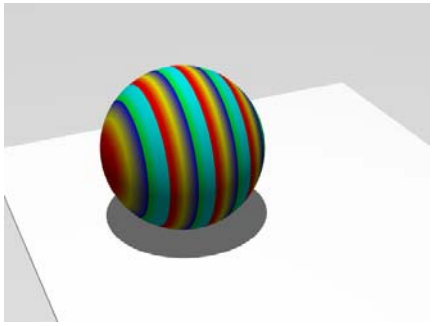
Color maps

- 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

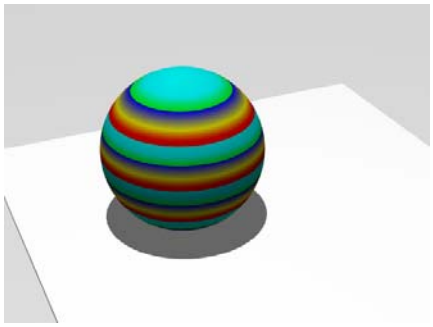
gradient

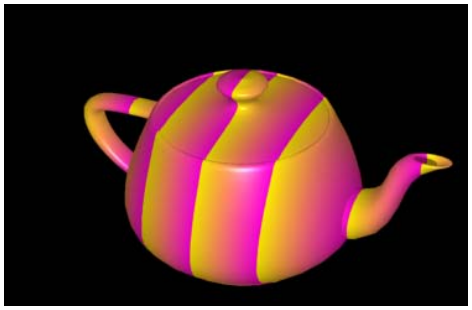
```
sphere {
    <0,1,2>, 2
    pigment {
      gradient x       //this is the PATTERN_TYPE
      color_map {
        [0.1  color Red]
        [0.3  color Yellow]
        [0.6  color Blue]
        [0.6  color Green]
        [0.8  color Cyan]
      }
    }
    finish {ambient 0.3}
    translate 1*y
 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

gradient x



gradient y

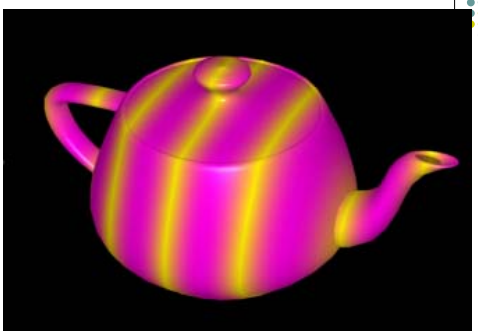




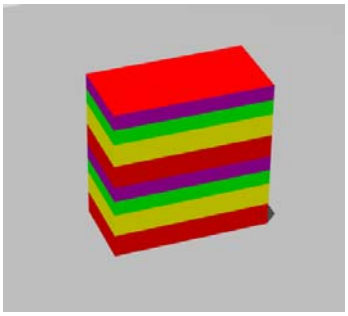
Sharp changes at 0.0, 1.0, 2.0

Smoother

```
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?



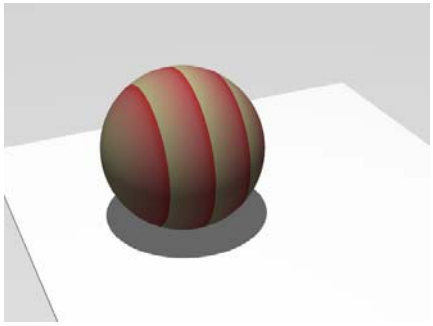
marble

- Similar to gradient x
- The difference lies on the way it blends the colors

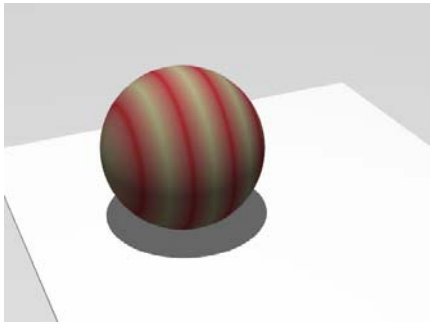
marble

```
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
  }
```

gradient x

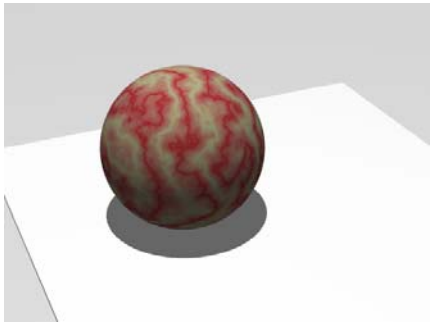


marble



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
  }
```

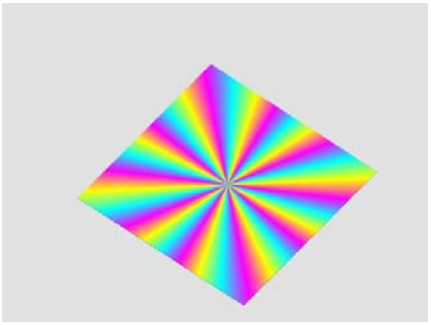


radial

- Creates bands radiating from the y axis

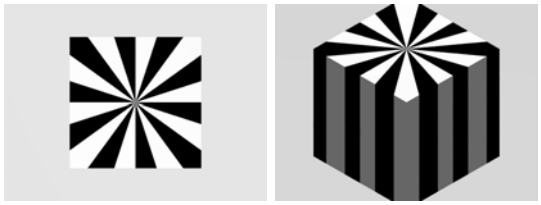
radial

```
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

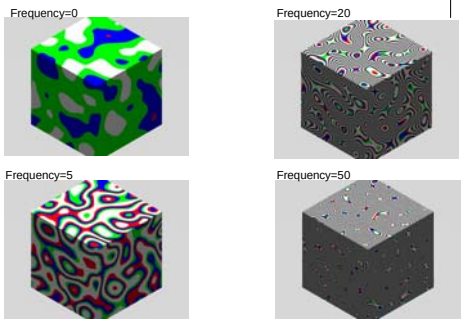
bozo

```
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 }
    }
}
```

bozo

```
box{<-2,-2,-2>, <2,2, 2>
      texture{
        pigment{
            bozo
            frequency 10
        }
        finish{diffuse 0.6 ambient 0.4 }
    }
}
```

bozo



agate

- 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

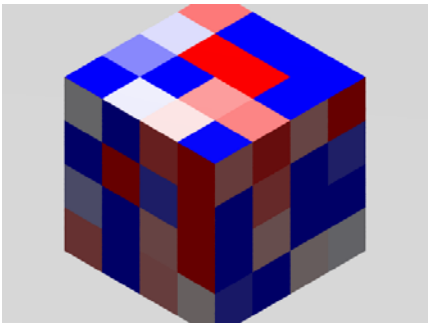
cells

- Fills 3D space with unit cubes

cells

```
box{<-2,-2,-2>, <2,2, 2>
      texture{
        pigment{ cells
        color_map{
            [0.1 Red ]
            [0.5 White]
            [0.7 Blue]
        }
      }
      finish{diffuse 0.6 ambient 0.4 }
    }
}
```

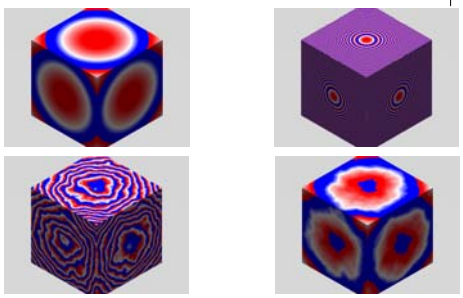
cells



onion

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

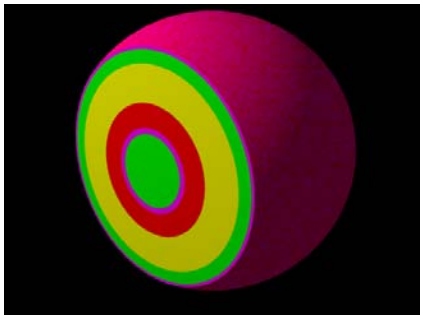
onion



onion

```
difference{
    sphere {<0,0,0>, 1.0}
    box    {<-5,-5,-1.1> <5,5,-0.6>}
    scale <3,3,3>
    rotate <0,40, 0>
    pigment {
              onion
              color_map{
                [0.0 color Red]
                [0.25 color Red]
                [0.25 color Yellow]
                [0.75 color Yellow]
                [0.75 color Green]
                [0.95 color Green]
                [0.95 color Magenta]
                [0.99 color Magenta]
              }
    }
   finish {ambient 0.3 diffuse 0.7}
}
```

onion

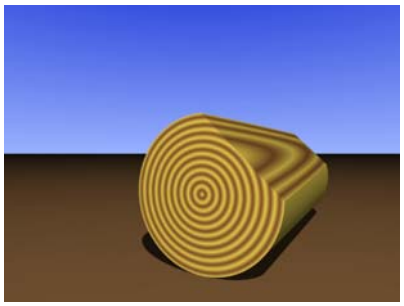


wood

```
#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>
}}
```

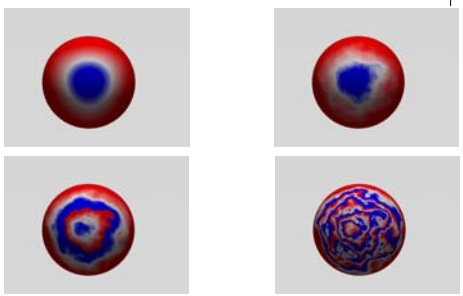
Wooden log



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}
}
```

leopard

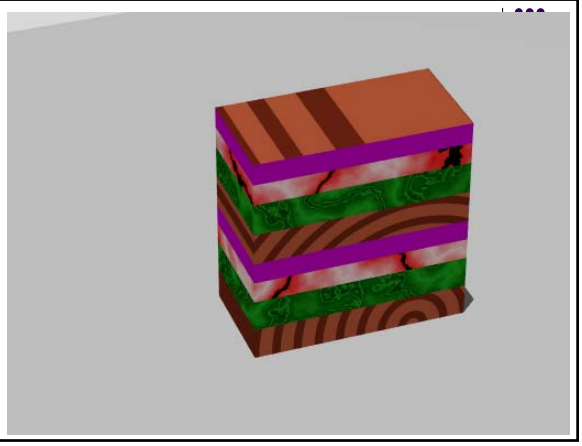


Pigment Map

- 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

```
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