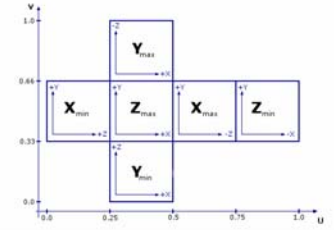
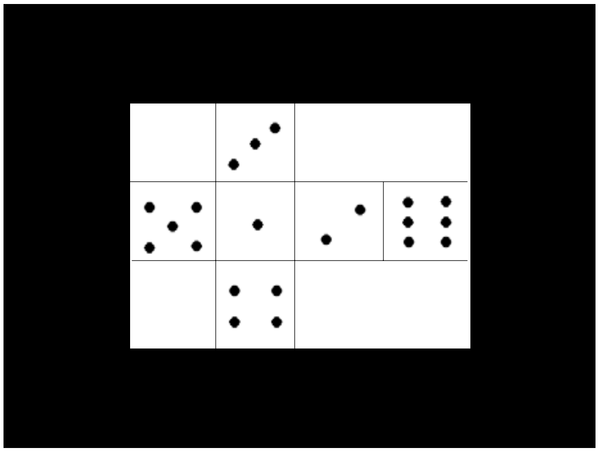
More on Texturing

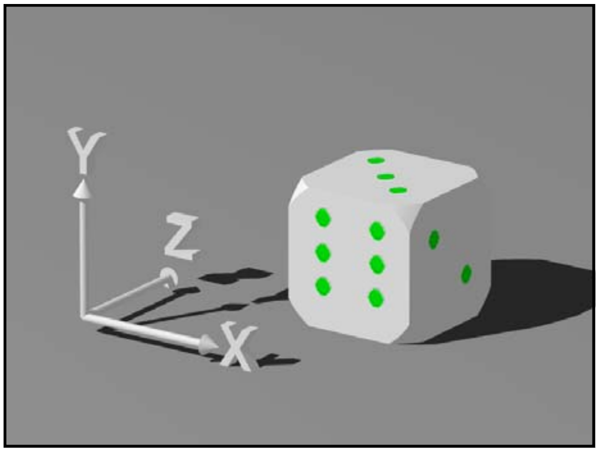
Box mapping

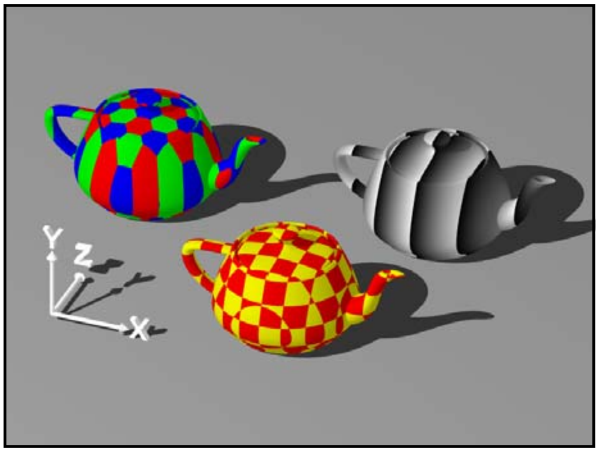


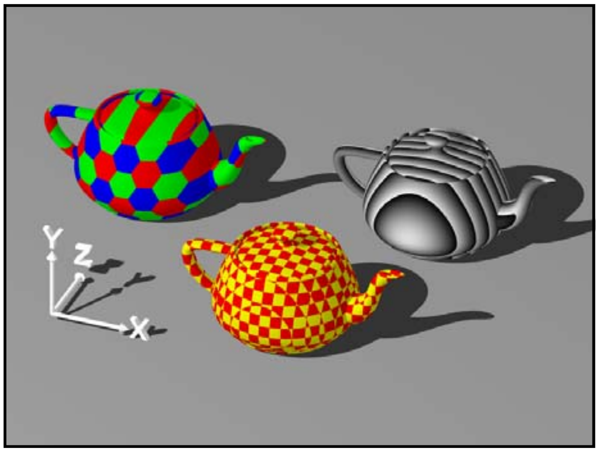
POV-Ray

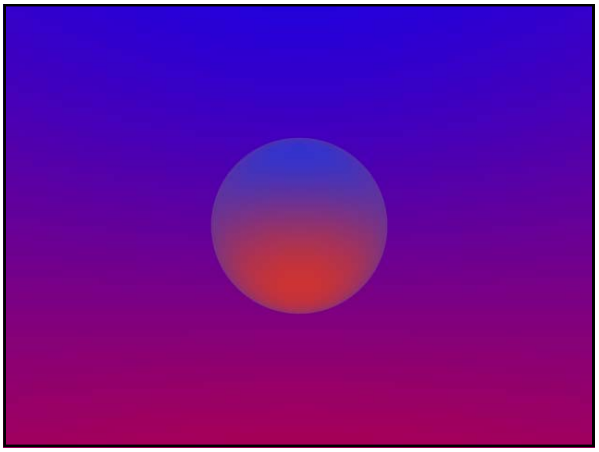
```
texture {
    pigment {
       uv_mapping
       image_map {
          sys "SomeImage.bmp“
      }
    }
}
```

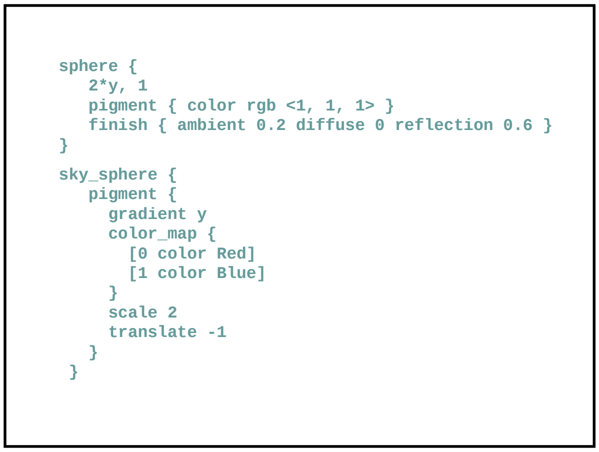



Y
Z
X

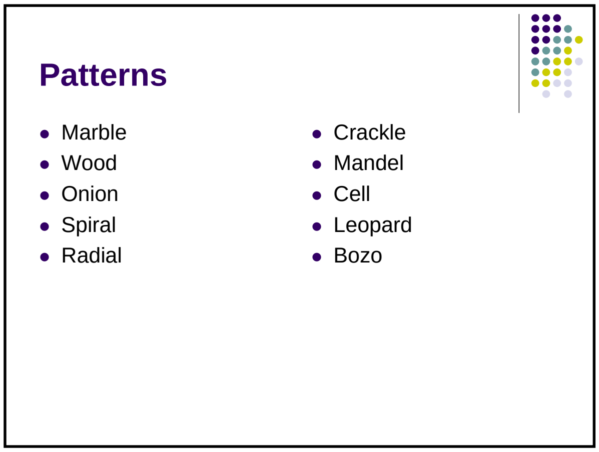

Y
Z
X





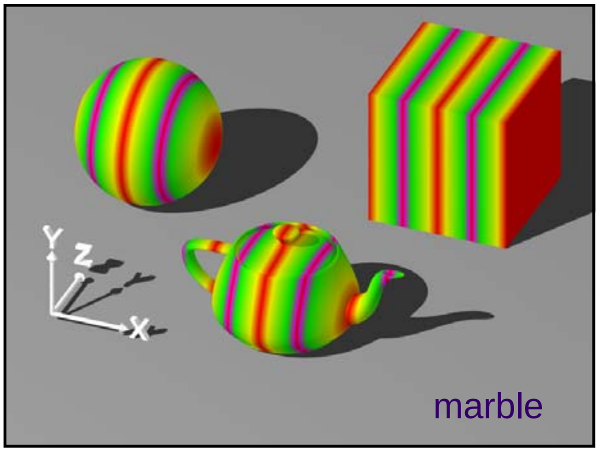


```
sphere {
   2*y, 1
   pigment { color rgb <1, 1, 1> }
   finish { ambient 0.2 diffuse 0 reflection 0.6 }
}
sky_sphere {
   pigment {
     gradient y
     color_map {
       [0 color Red]
       [1 color Blue]
     }
     scale 2
     translate -1
   }
 }
```

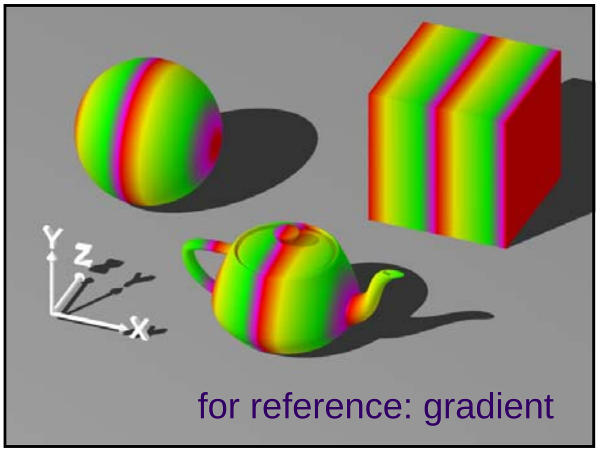


Patterns

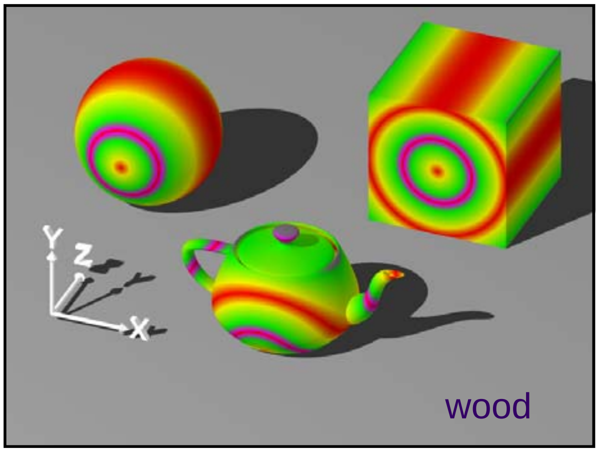
- Marble
- Wood
- Onion
- Spiral
- Radial
- Crackle
- Mandel
- Cell
- Leopard
- Bozo



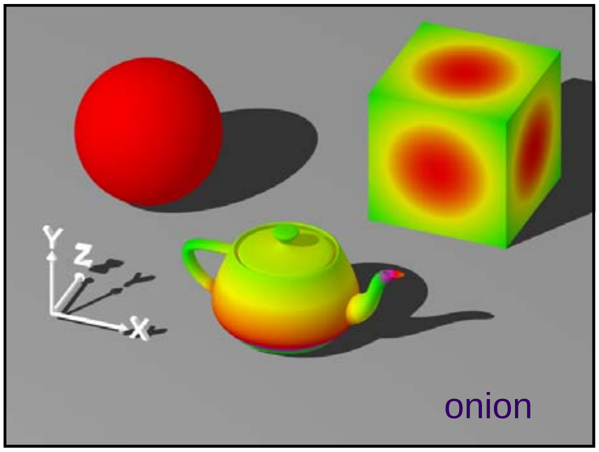
marble



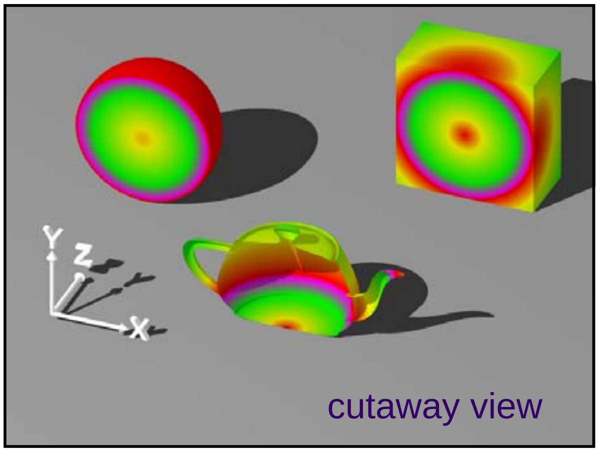
for reference: gradient



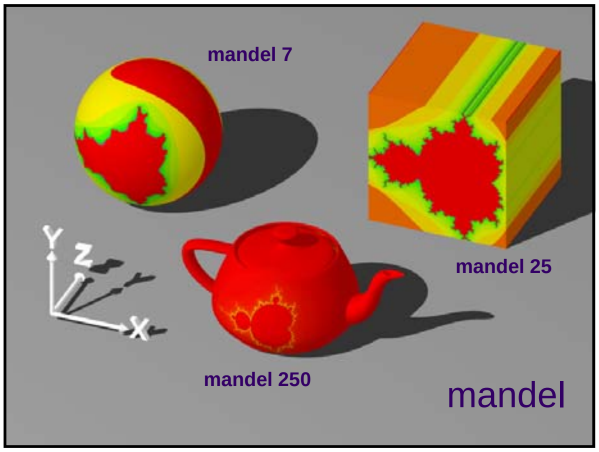
wood



onion



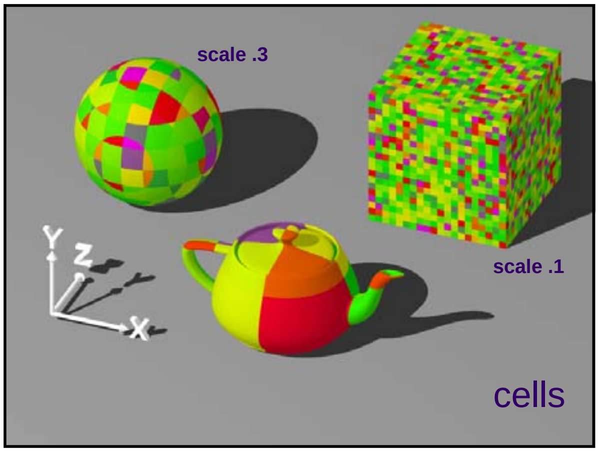
cutaway view



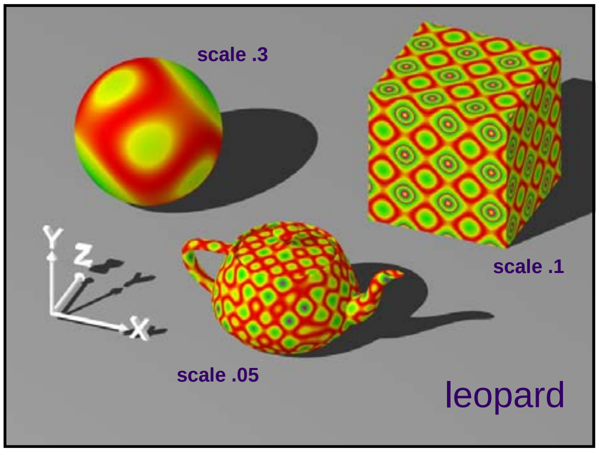
mandel

Modifying patterns

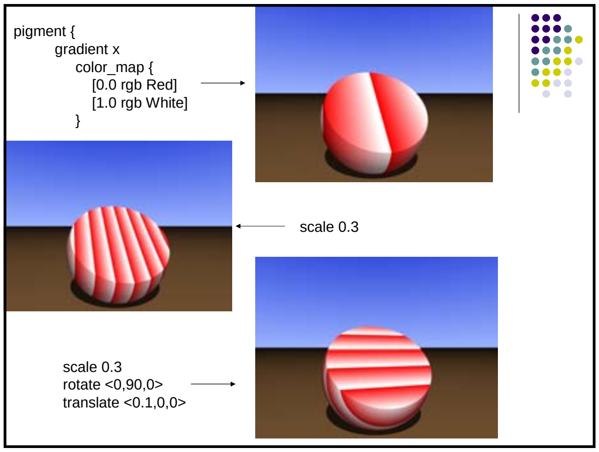
- Translate, rotate, scale
- Frequency and phase
- Waveforms
- Random noise



cells



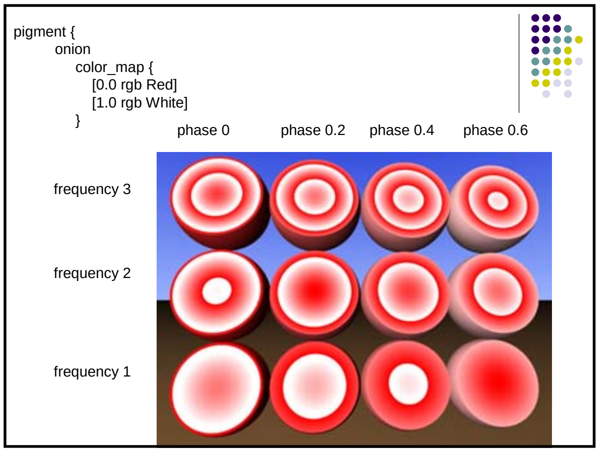
leopard



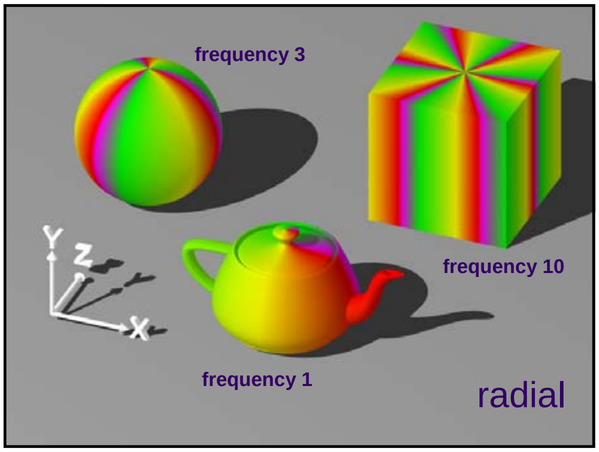
```
pigment {
        gradient x
            color_map {
                [0.0 rgb Red]
                [1.0 rgb White]
            }
```

scale 0.3

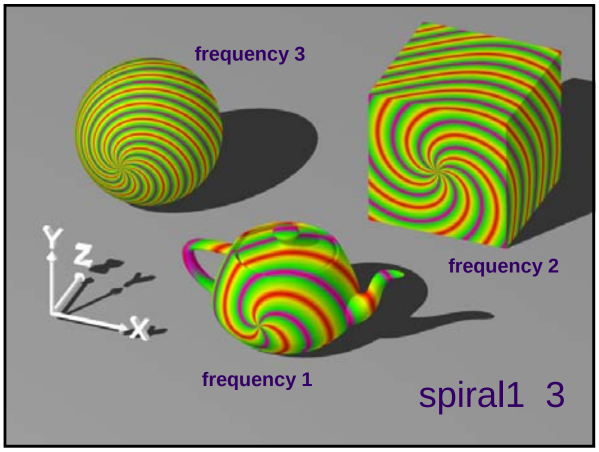
scale 0.3
rotate <0,90,0>
translate <0.1,0,0>



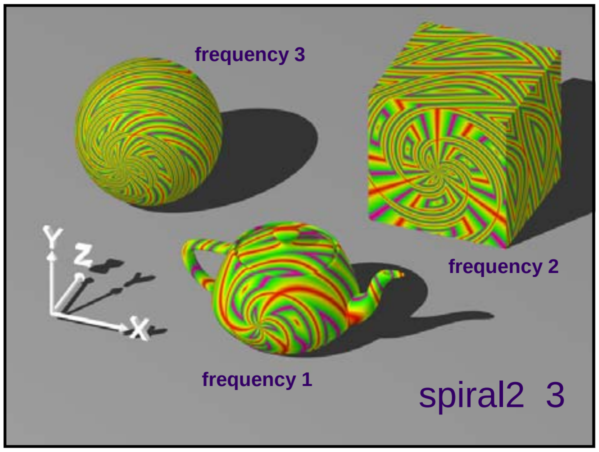
```
pigment {
        onion
            color_map {
                [0.0 rgb Red]
                [1.0 rgb White]
            }
```



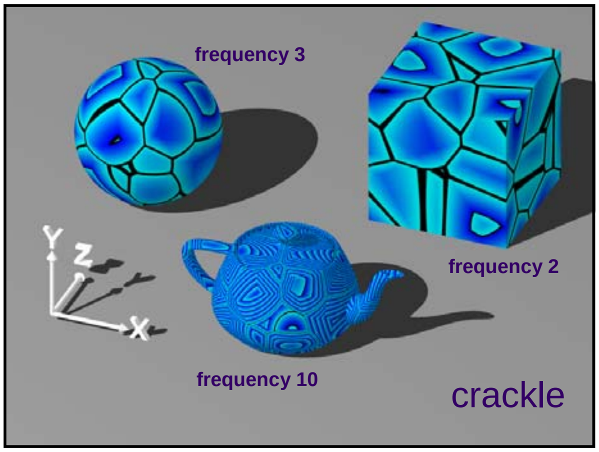
radial



spiral1 3



spiral2 3

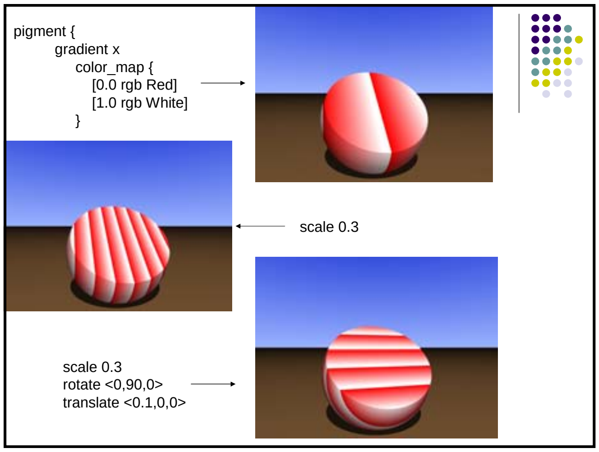


frequency 3

frequency 2

frequency 10

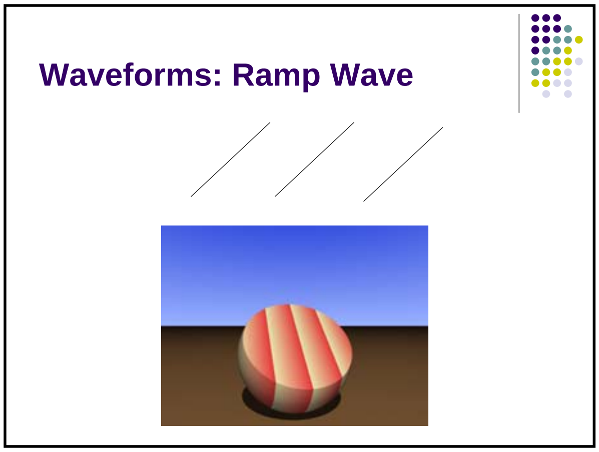
crackle



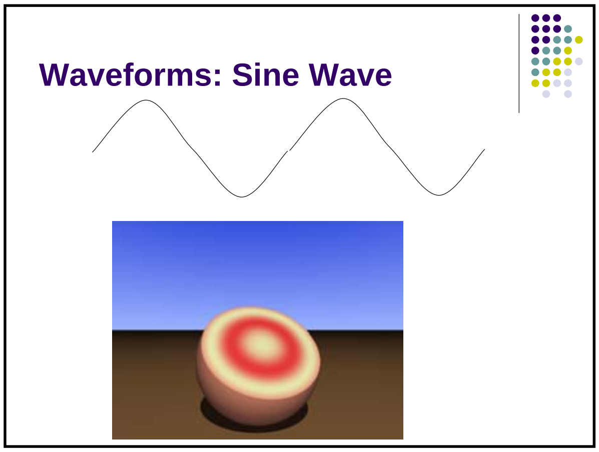
```
pigment {
        gradient x
            color_map {
                [0.0 rgb Red]
                [1.0 rgb White]
            }
```

scale 0.3

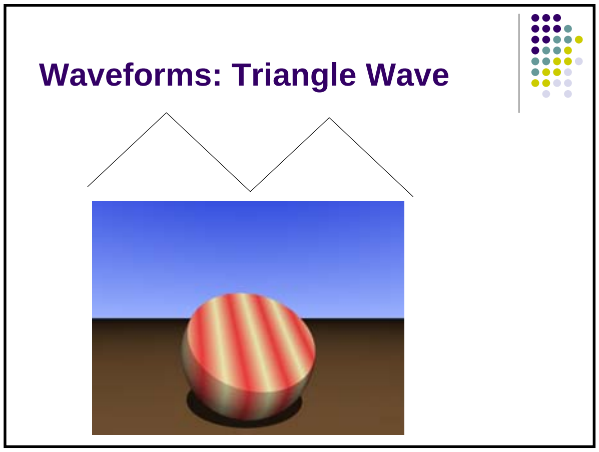
scale 0.3
rotate <0,90,0>
translate <0.1,0,0>



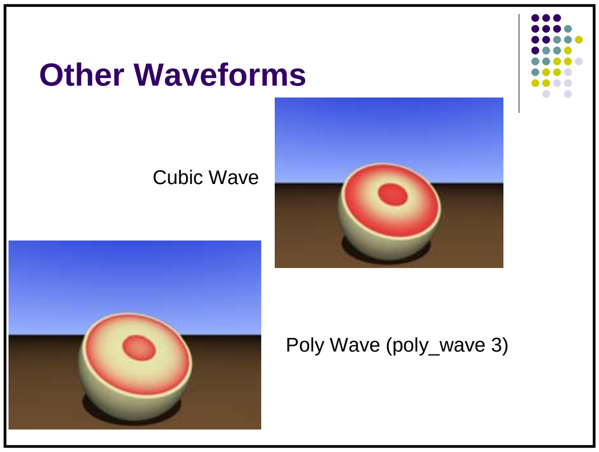
Waveforms: Ramp Wave



Waveforms: Sine Wave



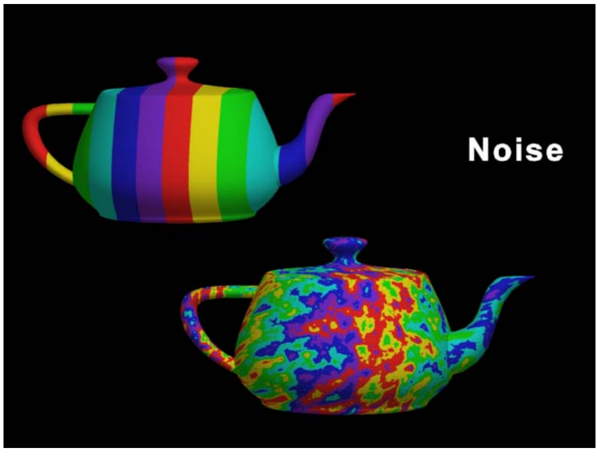
Waveforms: Triangle Wave



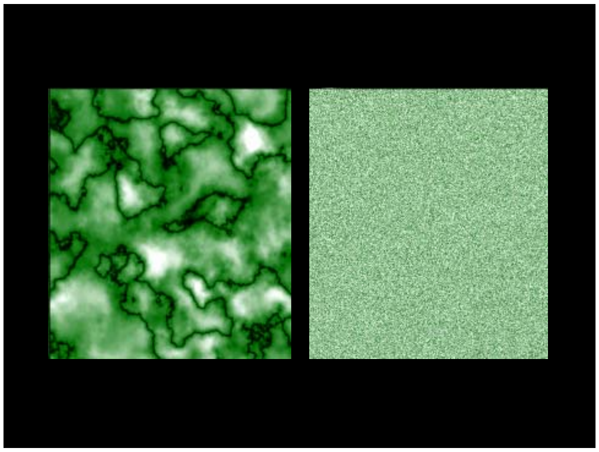
Other Waveforms

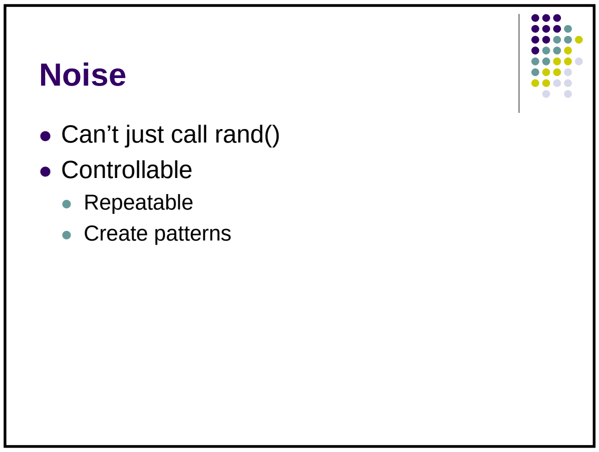
Cubic Wave

Poly Wave (poly_wave 3)



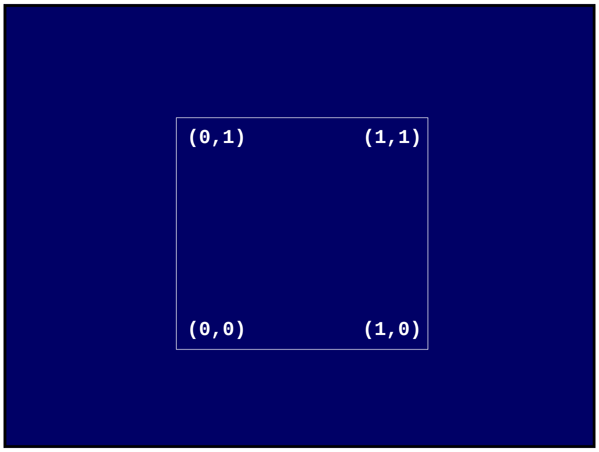
Noise





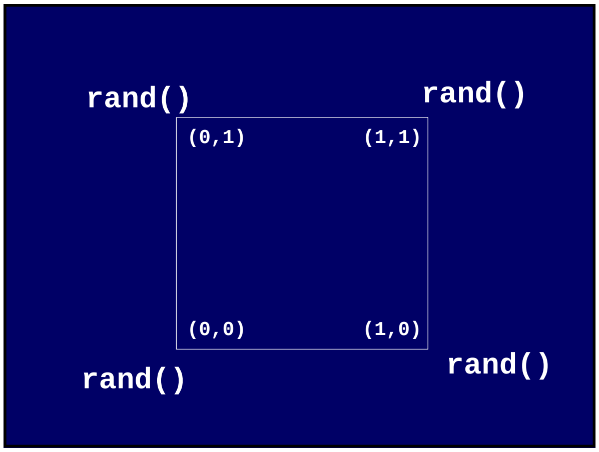
Noise

- Can’t just call rand()
- Controllable
  - Repeatable
  - Create patterns



(0,1) (1,1)

(0,0) (1,0)

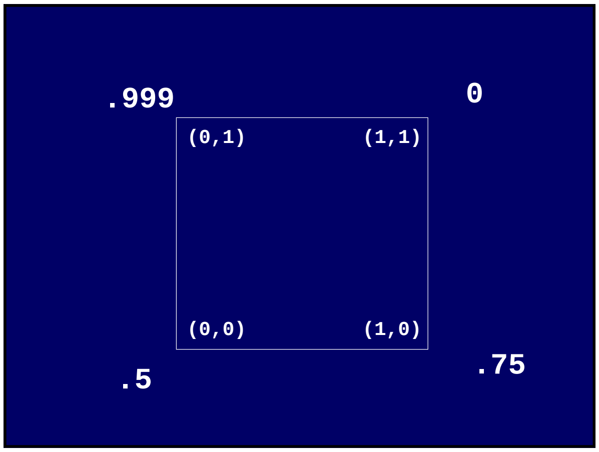


rand() rand()

(0,1) (1,1)

(0,0) (1,0)

rand() rand()

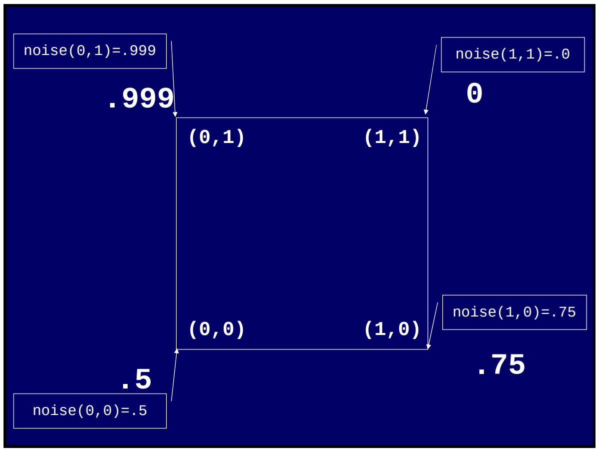


.999 0

(0,1) (1,1)

(0,0) (1,0)

.5 .75



noise(0,1)=.999

noise(1,1)=.0

.999

0

(0,1)

(1,1)

(0,0)

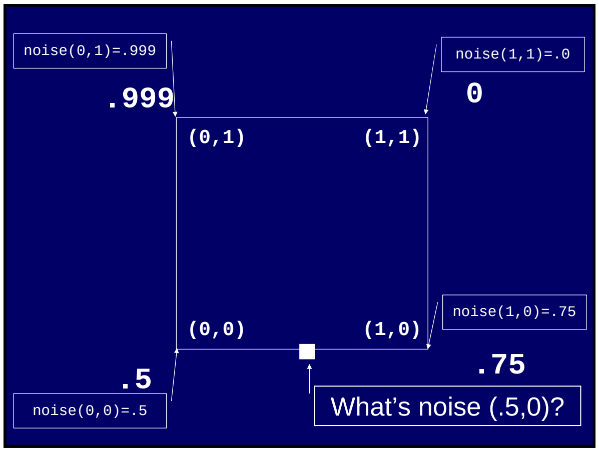
(1,0)

noise(1,0)=.75

.75

.5

noise(0,0)=.5



noise(0,1)=.999

noise(1,1)=.0

.999

0

(0,1)

(1,1)

(0,0)

(1,0)

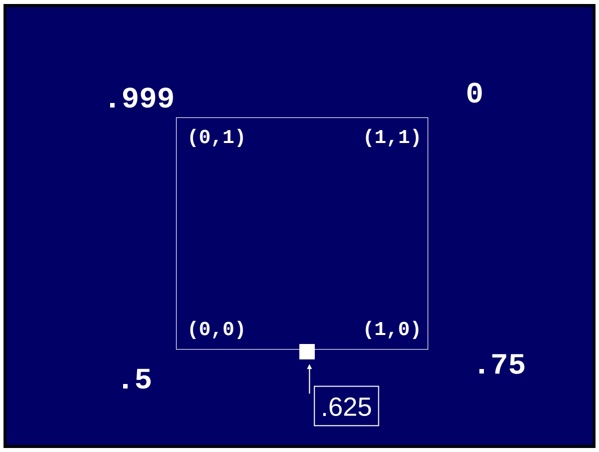
noise(1,0)=.75

.75

.5

noise(0,0)=.5

What’s noise (.5,0)?



.999

0

(0,1)

(1,1)

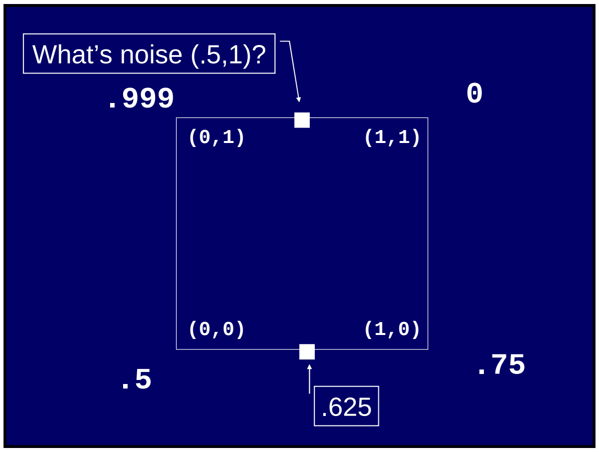
(0,0)

(1,0)

.5

.75

.625



What's noise (.5,1)?

.999

0

(0,1)

(1,1)

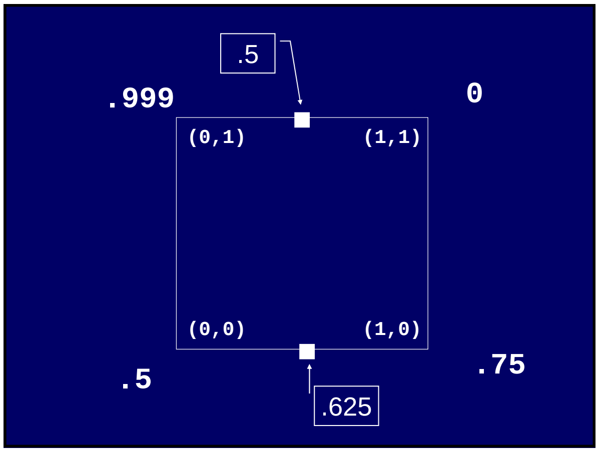
(0,0)

(1,0)

.5

.75

.625



.5

.999

0

(0,1)

(1,1)

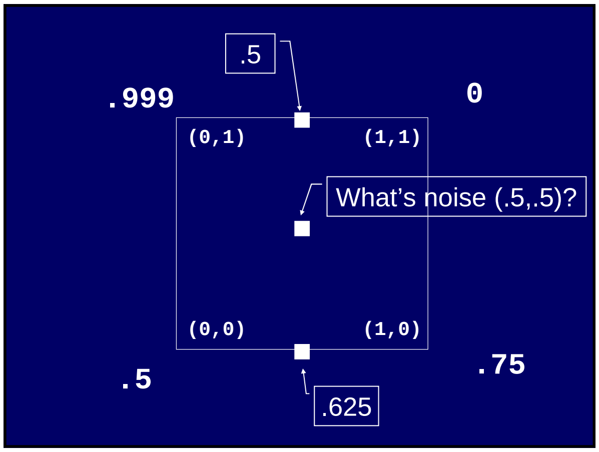
(0,0)

(1,0)

.5

.75

.625



.5

.999

0

(0,1)

(1,1)

What's noise (.5,.5)?

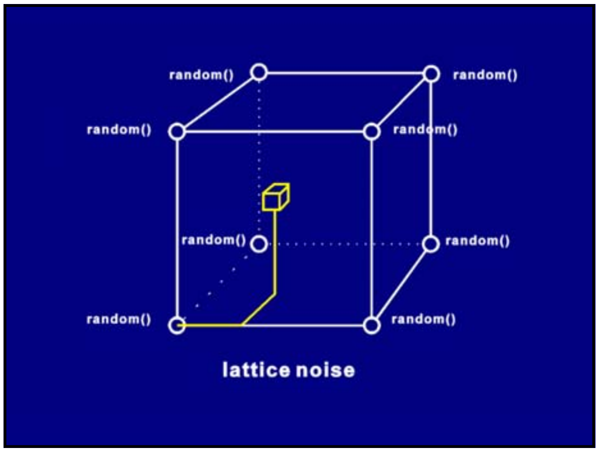
(0,0)

(1,0)

.5

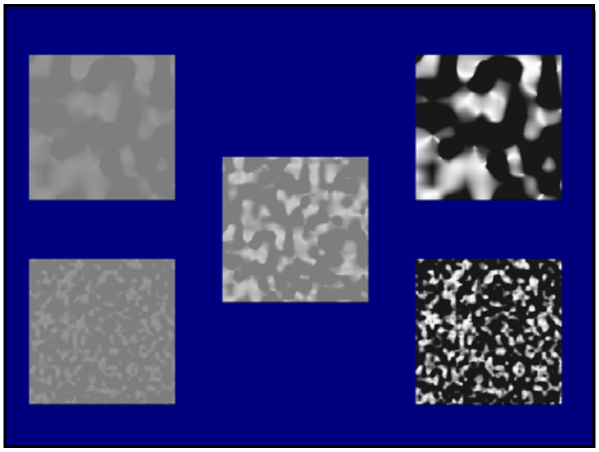
.75

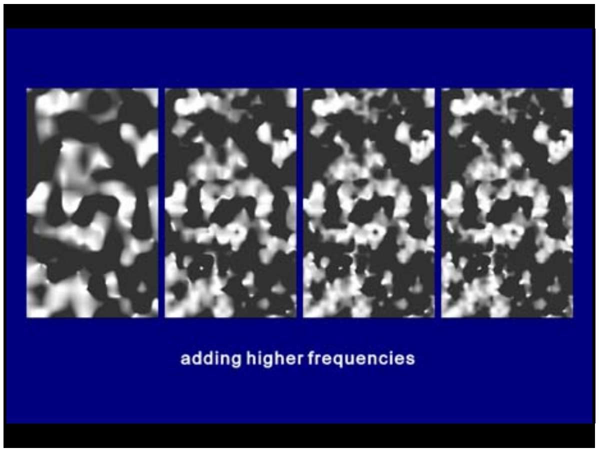
.625



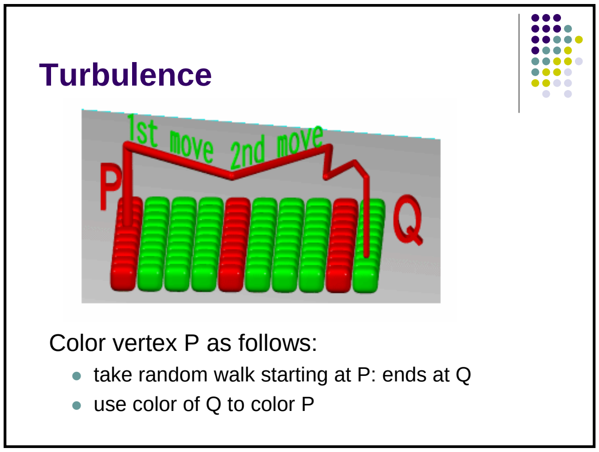
Noise

- Frequency
- Amplitude
- Number of terms





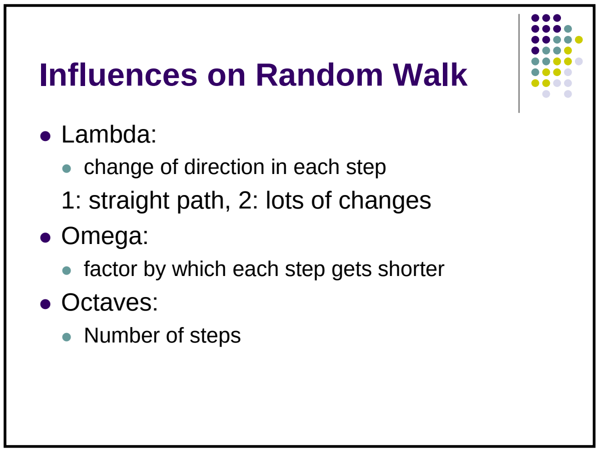
adding higher frequencies



Turbulence

Color vertex P as follows:

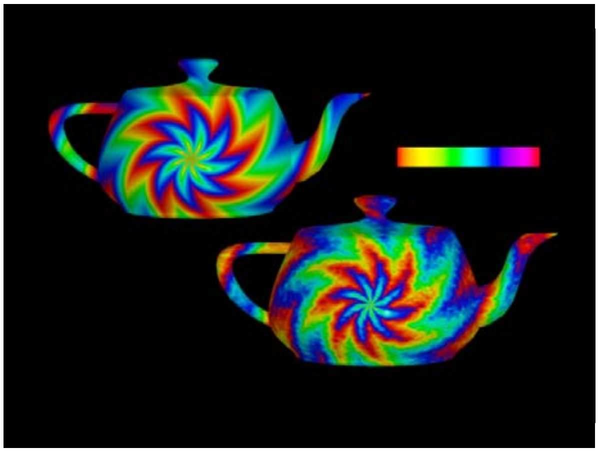
- take random walk starting at P: ends at Q
- use color of Q to color P



Influences on Random Walk

- Lambda:
  - change of direction in each step

  1: straight path, 2: lots of changes
- Omega:
  - factor by which each step gets shorter
- Octaves:
  - Number of steps



Creating noise in POV

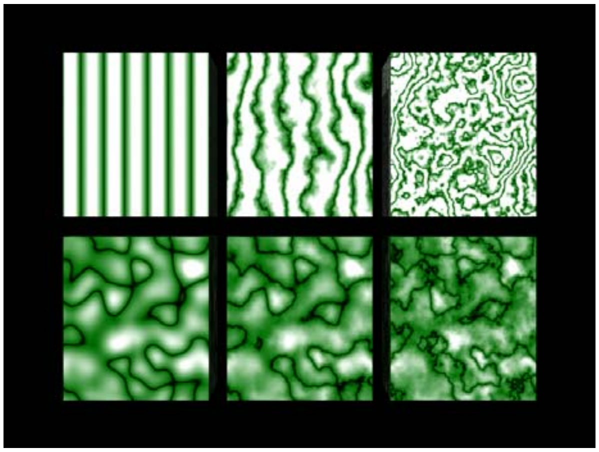
- Turbulence amount
  - turbulence 0
  - turbulence 1
  - turbulence <0,1,0.5>
- Turbulence parameters
  - Octaves -- 6
  - Lambda -- .5
  - Omega -- 2

Turbulence

Use with

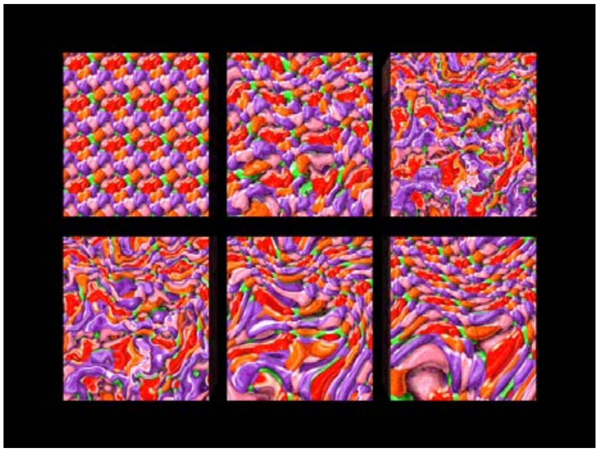
- any previous pattern
- Image Maps!

turbulence 1
versus
warp {turbulence 1}



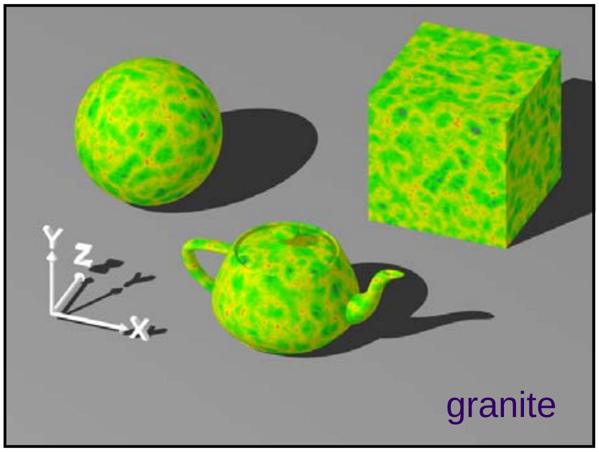
Octaves affect turbulence

- Second row has constant turbulence, decreasing octaves

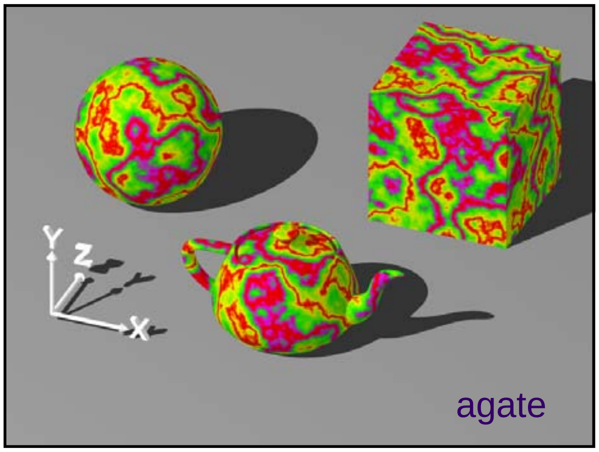


With turbulence presets

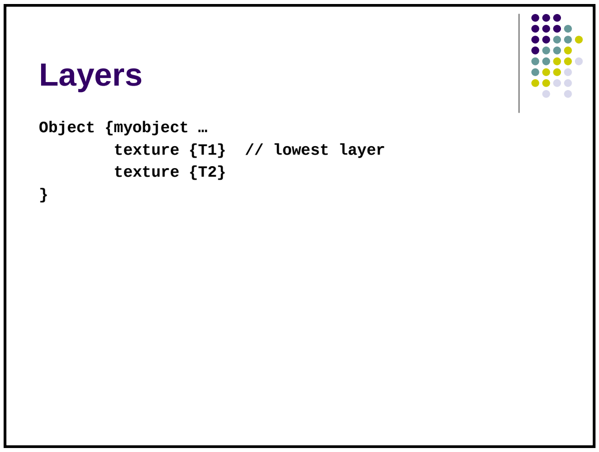
- Granite
  - 1/f noise
- Agate
  - Banding like marble
  - Different turbulence function



granite

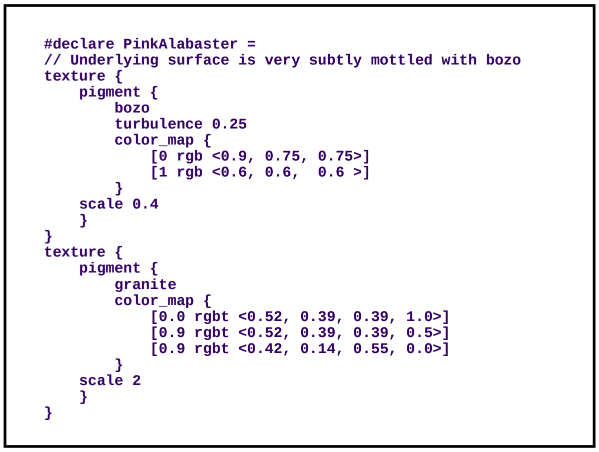


agate

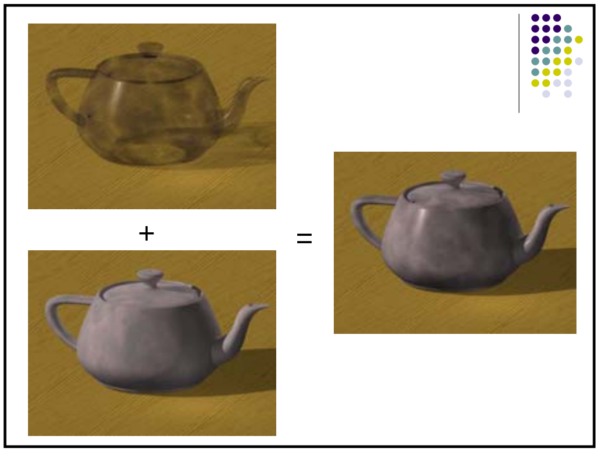


Layers

```
Object {myobject …
        texture {T1}  // lowest layer
        texture {T2}
}
```

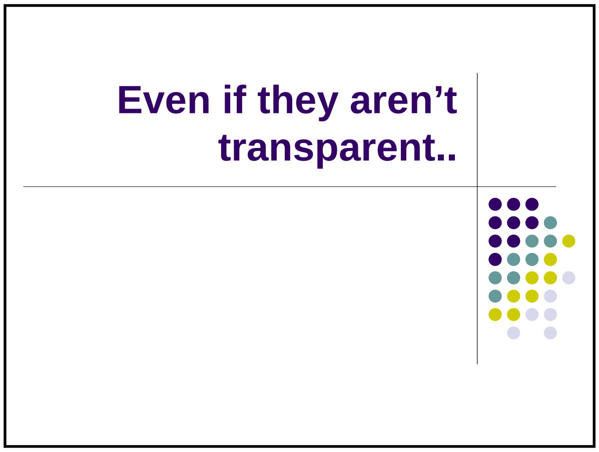


```
#declare PinkAlabaster =
// Underlying surface is very subtly mottled with bozo
texture {
    pigment {
        bozo
        turbulence 0.25
        color_map {
            [0 rgb <0.9, 0.75, 0.75>]
            [1 rgb <0.6, 0.6,  0.6 >]
        }
    scale 0.4
    }
}
texture {
    pigment {
        granite
        color_map {
            [0.0 rgbt <0.52, 0.39, 0.39, 1.0>]
            [0.9 rgbt <0.52, 0.39, 0.39, 0.5>]
            [0.9 rgbt <0.42, 0.14, 0.55, 0.0>]
        }
    scale 2
    }
}
```

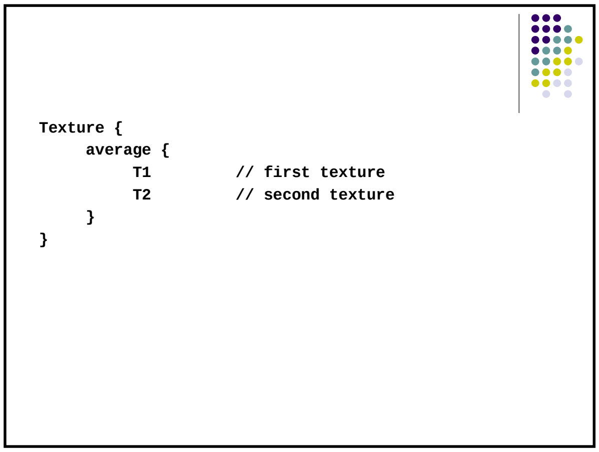


+

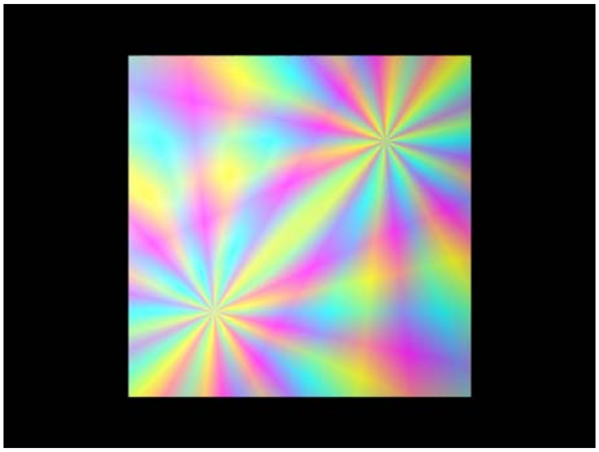
=

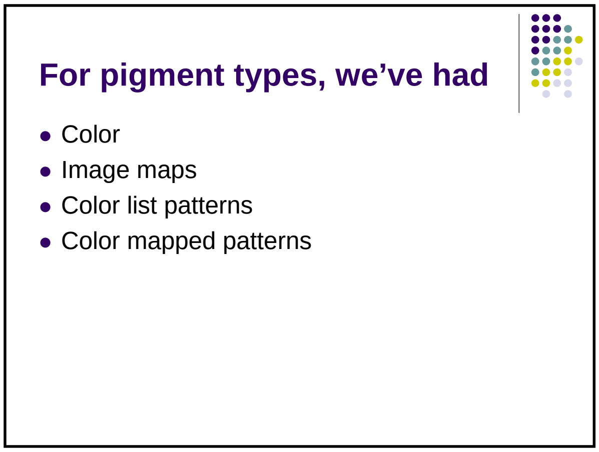


Even if they aren’t transparent..



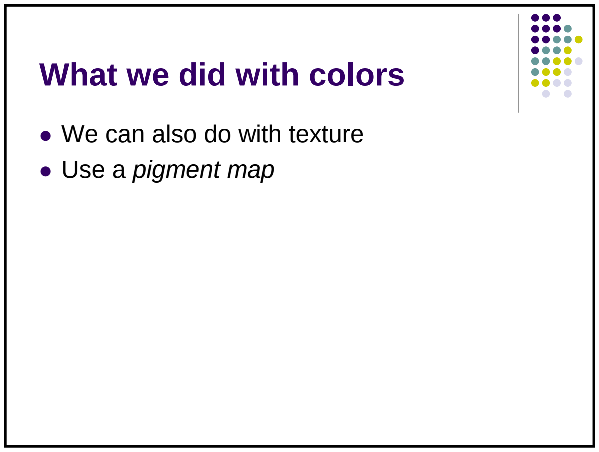
```
Texture {
     average {
          T1          // first texture
          T2          // second texture
     }
}
```





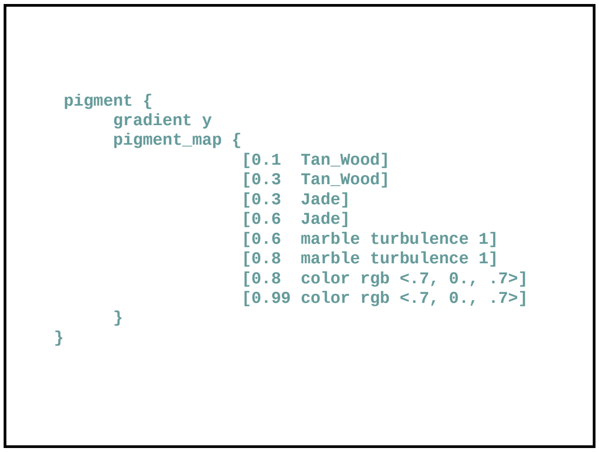
For pigment types, we’ve had

- Color
- Image maps
- Color list patterns
- Color mapped patterns

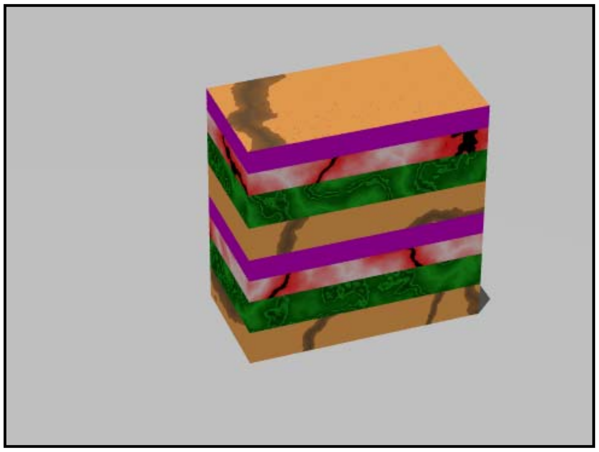


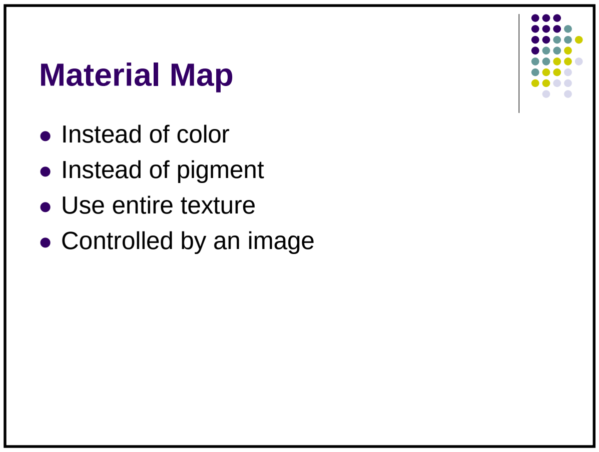
What we did with colors

- We can also do with texture
- Use a *pigment map*



```
 pigment {
      gradient y
      pigment_map {
                   [0.1  Tan_Wood]
                   [0.3  Tan_Wood]
                   [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>]
      }
}
```

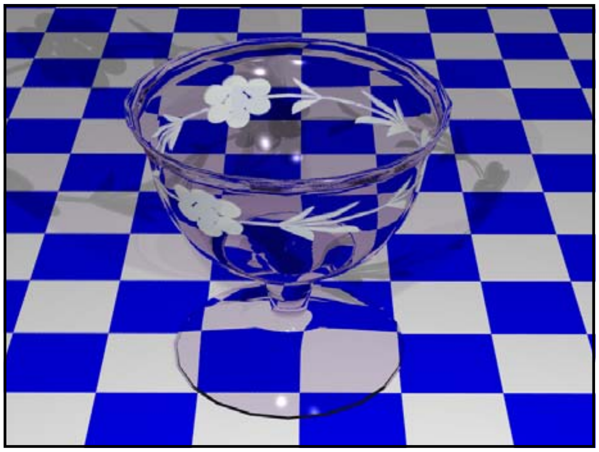


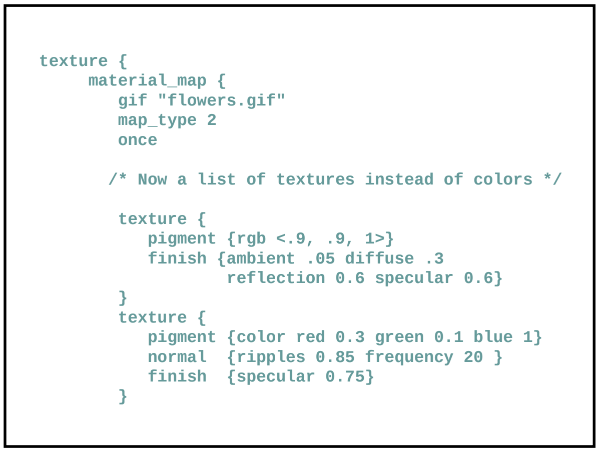


Material Map

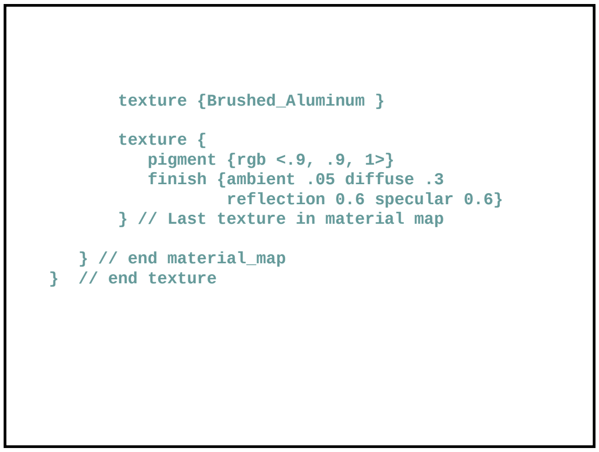
- Instead of color
- Instead of pigment
- Use entire texture
- Controlled by an image

Flowers.gif

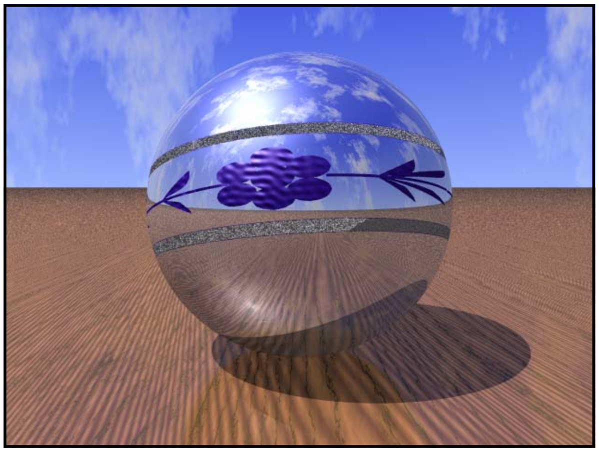


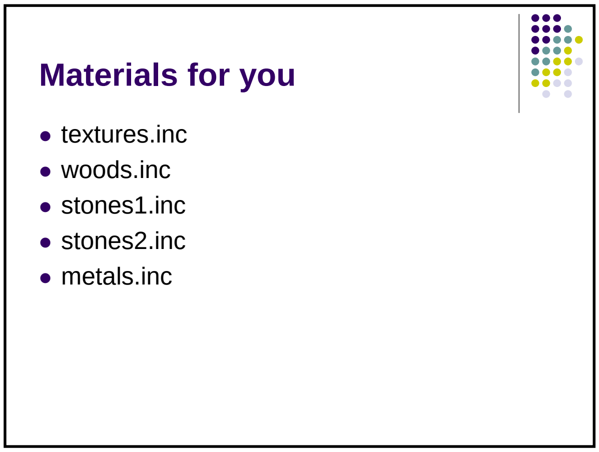


```
texture {
     material_map {
        gif "flowers.gif"
        map_type 2
        once

       /* Now a list of textures instead of colors */

        texture {
           pigment {rgb <.9, .9, 1>}
           finish {ambient .05 diffuse .3
                   reflection 0.6 specular 0.6}
        }
        texture {
           pigment {color red 0.3 green 0.1 blue 1}
           normal  {ripples 0.85 frequency 20 }
           finish  {specular 0.75}
        }
```



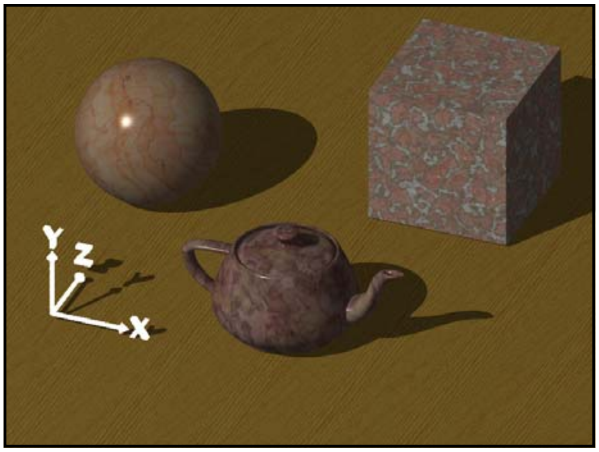
```
        texture {Brushed_Aluminum }

        texture {
           pigment {rgb <.9, .9, 1>}
           finish {ambient .05 diffuse .3
                   reflection 0.6 specular 0.6}
        } // Last texture in material map

    } // end material_map
 }  // end texture
```

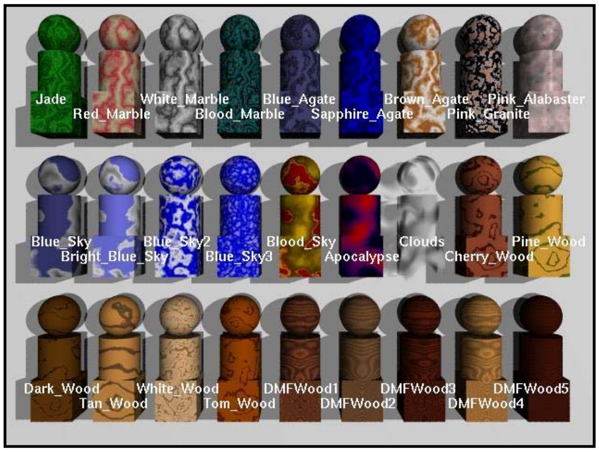


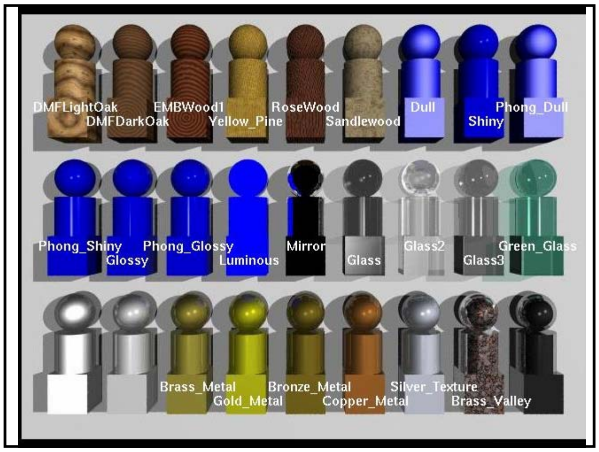


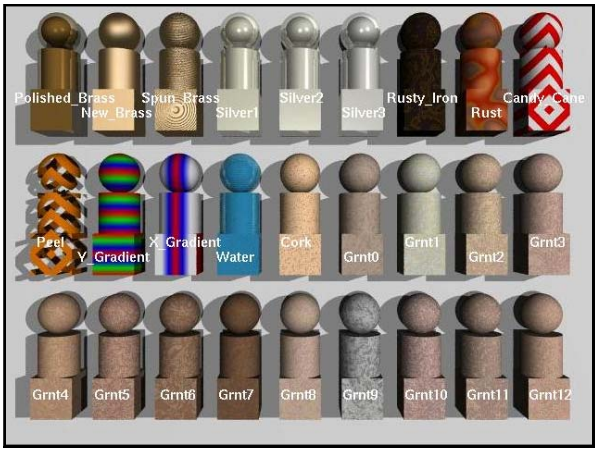
Materials for you

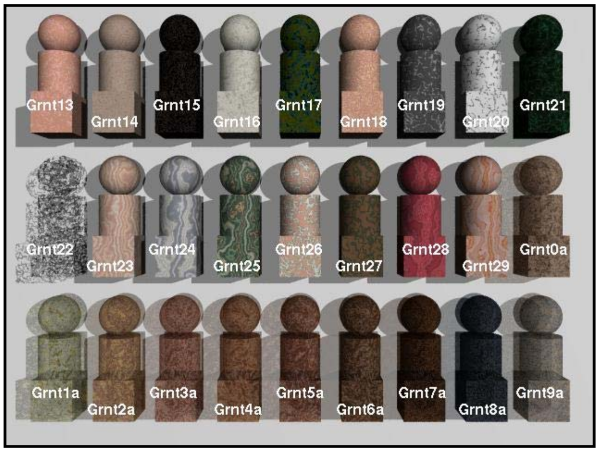
- textures.inc
- woods.inc
- stones1.inc
- stones2.inc
- metals.inc






DMFLightOak
DMFDarkOak
EMBWood1
Yellow_Pine
RoseWood
Sandlewood
Dull
Shiny
Phong_Dull
Phong_Shiny
Glossy
Phong_Glossy
Luminous
Mirror
Glass
Glass2
Glass3
Green_Glass
Brass_Metal
Gold_Metal
Bronze_Metal
Copper_Metal
Silver_Texture
Brass_Valley


Polished_Brass
New_Brass
Spun_Brass
Silver1
Silver2
Silver3
Rusty_Iron
Rust
Candy_Cane
Peel
Y_Gradient
X_Gradient
Water
Cork
Grnt0
Grnt1
Grnt2
Grnt3
Grnt4
Grnt5
Grnt6
Grnt7
Grnt8
Grnt9
Grnt10
Grnt11
Grnt12


Grnt13
Grnt14
Grnt15
Grnt16
Grnt17
Grnt18
Grnt19
Grnt20
Grnt21
Grnt22
Grnt23
Grnt24
Grnt25
Grnt26
Grnt27
Grnt28
Grnt29
Grnt0a
Grnt1a
Grnt2a
Grnt3a
Grnt4a
Grnt5a
Grnt6a
Grnt7a
Grnt8a
Grnt9a