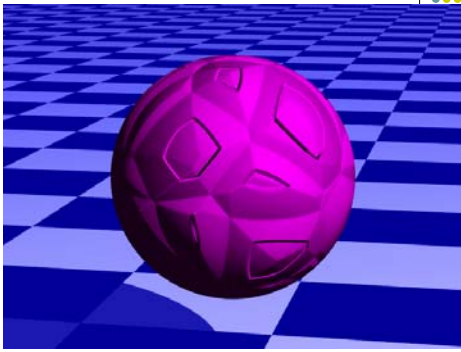


Bump Mapping



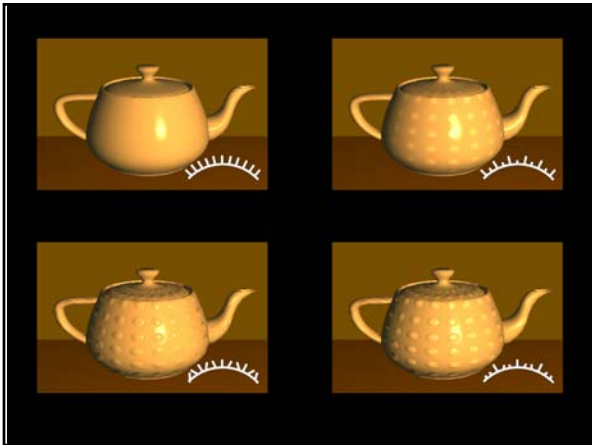




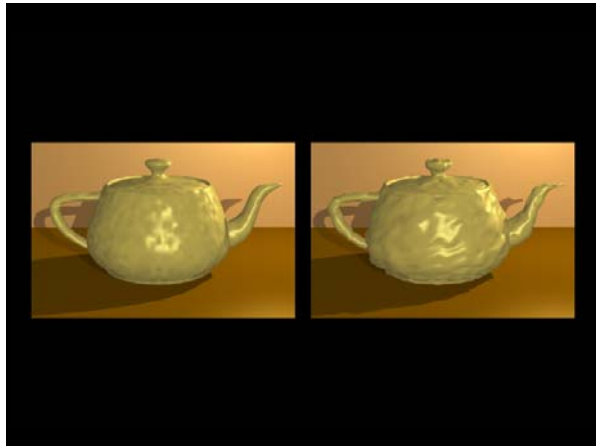
Bump mapping



- “Fooling” the shader by altering normals
- Cheaper than changing the geometry







Bump mapping in POV-Ray



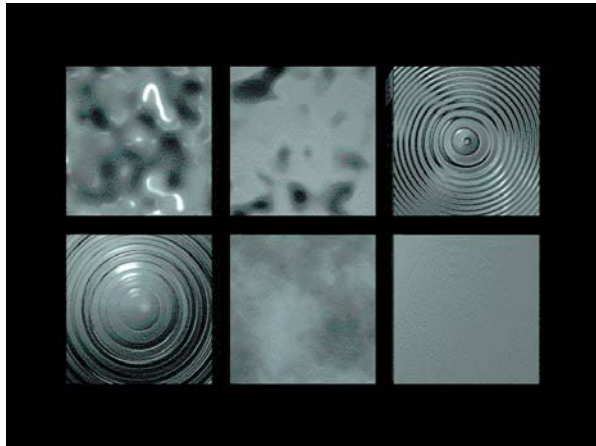
```
#declare asphere =
  sphere{<0,0,0>, .95
    pigment {color rgb <1., .6, .5>
    }
  }

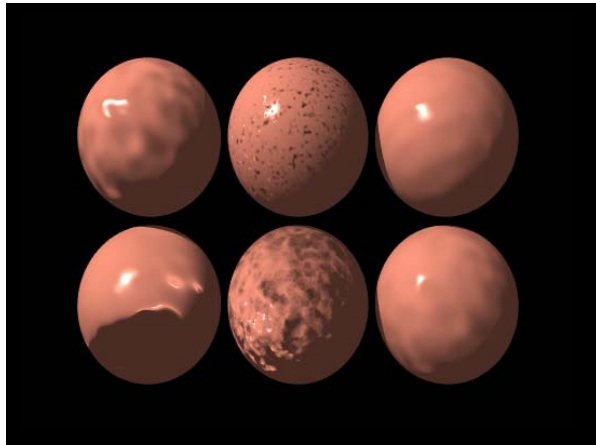
object {
  asphere
  normal{bumps 0.4 scale 0.2}
  finish {phong 1 phong_size 100
    ambient .3 diffuse .7}
  translate <-2, 1, 0>
}
```

Just the normal clause ...



```
normal{bumps 0.4 scale 0.2}
normal{dents 1.0 scale 0.05}
normal{ripples 1.0 scale 0.2 frequency 3}
normal{waves 1.0 scale 0.2 frequency 5}
normal{wrinkles 1.0 scale 0.2}
normal{bumps 0.2 scale 0.2}
```

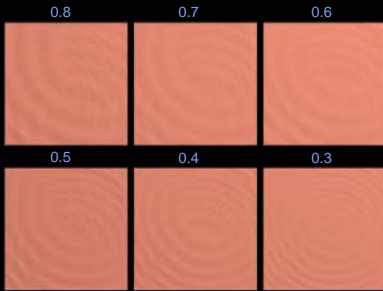




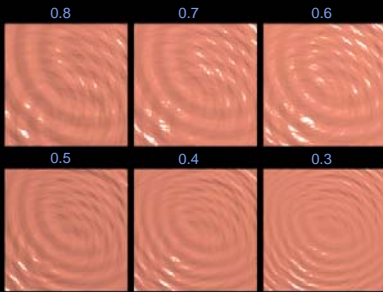
Bump mapping

- Waves
`normal{ waves 1.0 scale 0.2 frequency 5 }`
- The waves pattern looks similar to the ripples pattern except the features are rounder and broader.

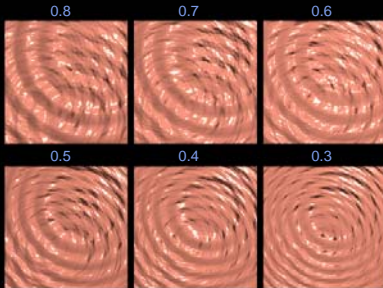
normal{ waves 0.1 scale n frequency 15}



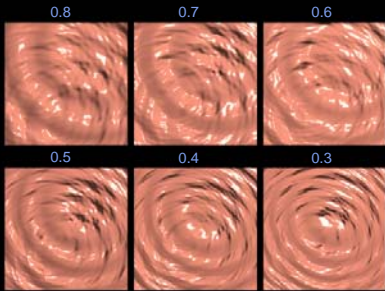
normal{ waves 0.3 scale n frequency 15}



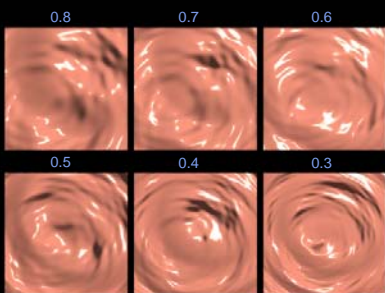
normal{ waves 0.8 scale n frequency 15}



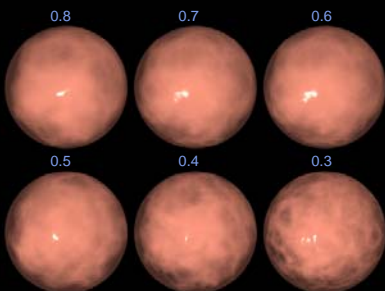
normal{ waves 0.8 scale n frequency 10}

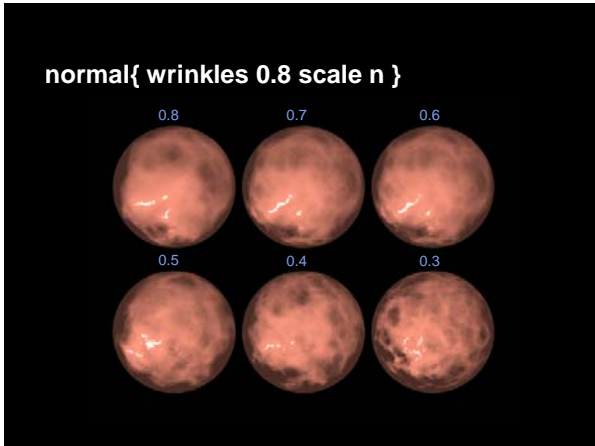


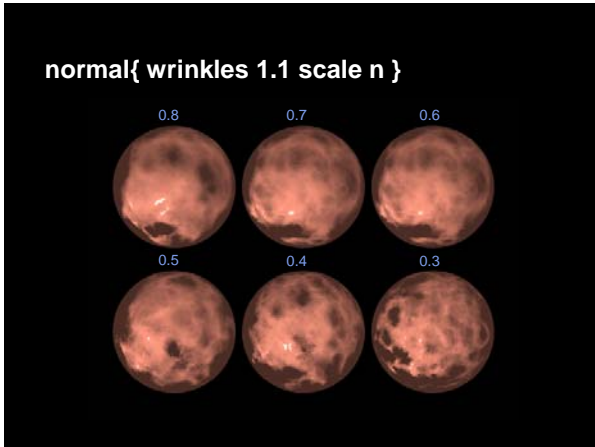
normal{ waves 0.8 scale n frequency 5}

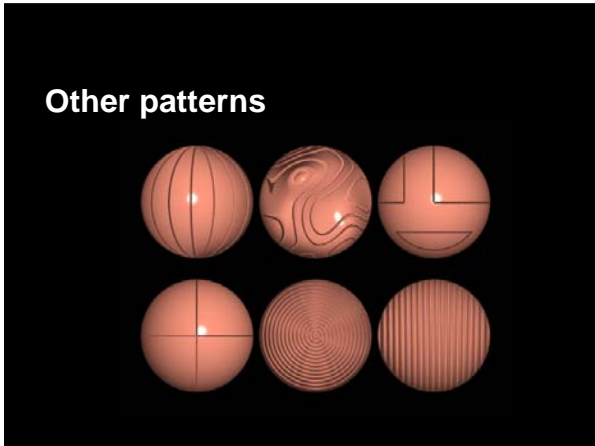


normal{ wrinkles 0.5 scale n }

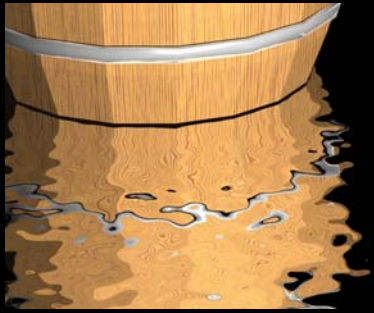








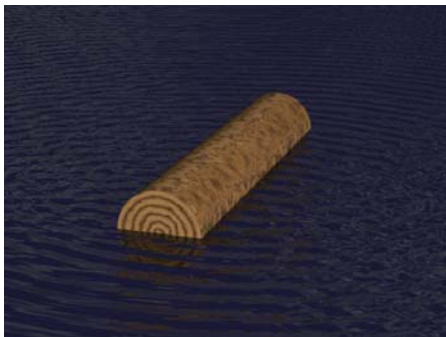
Bump map with reflection



Another example



Example



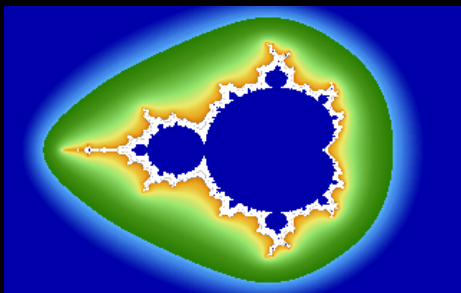
Bump_map



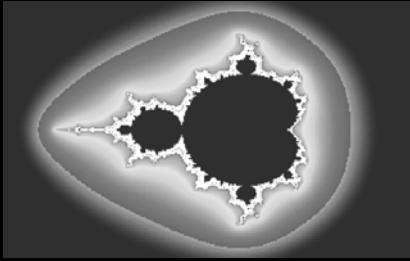
- Instead of placing the color of the image on the shape like an `image_map`, a `bump_map` perturbs the surface normal based on the color of the image at that point
- Colors are converted to gray scale before calculating the height of the bump

```
sphere { <0, 0, 0>, 25
  pigment {Blue}
  normal {
    bump_map {
      png "bumpmap.png"
      bump_size 5
      interpolate 2
      once
    }
    scale 50
    translate <-25, -25, 0>
  }
  finish {ambient 0.2 diffuse 0.7 specular 0.6}
}
```

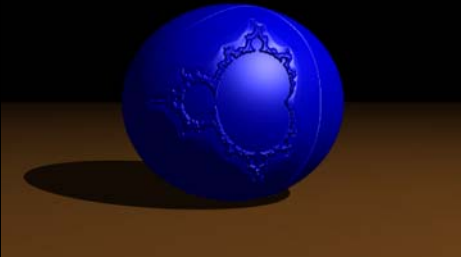
bump_map



bump_map



Result



For texture design



- www.rene-schwietzke.de/povray/index.html
Wonderful images showing all of the textures that come with POV-Ray.
- Architecture
sourceforge.net/projects/ute
Source and executable for creating and previewing textures for POV
 - A little tempermental
 - Written in VB; source freely downloadable. Improvements (FP?)

For texture design



- Texture Magic
private.homepages.intershop.de/rene/povray/texture_mag.html
Excellent preview software. Oldie but goodie.
Free for 60 days.
- POVMan
www.aetec.ee/fv/vkhomep.nsf

Soft focus



- Aperture
- Blur_samples
- Variance
- Focal Point

```
camera {  
  location <3.0, 6.0, -10.0>  
  look_at <2.0, 1.0, 1.5>  
  direction <0,0,2>  
  focal_point <2.0, 1.0, 1.5>  
  aperture 1.5 // much blurring  
  blur_samples 60 / more samples, higher quality  
  variance .15  
}
```

