Bump Mapping
Bump mapping

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

Bump mapping in POV-Ray

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
  \[
  \text{normal\{ waves 1.0 scale 0.2 frequency 5 \}}
  \]
  
- The waves pattern looks similar to the ripples pattern except the features are rounder and broader.
• agate
• bozo
• brick
• checker
• mandel
• hexagon
• radial
• wood
• marble

Other patterns
**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.

```plaintext
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](http://www.rene-schwietzke.de/povray/index.html)
  Wonderful images showing all of the textures that come with
  POV-Ray.

- [Architexture](http://sourceforge.net/projects/architexture)
  Source and executable for creating and previewing textures for
  POV
  - A little temperamental
  - Written in VB, source freely downloadable. Improvements (FP?)
For texture design

- Texture Magic
  [www.homepages.intershop.de/rene/povray/tex_mag.html](http://www.homepages.intershop.de/rene/povray/tex_mag.html)
  Excellent preview software. Oldie but goodie.
  Free for 60 days.

- POVMan
  [www.aetec.ee/fr/khomep.nsf](http://www.aetec.ee/fr/khomep.nsf)

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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
}
```