

## 3D Texture Mapping



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## Color Mapping



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## 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

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## 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 }  
  }  
}
```



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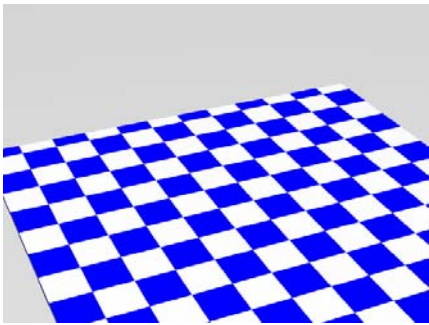
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## checker



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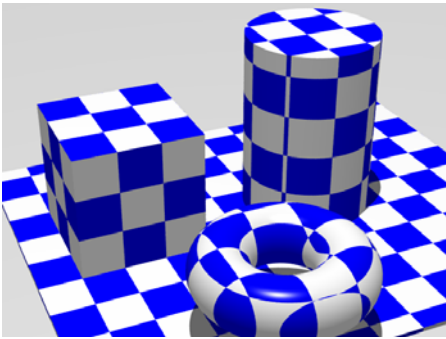
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## Why?



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## 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 }  
  }  
}
```



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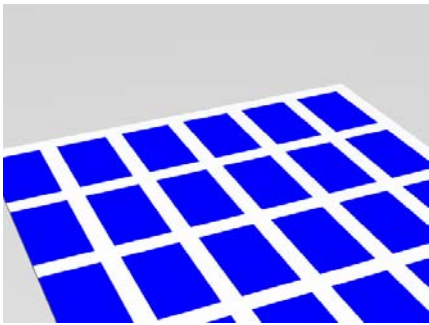
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## brick



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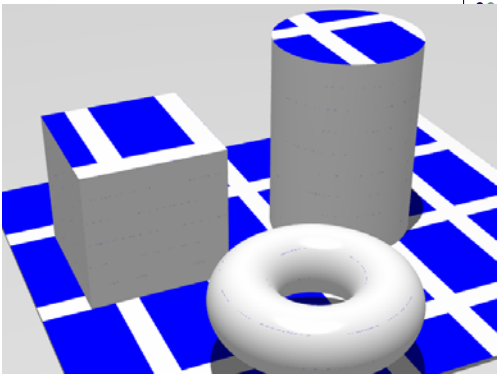
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## hexagon

```
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 }  
}
```



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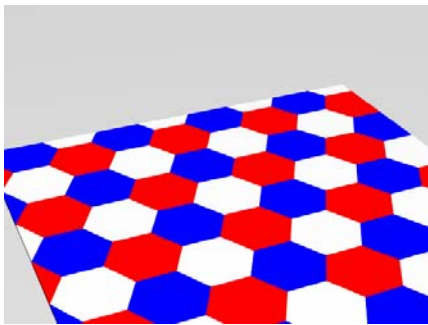
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## hexagon



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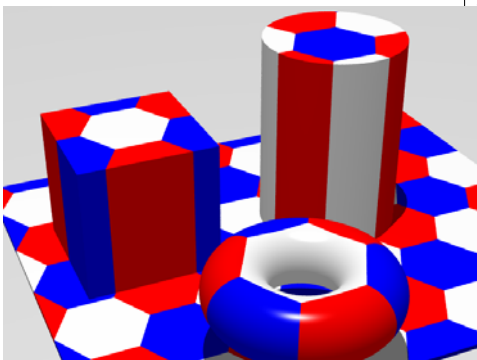
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## Color maps



- 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

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## 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  
}
```

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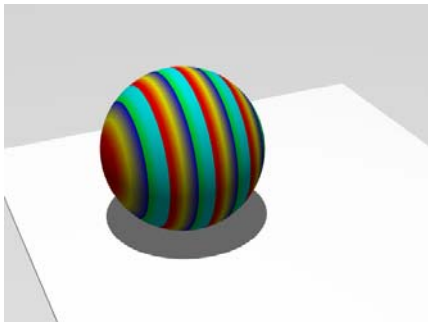
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## gradient x



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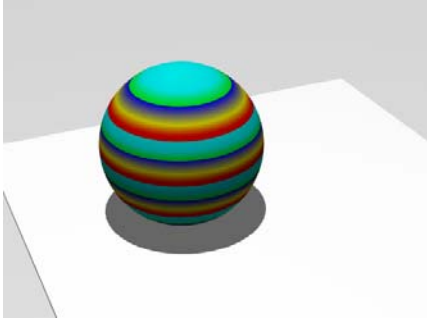
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## gradient y



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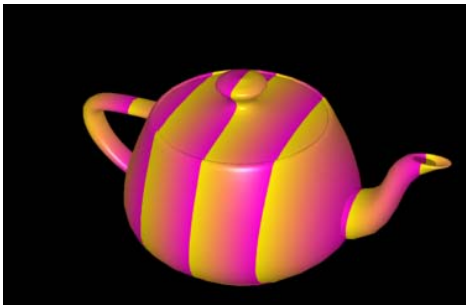
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Sharp changes at 0.0, 1.0, 2.0



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## Smoother

```
pigment {  
  gradient <1, 0, 0>  
  color_map {  
    [0.0 color Yellow]  
    [0.5 color Magenta]  
    [1.0 color Yellow]  
  }  
  scale <2,2,2>  
}
```



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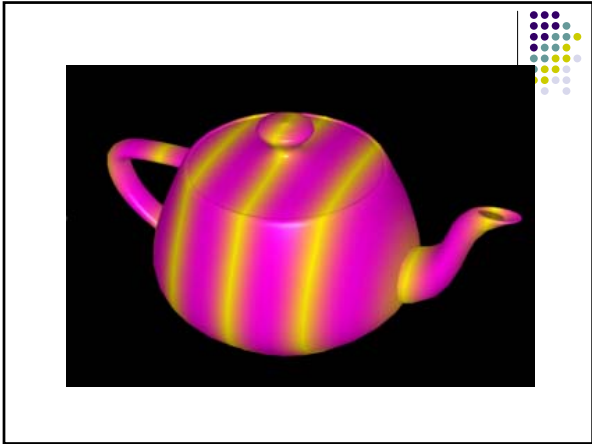
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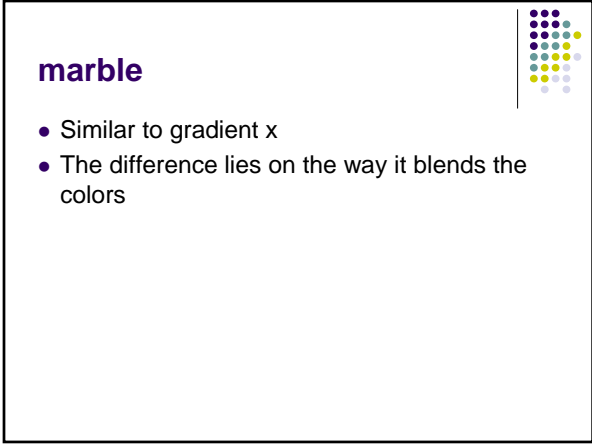
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## marble

```
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  
}
```



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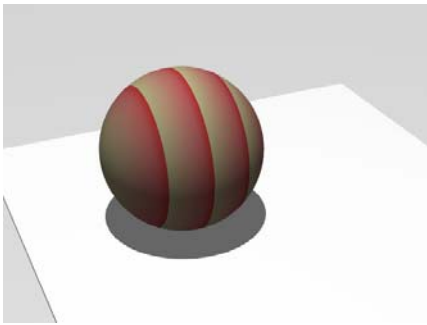
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## gradient x



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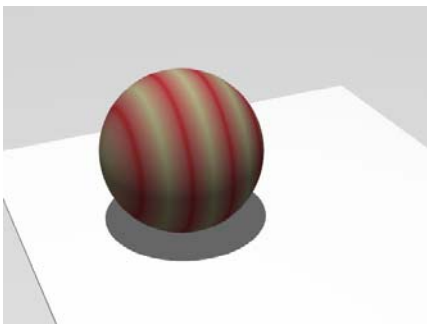
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## marble



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## 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
}
```



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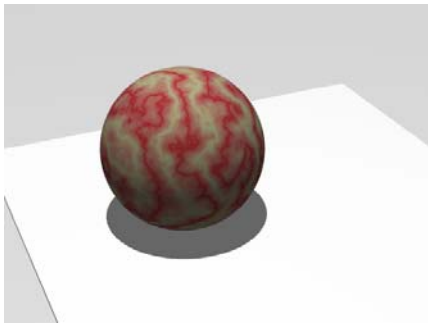
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## radial

- Creates bands radiating from the y axis



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## 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 }  
  }  
}
```



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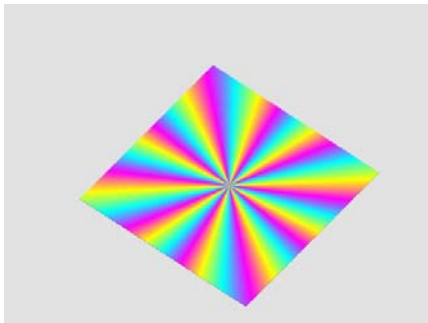
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## radial

```
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 }  
  }  
}
```



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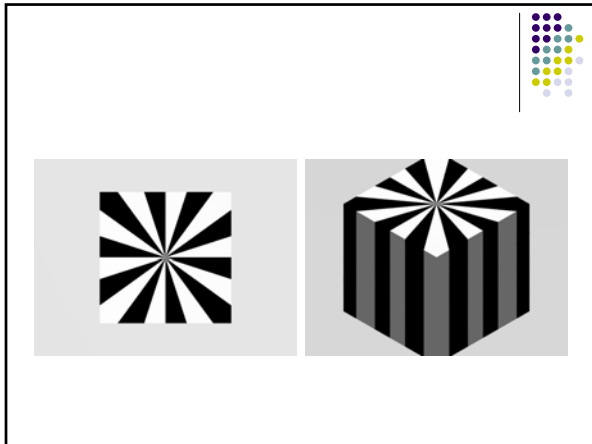
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**bozo**

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




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**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 }
  }
}

```




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## bozo

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



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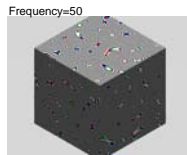
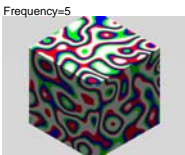
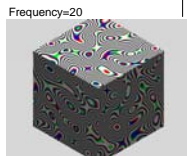
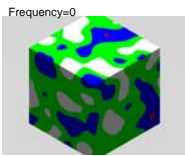
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## bozo



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## 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



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## 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 0.4 }
  }
}
```



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## agate



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## cells

- Fills 3D space with unit cubes



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## 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 }
}
```



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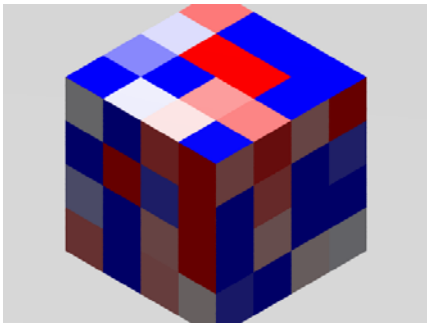
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## cells



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## onion

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



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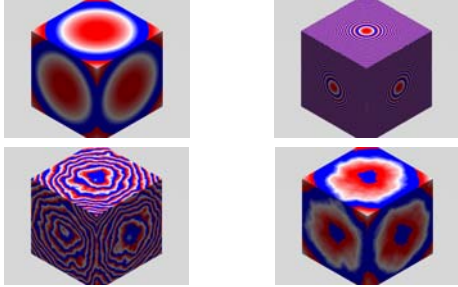
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# onion



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# 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}
}
```

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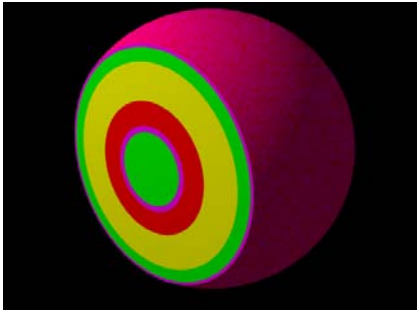
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# onion



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## 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>
}}
```

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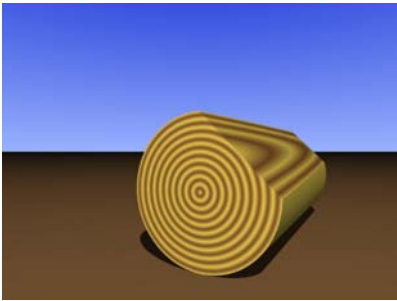
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## Wooden log



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## 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}
}
```

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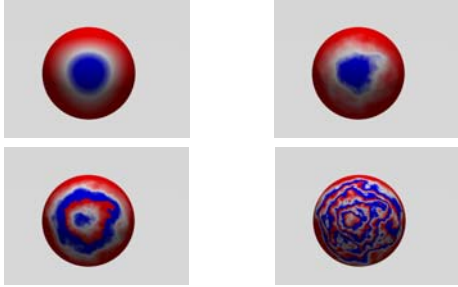
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## leopard



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## 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).

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## 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>]  
}
```

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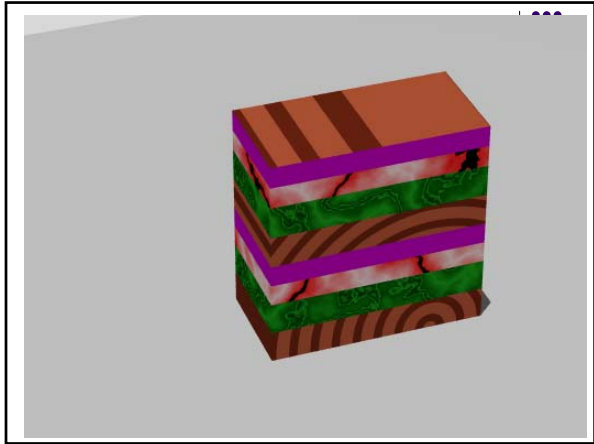
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**For more...**

- See "textures.inc"



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