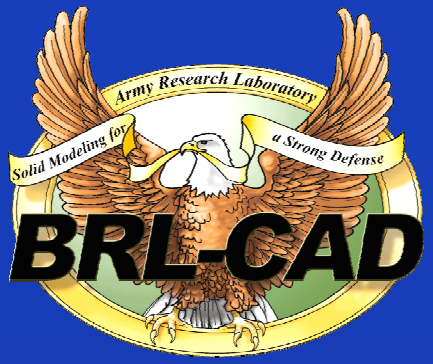
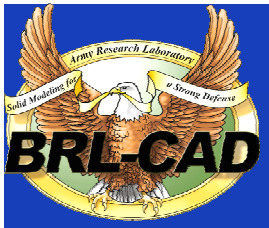


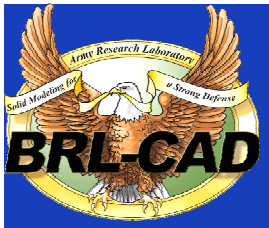
Shading Objects

This presentation was not given during the meeting, but serves as a useful reference for shader examples and information.



What is a shader?

- A shader is effectively a way to assign visual material properties to geometry
- They describe how something should look

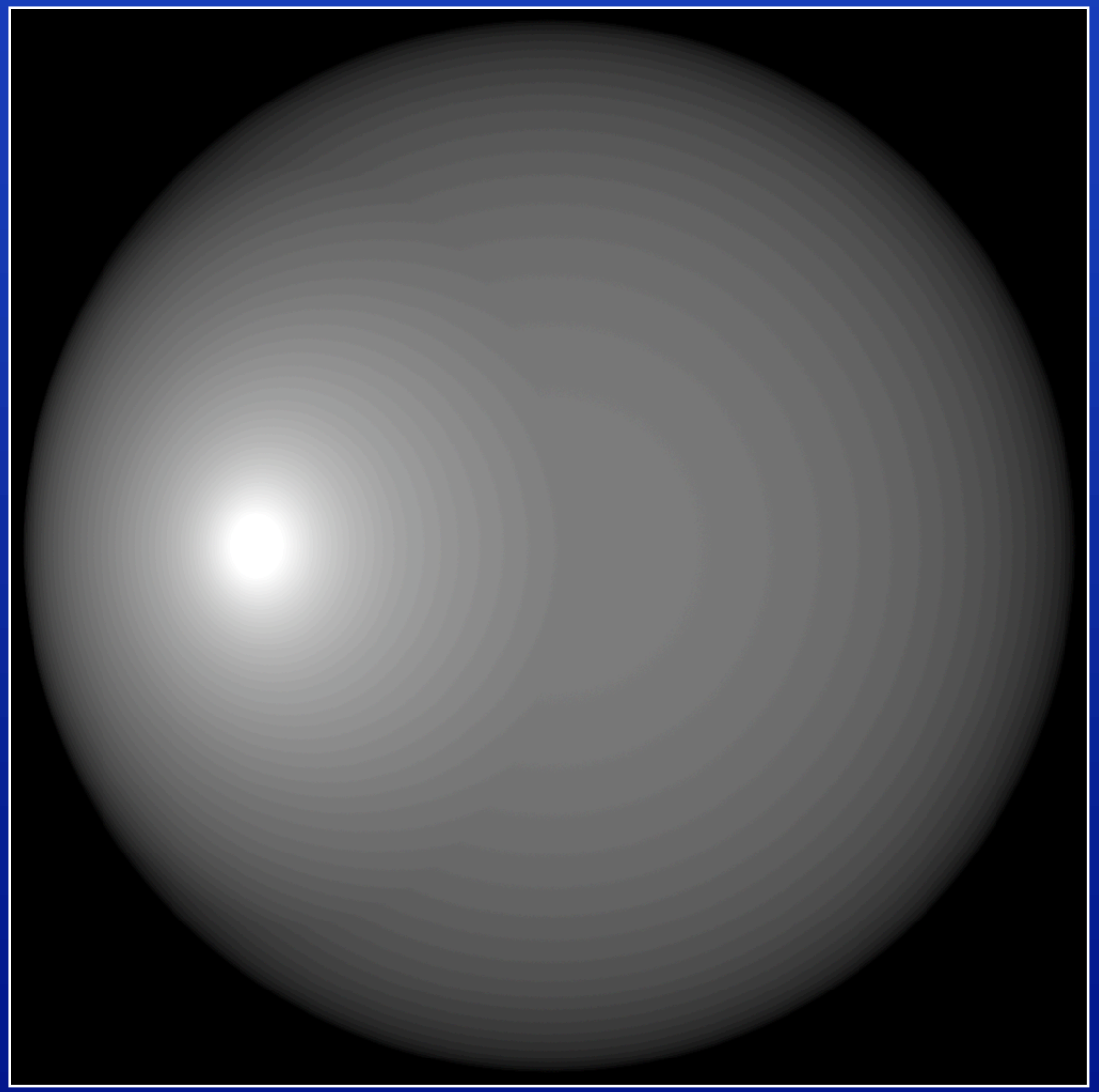


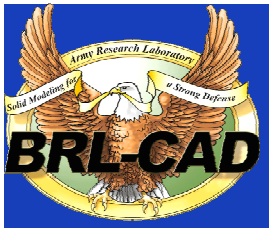
Applying Shaders to Geometry

- Shaders are applied to regions
- Default shader for unspecified geometry is “plastic” (Phong shader)
- Multiple shaders may be specified with the “stack” shader

Quick Example

- The default shader is called “plastic”, which is a particular set of parameters to the Phong shader

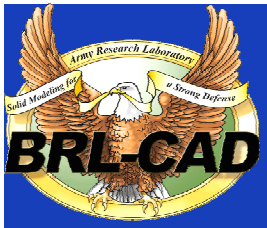




Existing Shaders

There are more than a few...

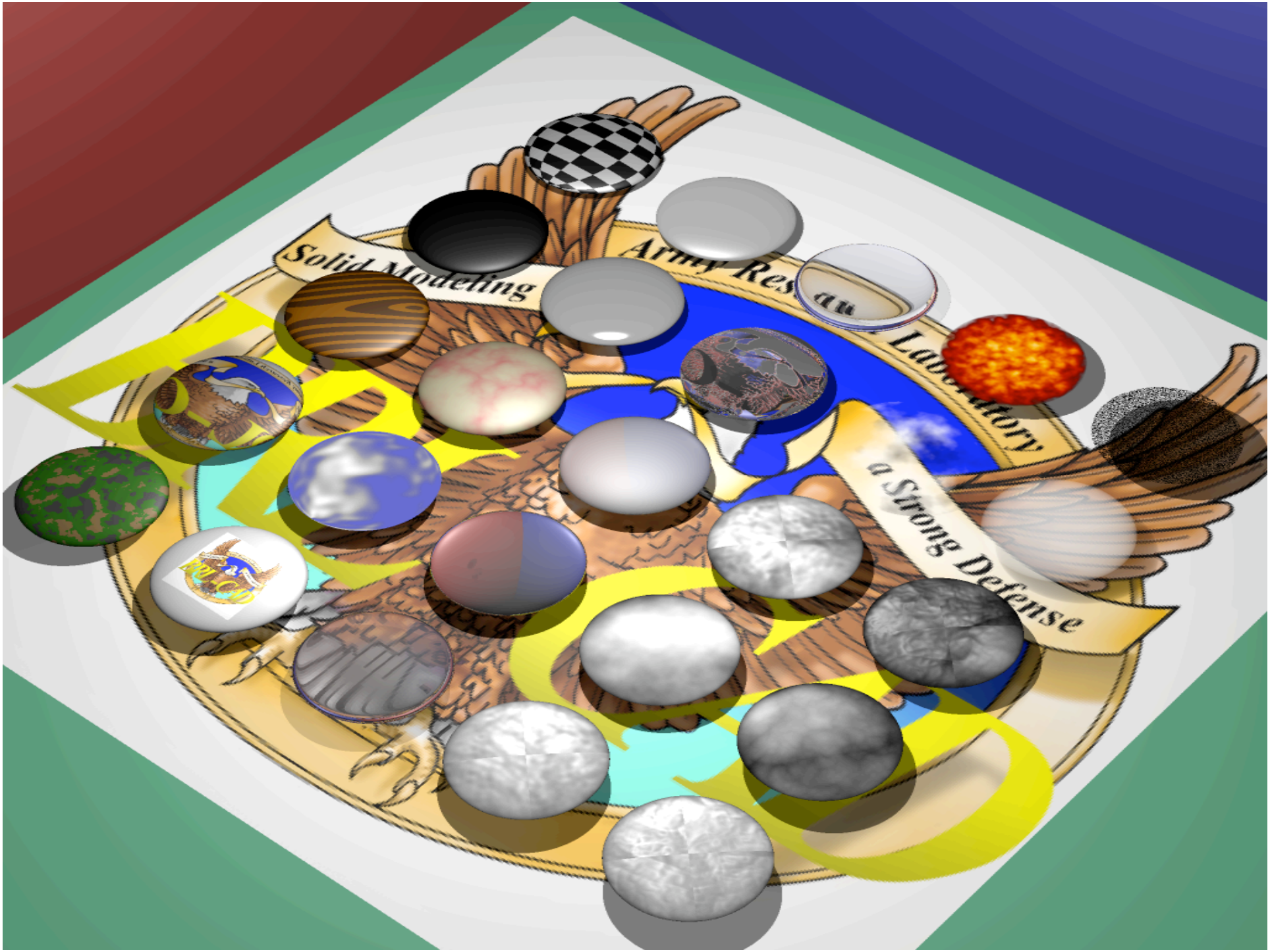
air, brdf, bump, bwtexture, camo, checker, cloud, cook, envmap, fakestar, fbmbump, fbmcolor, fire, flat, grass, gravel, grunge, light, marble, null, phong, projection, rtrans, scloud, stack, tcl, texture, toyota, turbump, turcolor, wood, ...



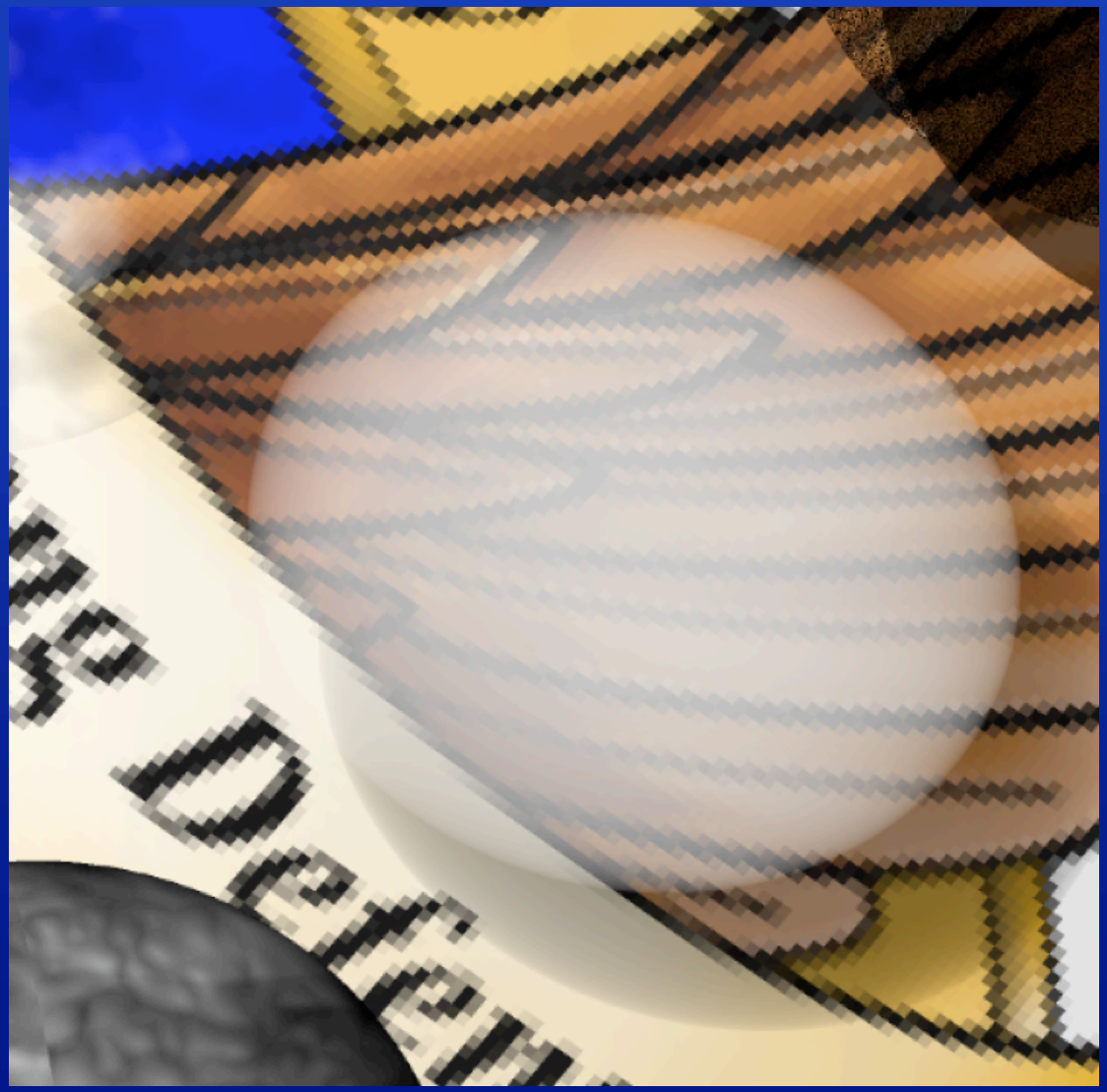
Now for some examples

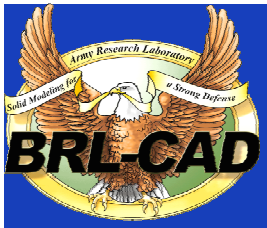
The following image is a collection of a variety of shaders all stacked with the plastic shader.

Each individual shader is then shown by name with a closeup of the corresponding shader. The list is in alphabetical order.


Solid Modeling
Army Res
Laboratory
a Strong Defense

Air Shader Example



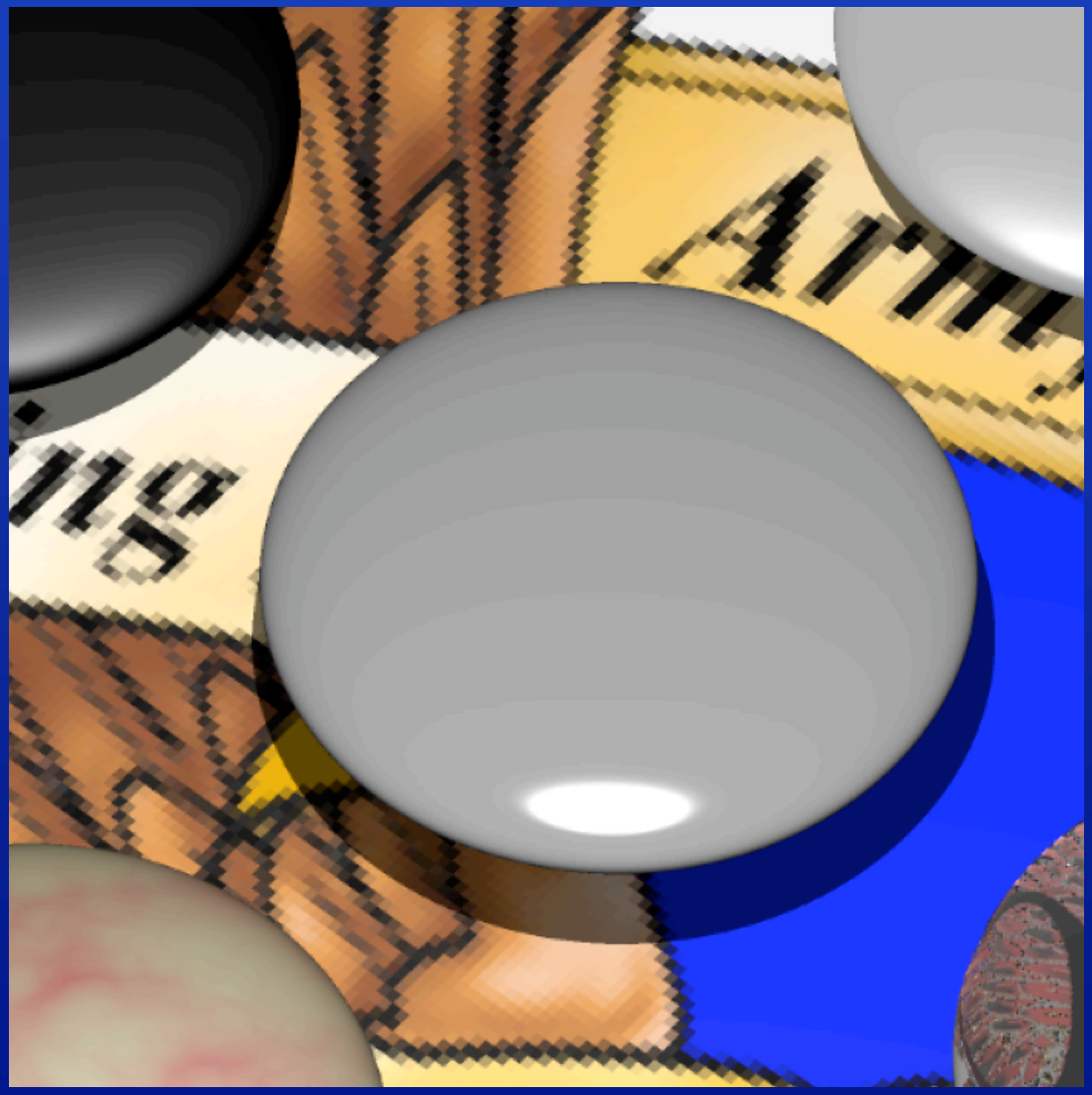


Bidirectional Reflectance Distribution Function (brdf)

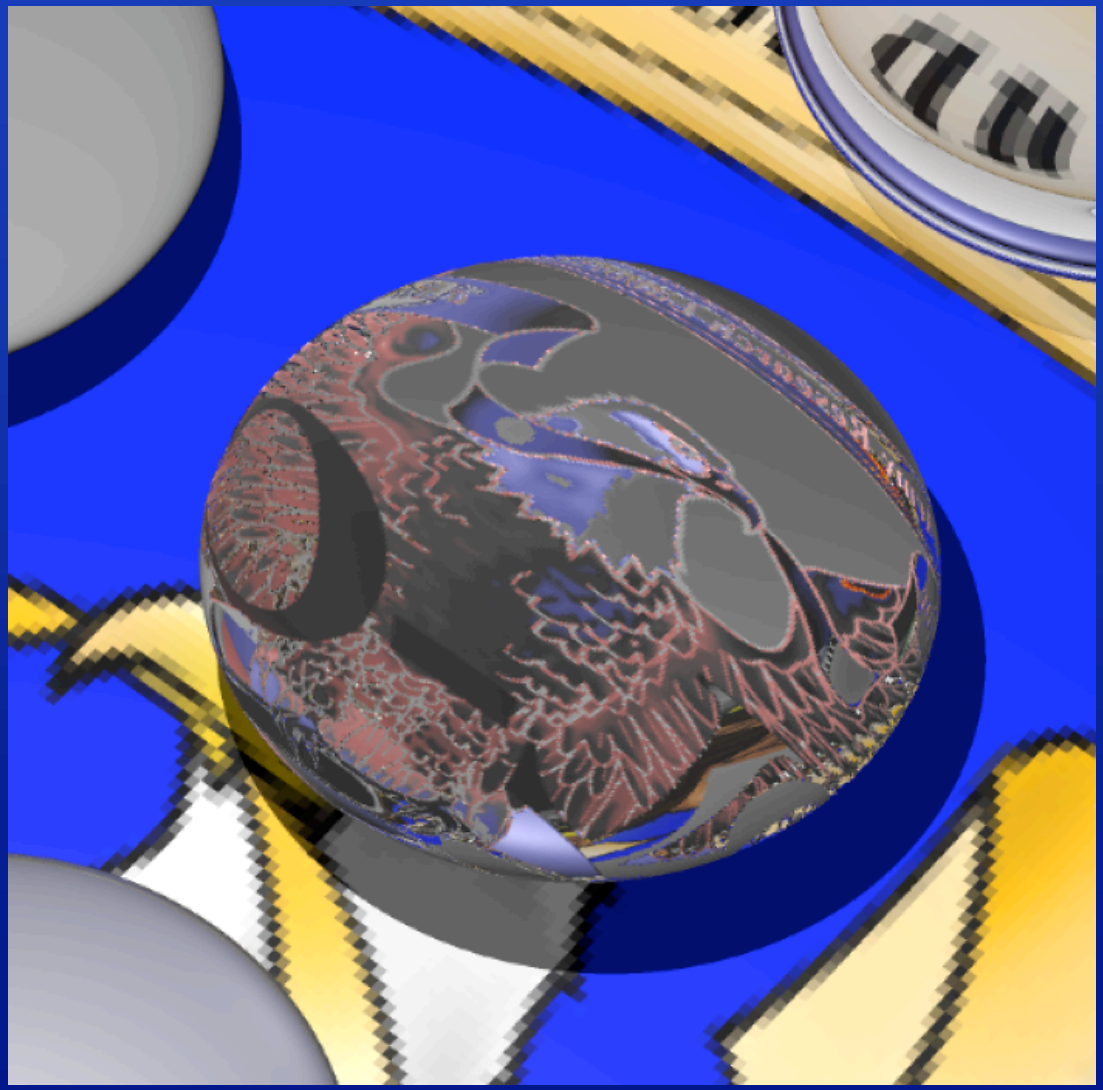
- Simple Isotropic Gaussian model with just one parameter (RMS slope)
- Preset Values: brdf

Parameters	**Description**
specular | sp	specular reflectance
diffuse | di	diffuse reflectance
rough | rms	standard deviation (RMS) of surface slope (roughness)
transmit | tr	Moss “transparency”
reflect | re	Moss “transmission”
ri	refraction index
extinction_per_meter | extinction | ex	

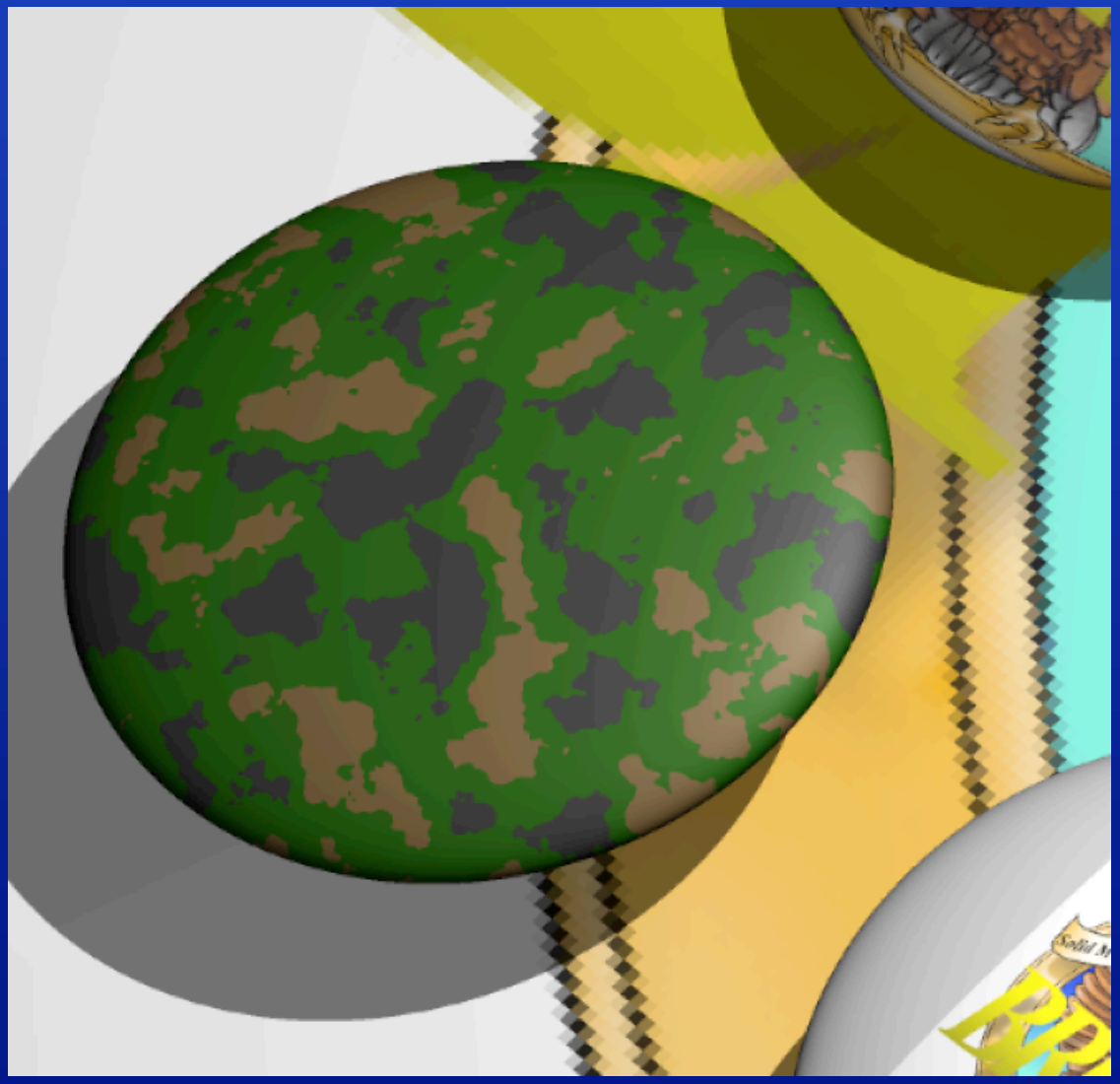
BRDF Shader Example



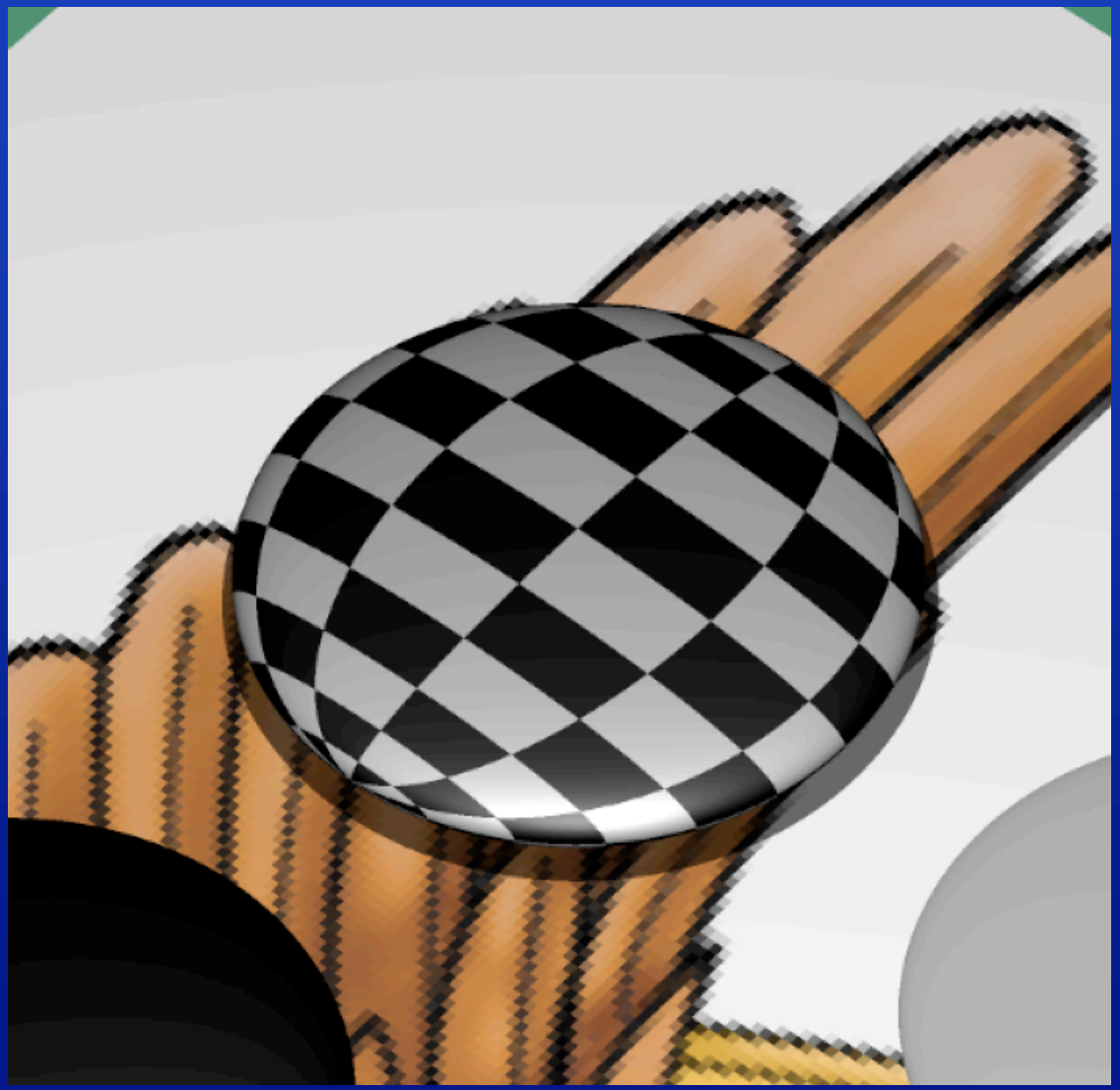
Bump Map Shader Example

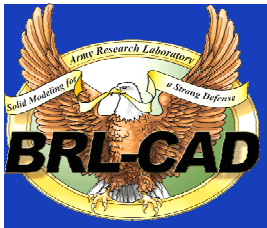


Camouflage Shader Example



Checker Shader Example





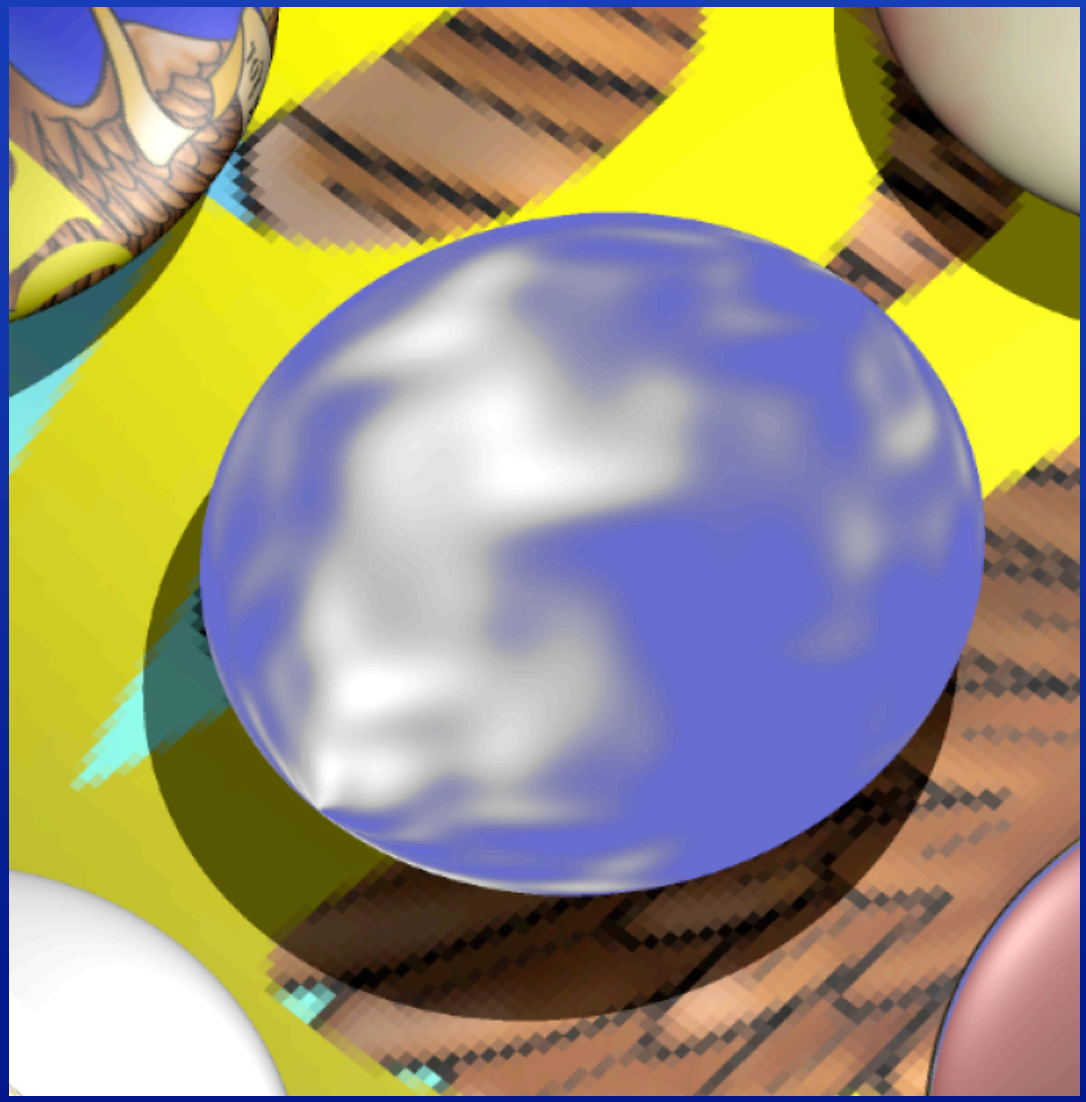
Cloud Shader

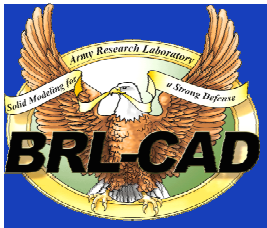
- Two-dimensional Geoffrey Gardner style cloud texture map
- Name: cloud

Parameters	Description
thresh	threshold below which it is completely translucent
range	range on intensities over which transluecency varies from 0 to 1

thresh=0.35, range=0.3 for decent clouds

Cloud Shader Example





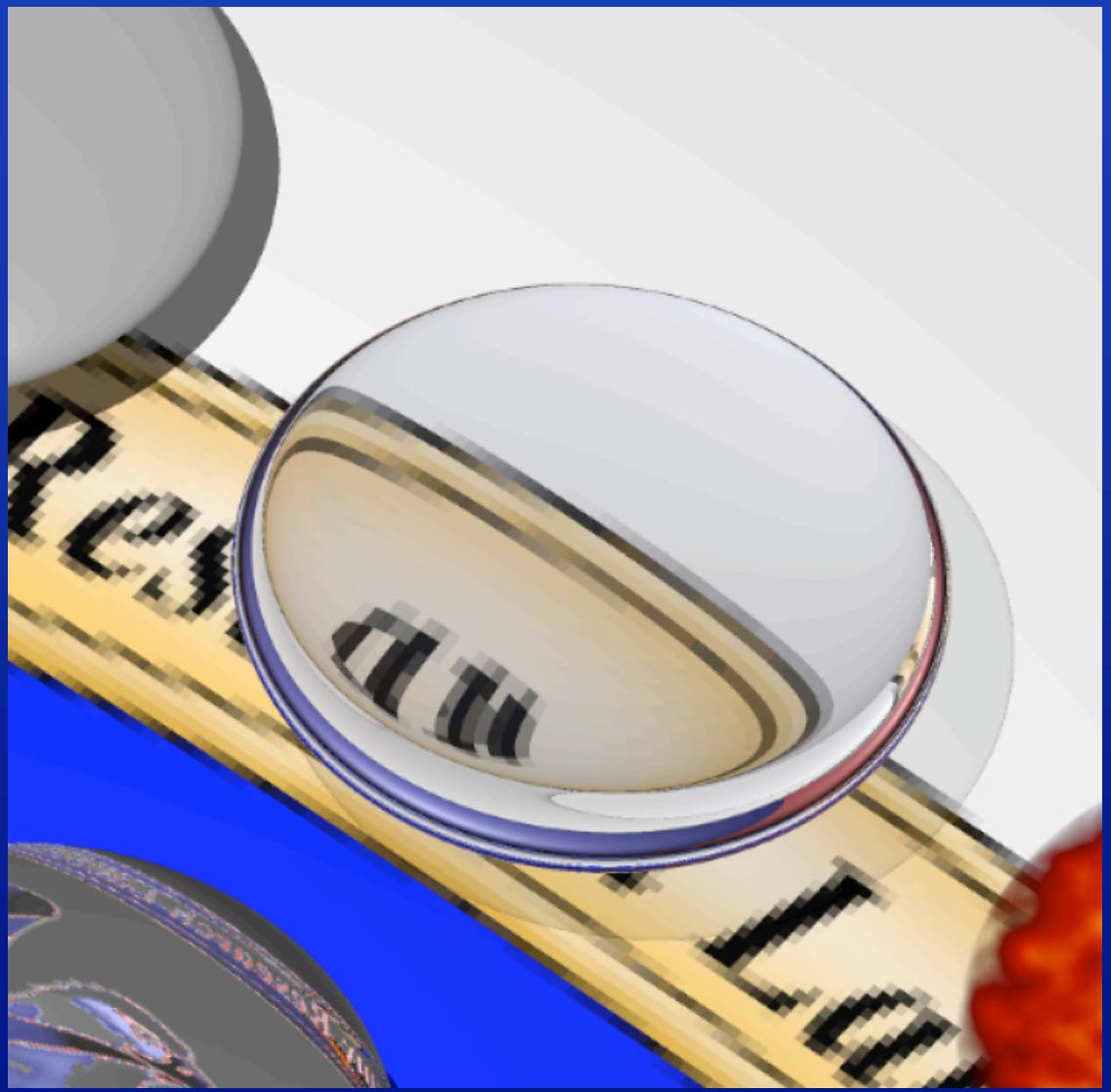
Cook-Torrence Direct Illumination Shader

- Implementation of the Cook-Torrence direct illumination of surfaces by light sources shading model (good for metals and shiny objects)
- Early attempts were made at making this a replacement for the Phong shader
- Preset values: cook

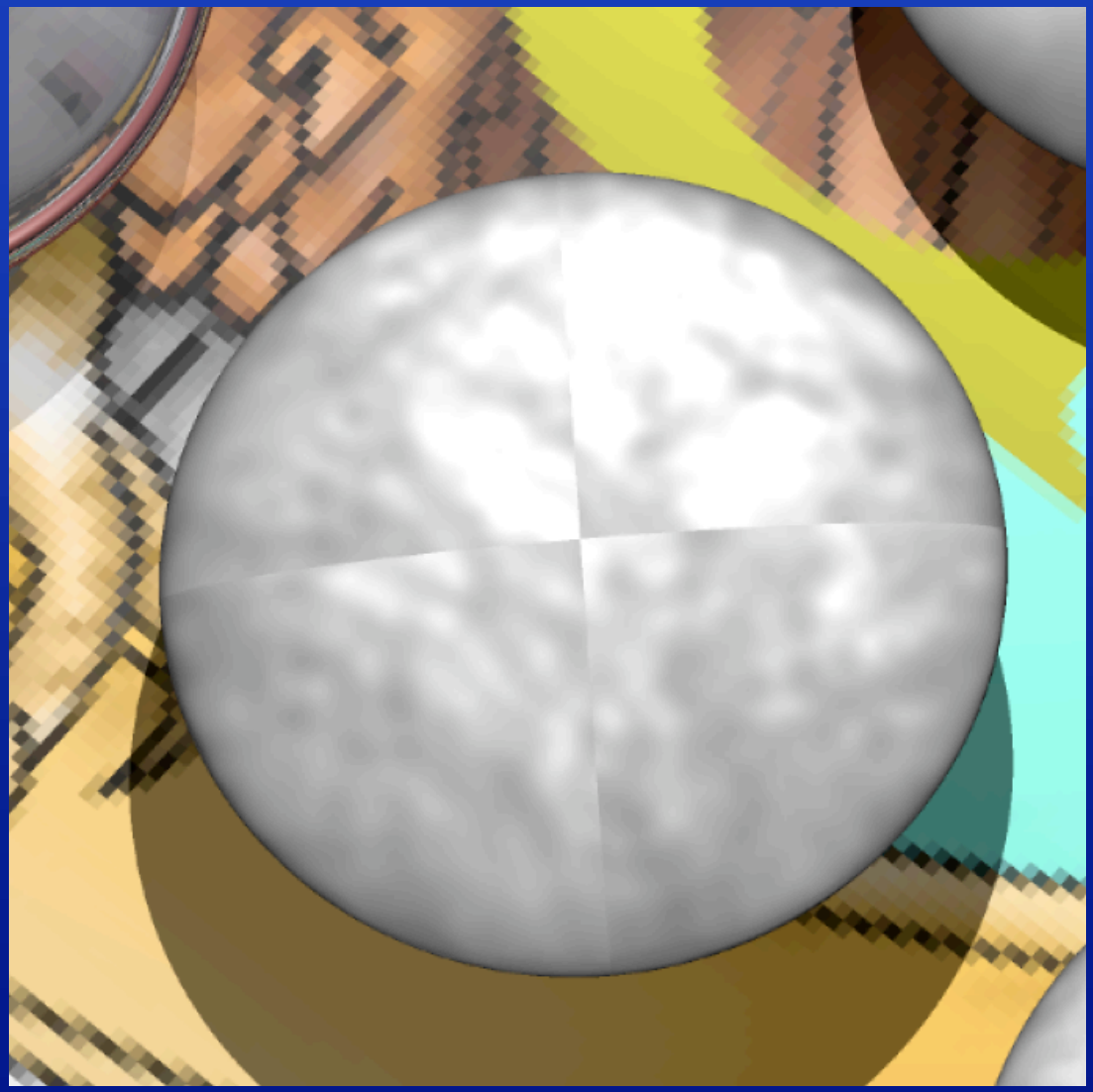
Parameters	**Description**
specular | sp	specular reflectance
diffuse | di	diffuse reflectance
transmit | tr	Transparency
reflect | re	Transmission
ri	refraction index
extinction | ex	

Cook-Torrence Shader Example

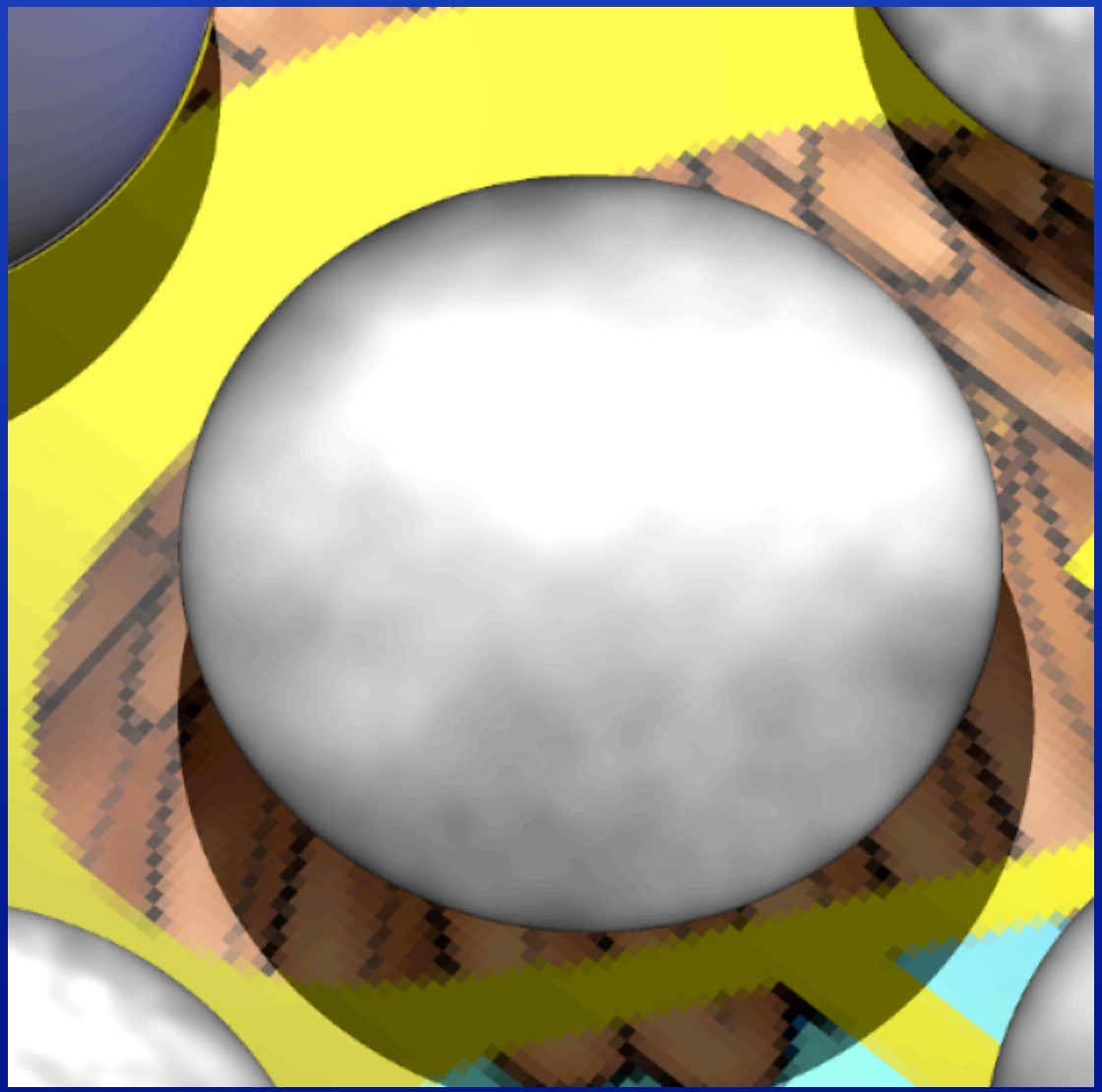
Good for metals and shiny objects



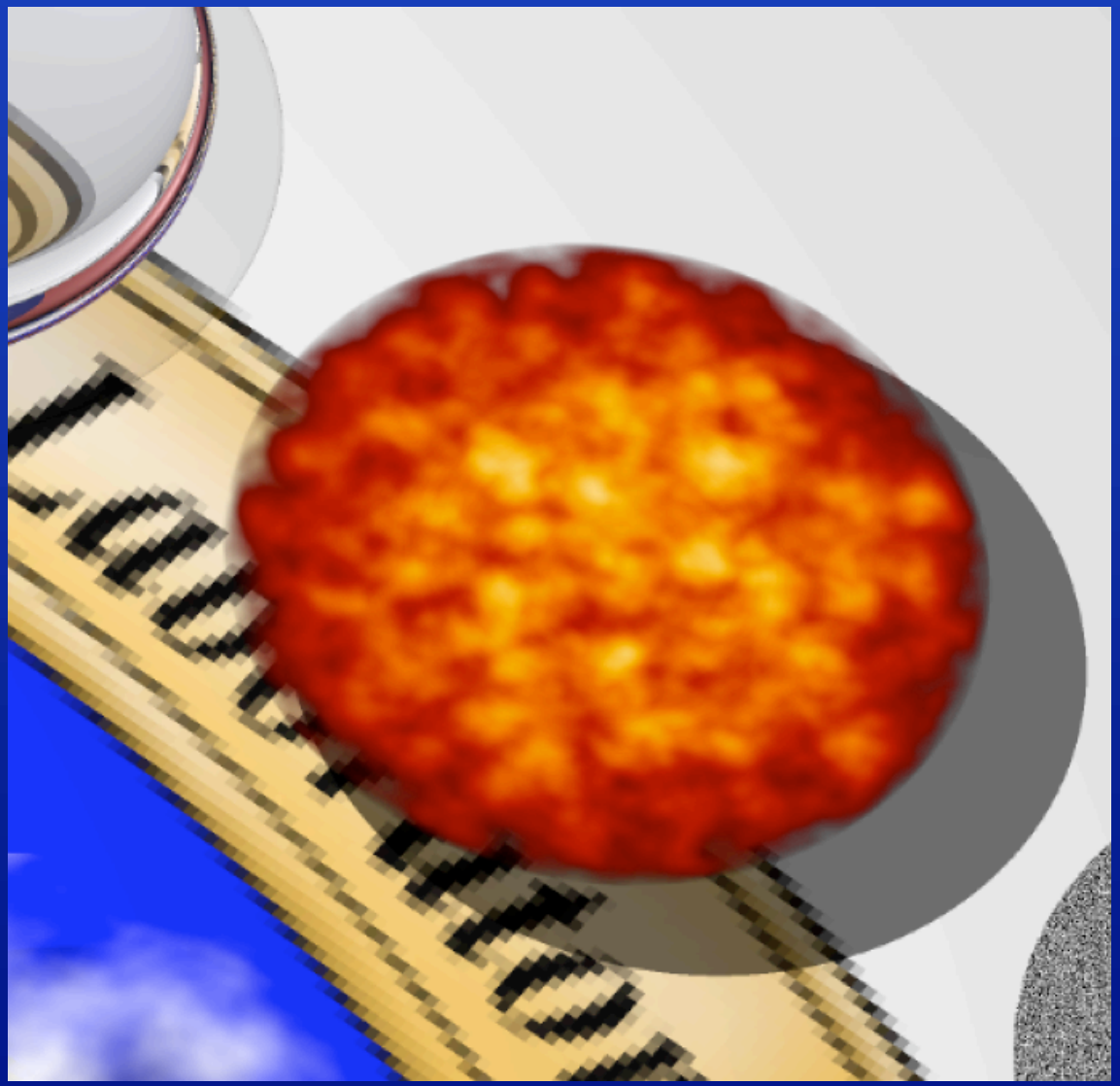
FBM Shader Example



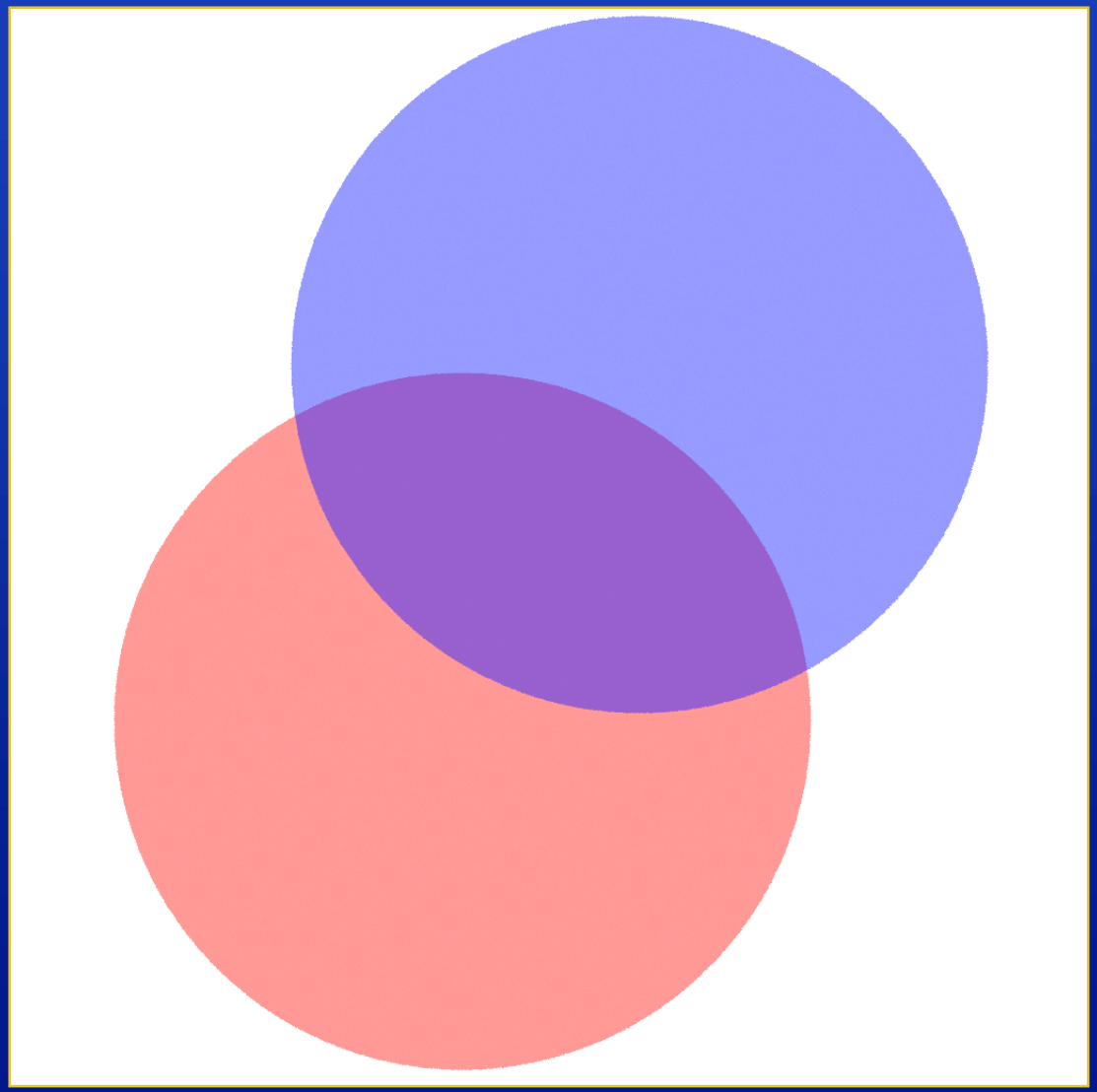
Fbmcolor Shader Example



Fire Shader Example

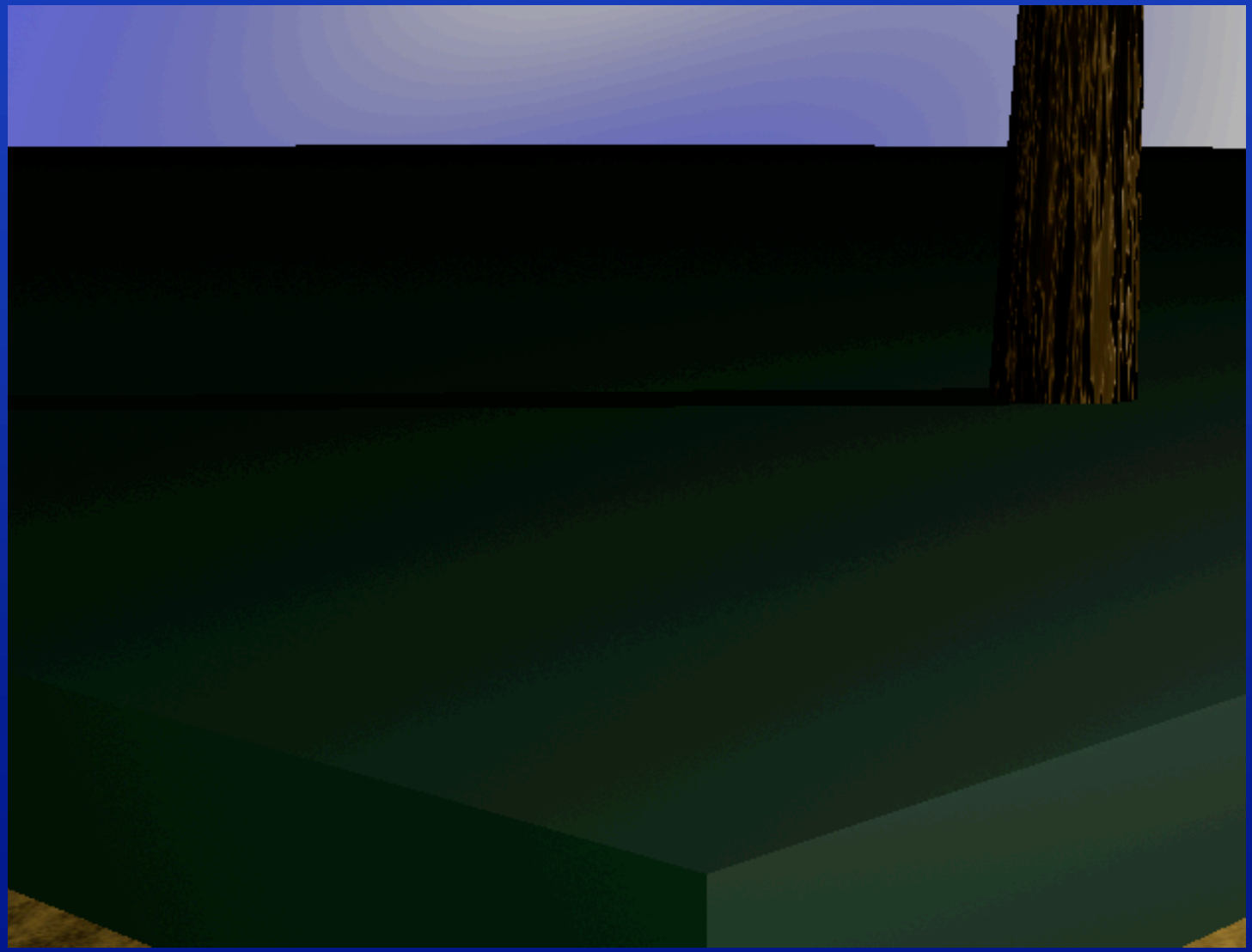


Flat Shader Example

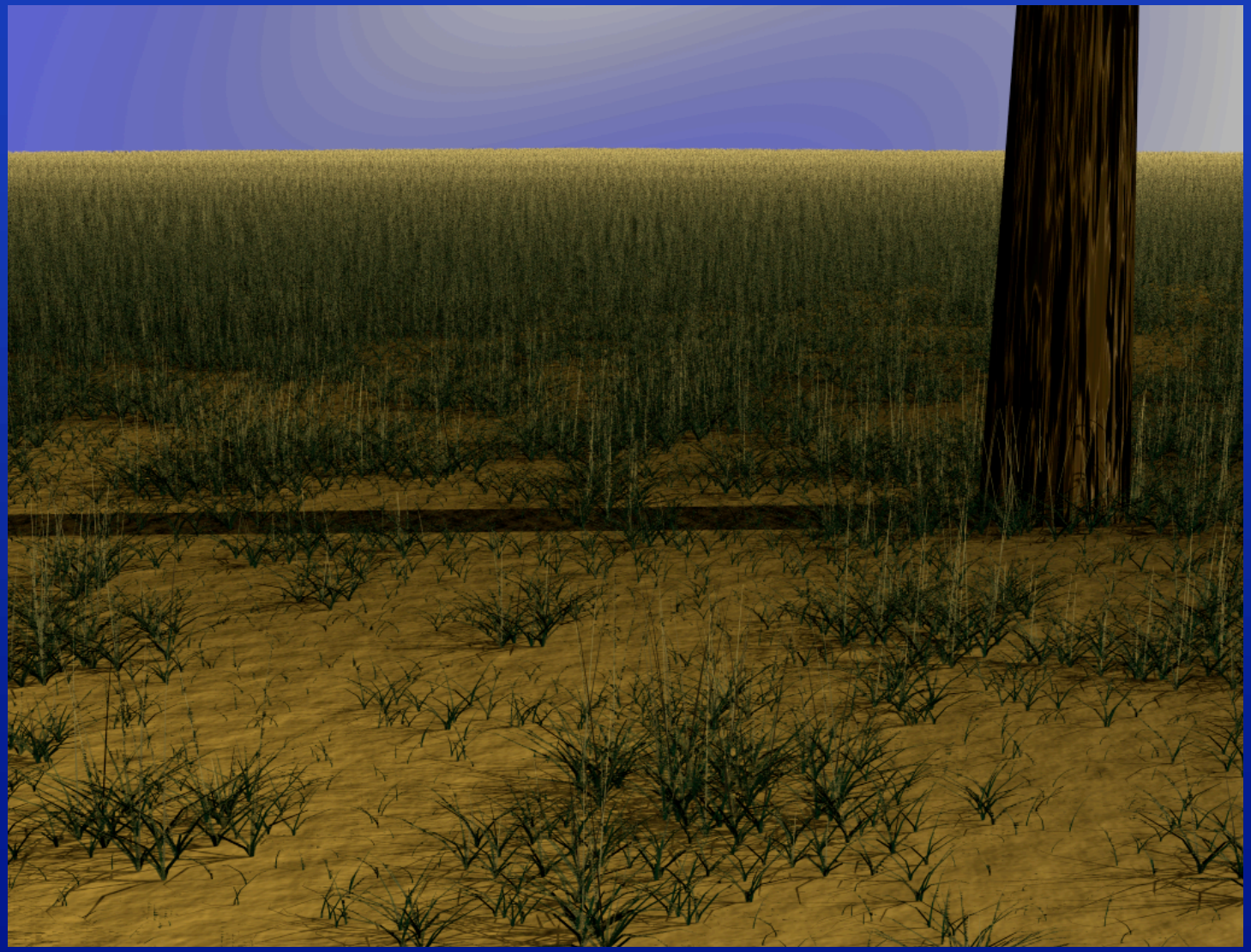


Blue sphere in front of red sphere with 50% transparency

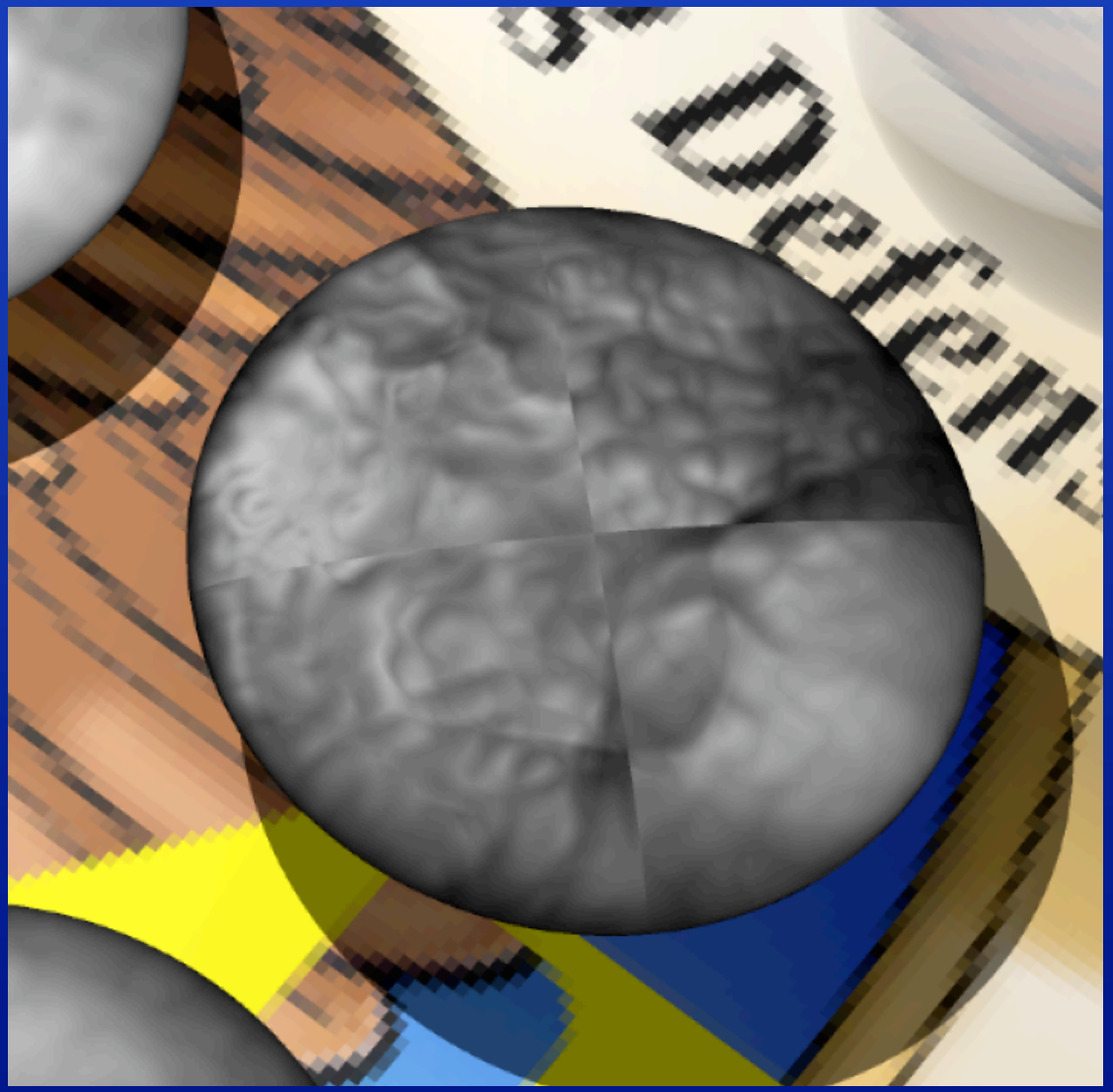
Grass Shader Example



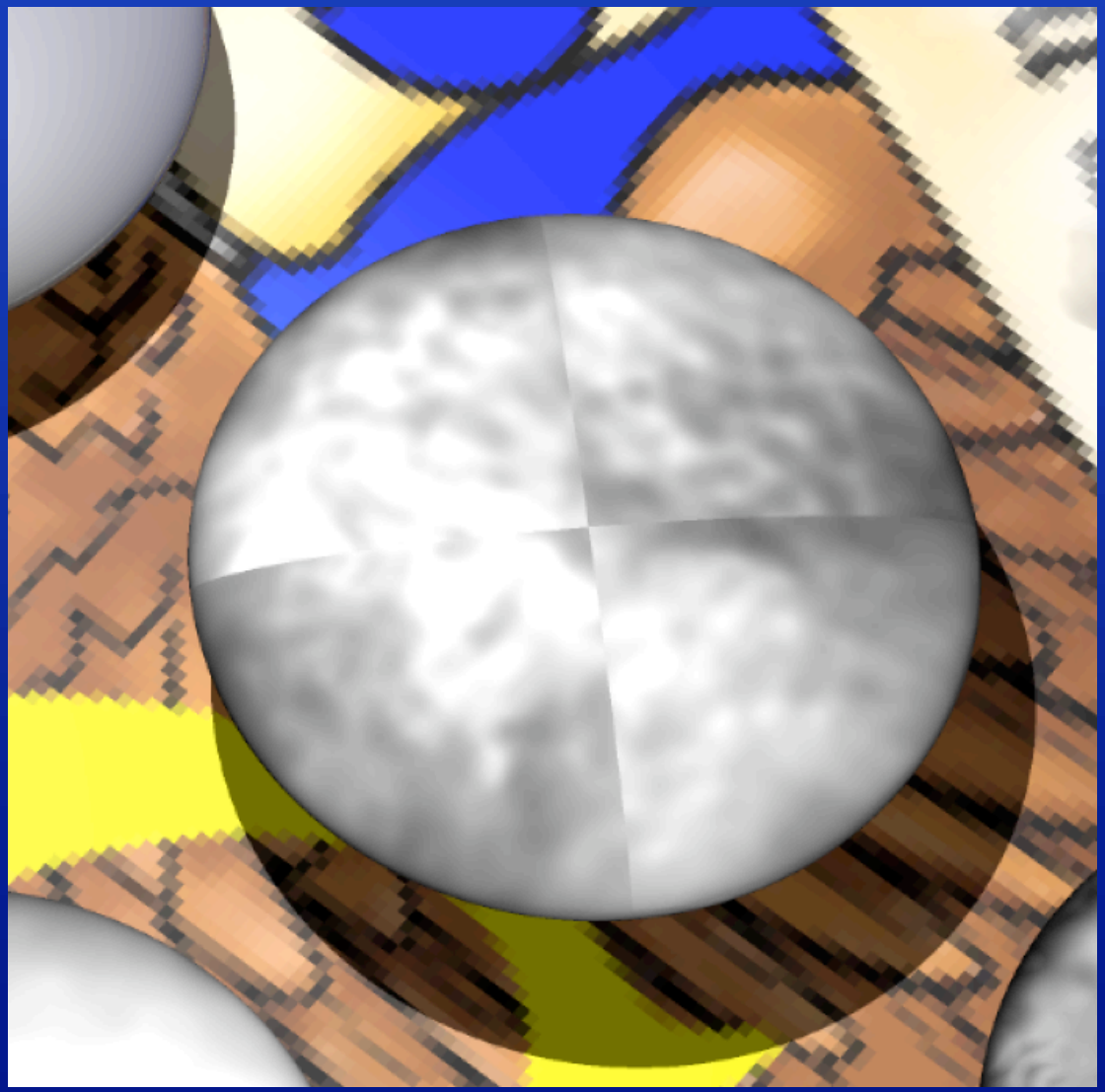
Grass Shader Example

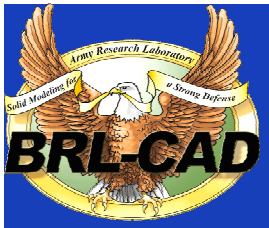


Gravel Shader Example



Grunge Shader Example

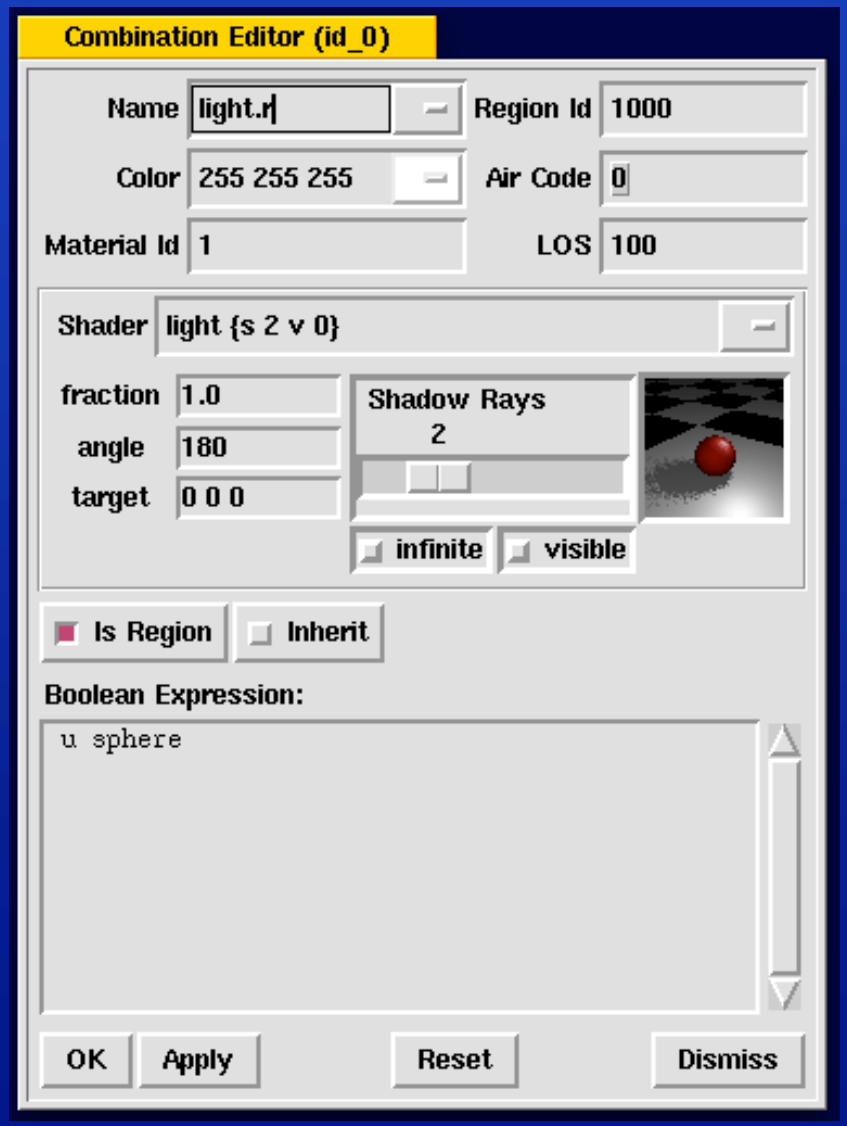




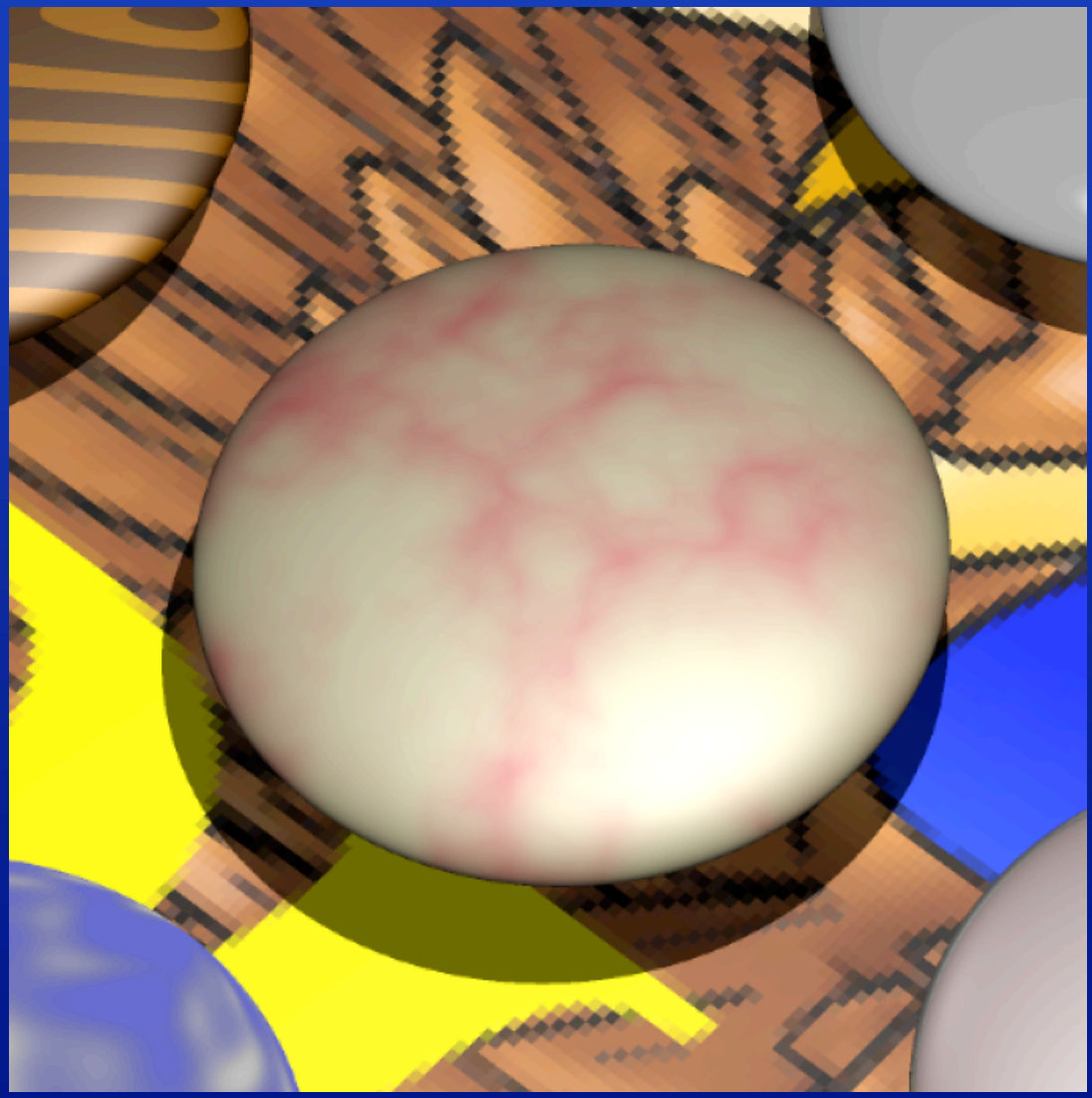
Lights

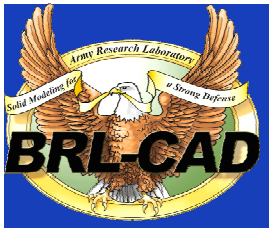
- Lights in BRL-CAD are actually also a special shader type that emits a spectrum of energy
- Other shaders use objects shaded with the light shader as light sources
- Lights may be made visible, but are usually invisible (you see the objects that they illuminate)

Light Parameters



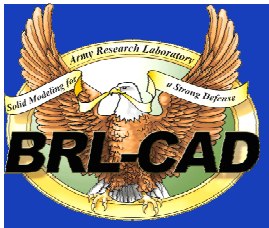
Marble Shader Example





Null Shader

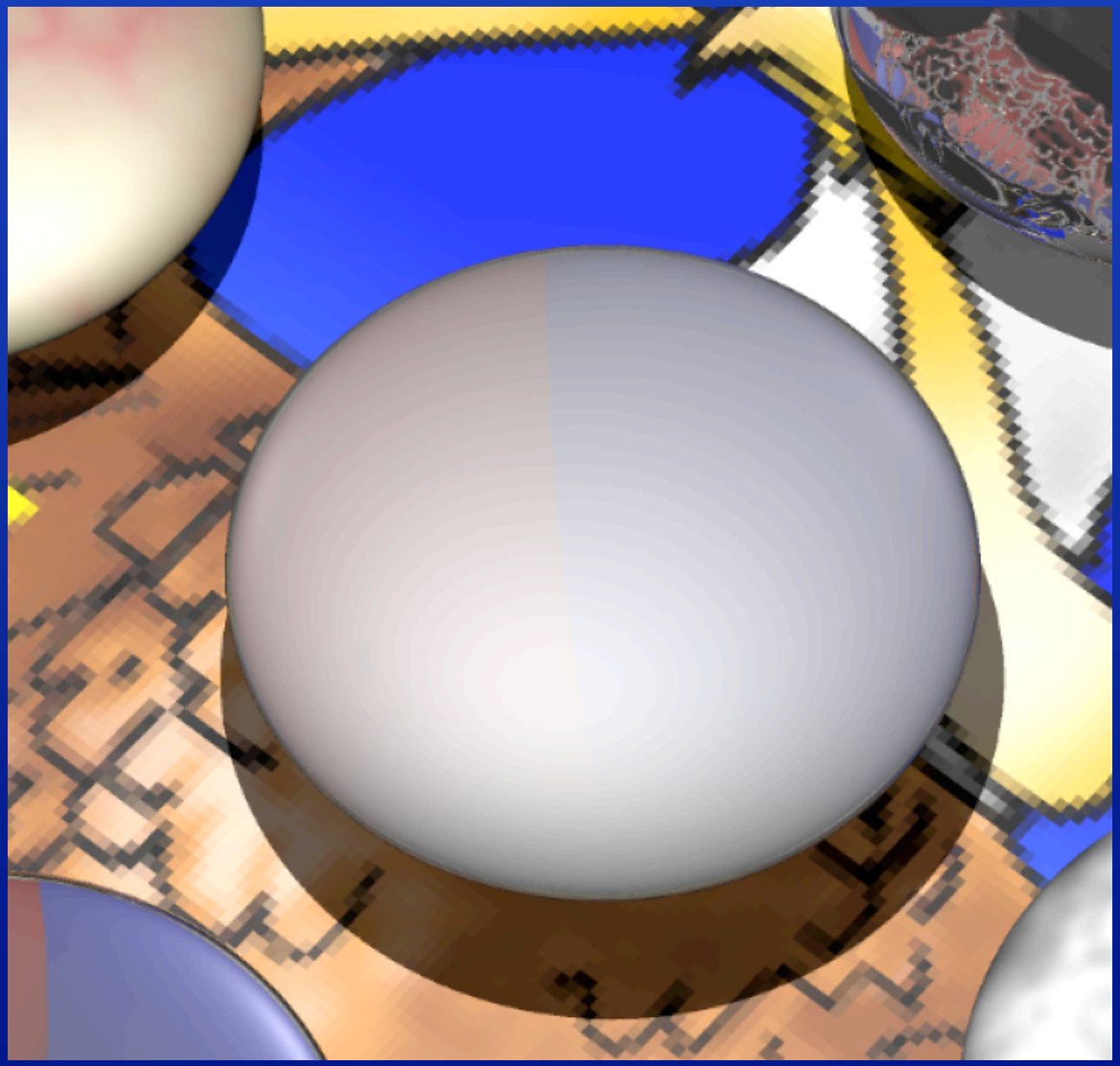
- Is the most simple shader
- Effectively makes an object disappear visually from a display, while still returning segments within the raytracer for analysis
- Is a good starting point for writing new shaders



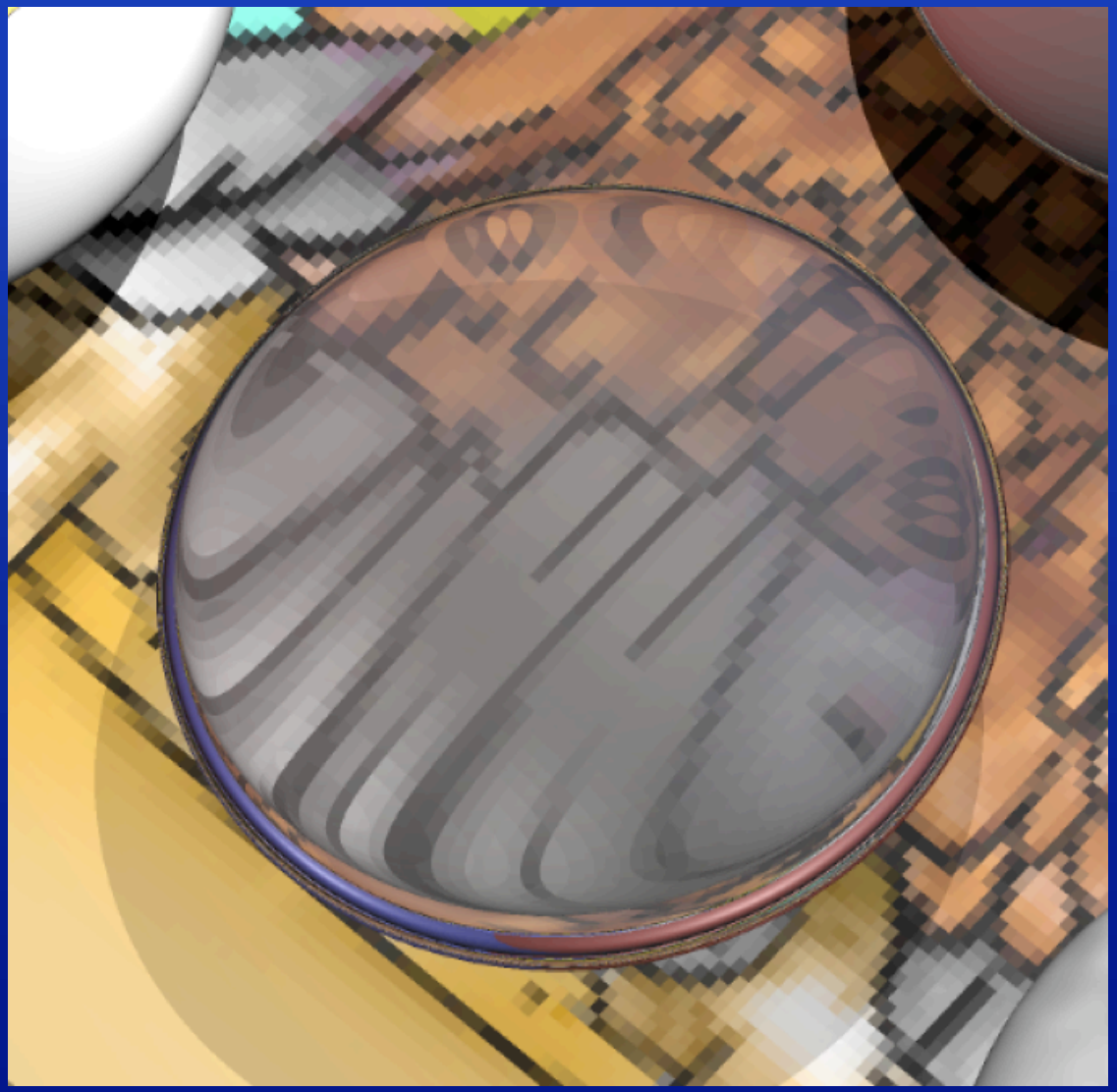
Phong Shader

- Is the default shader, using a default set of parameters that appear similar to plastic
- Is references with a variety of names to access preset values: plastic, glass, mirror,...
- diffuse + specular = 1.0

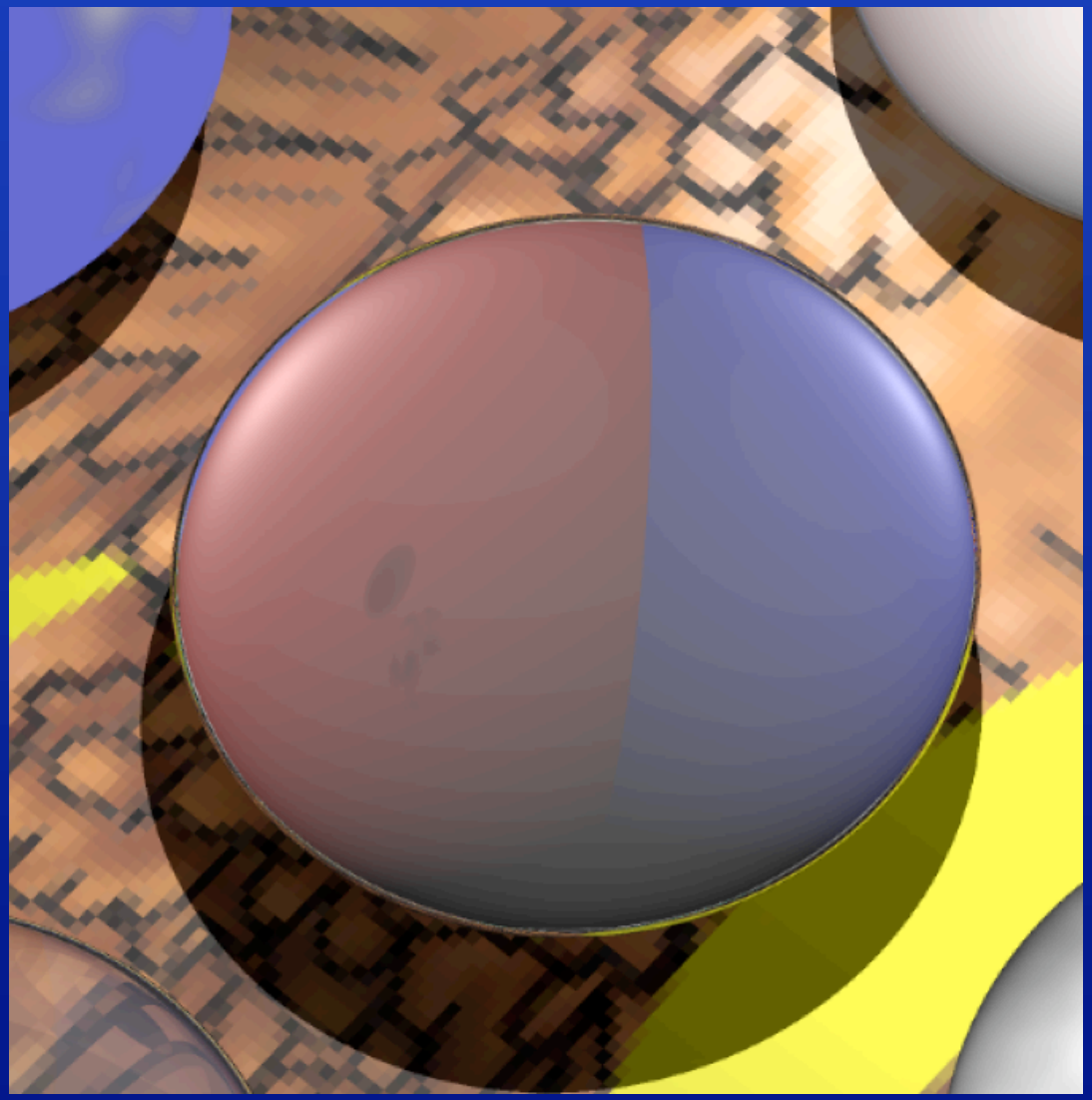
Phong: Plastic Example



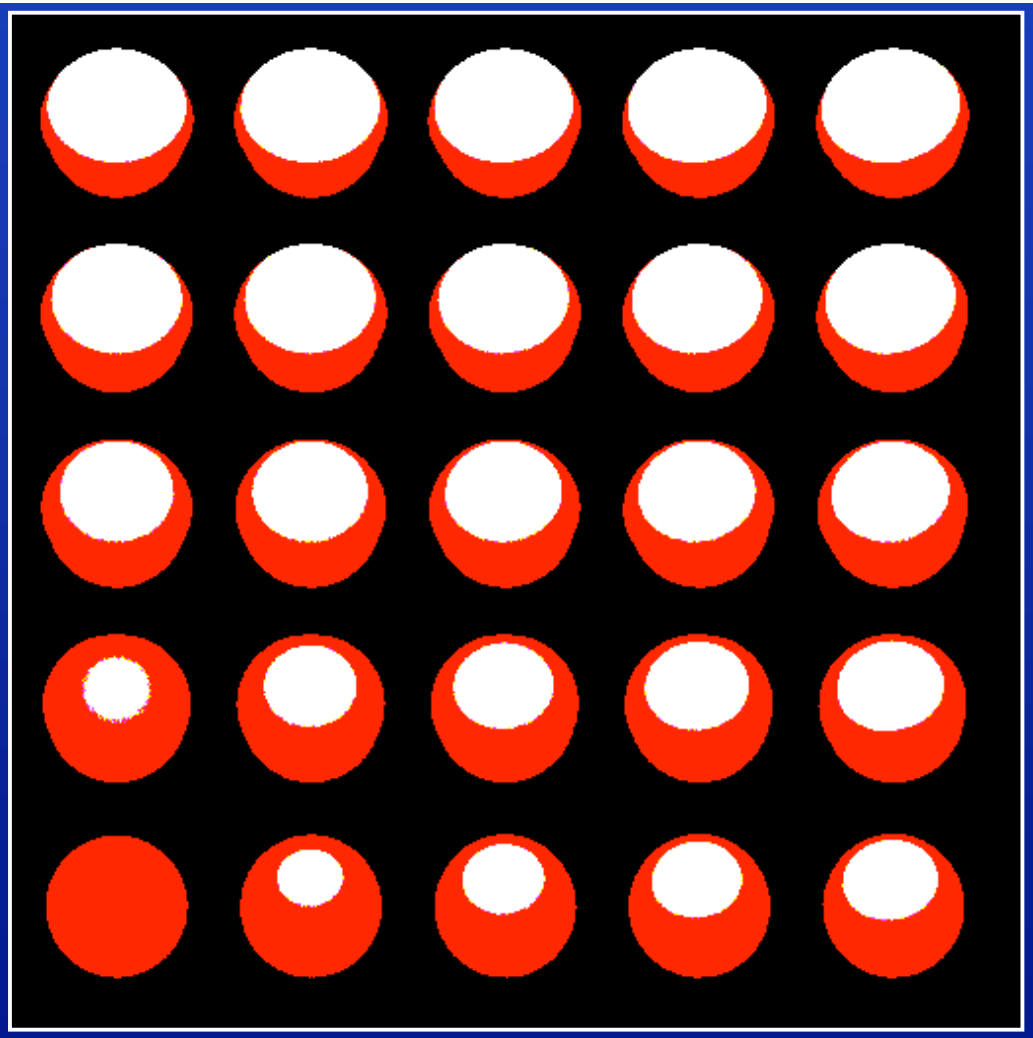
Phong: Glass Example



Phong: Mirror Example



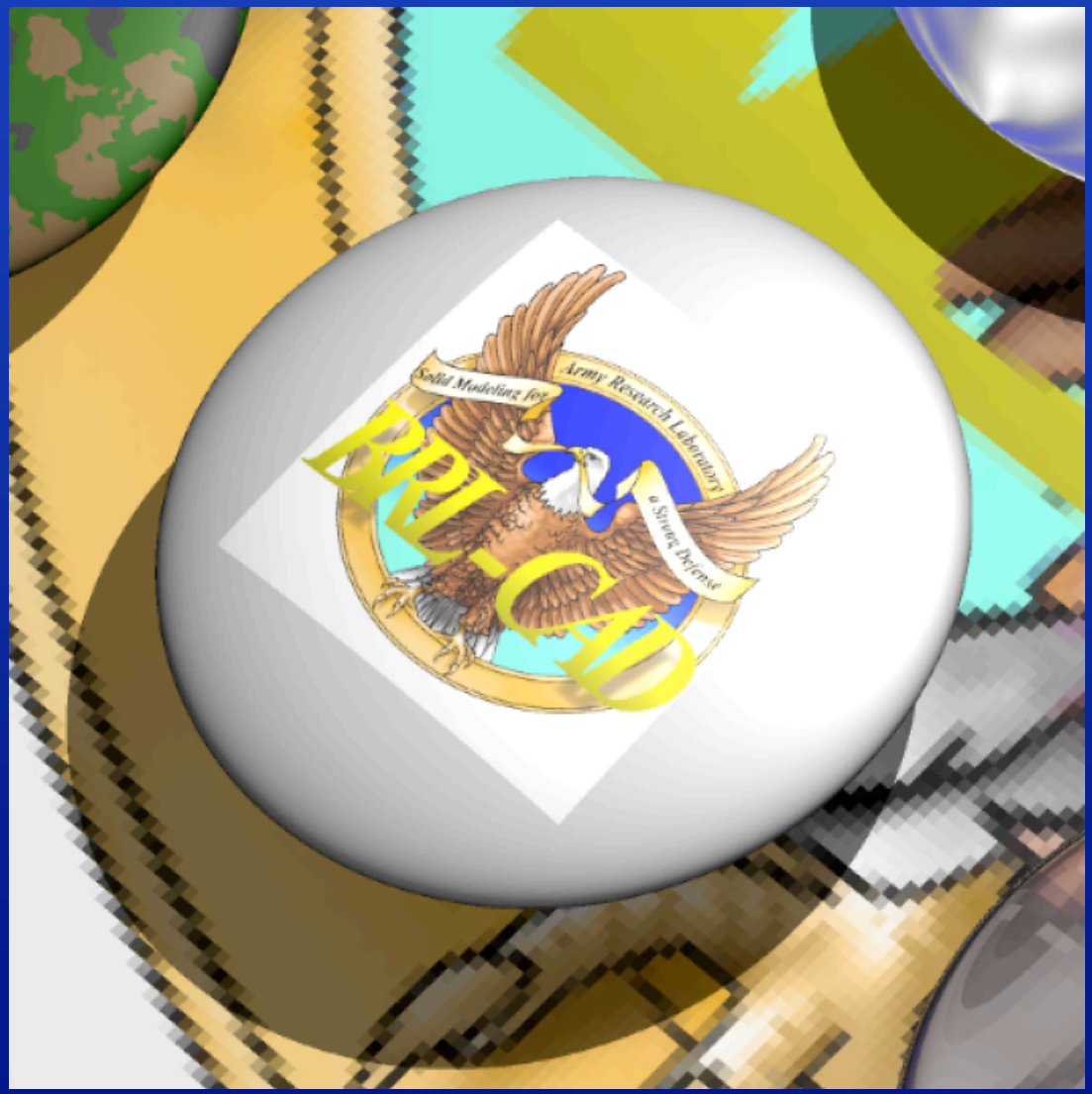
Diffuse/Specular



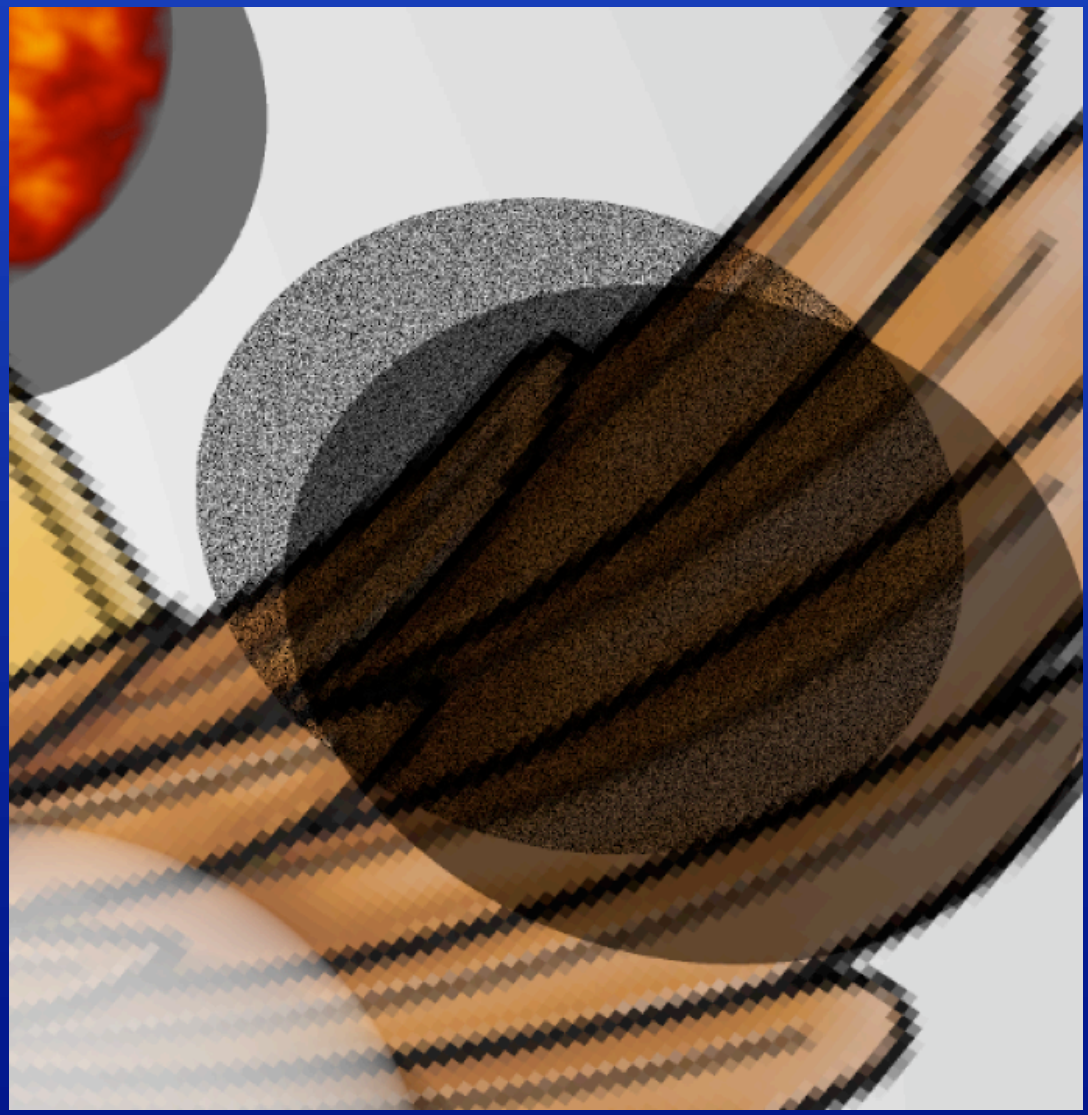
Diffuse component increases --->

Specular component increases --->

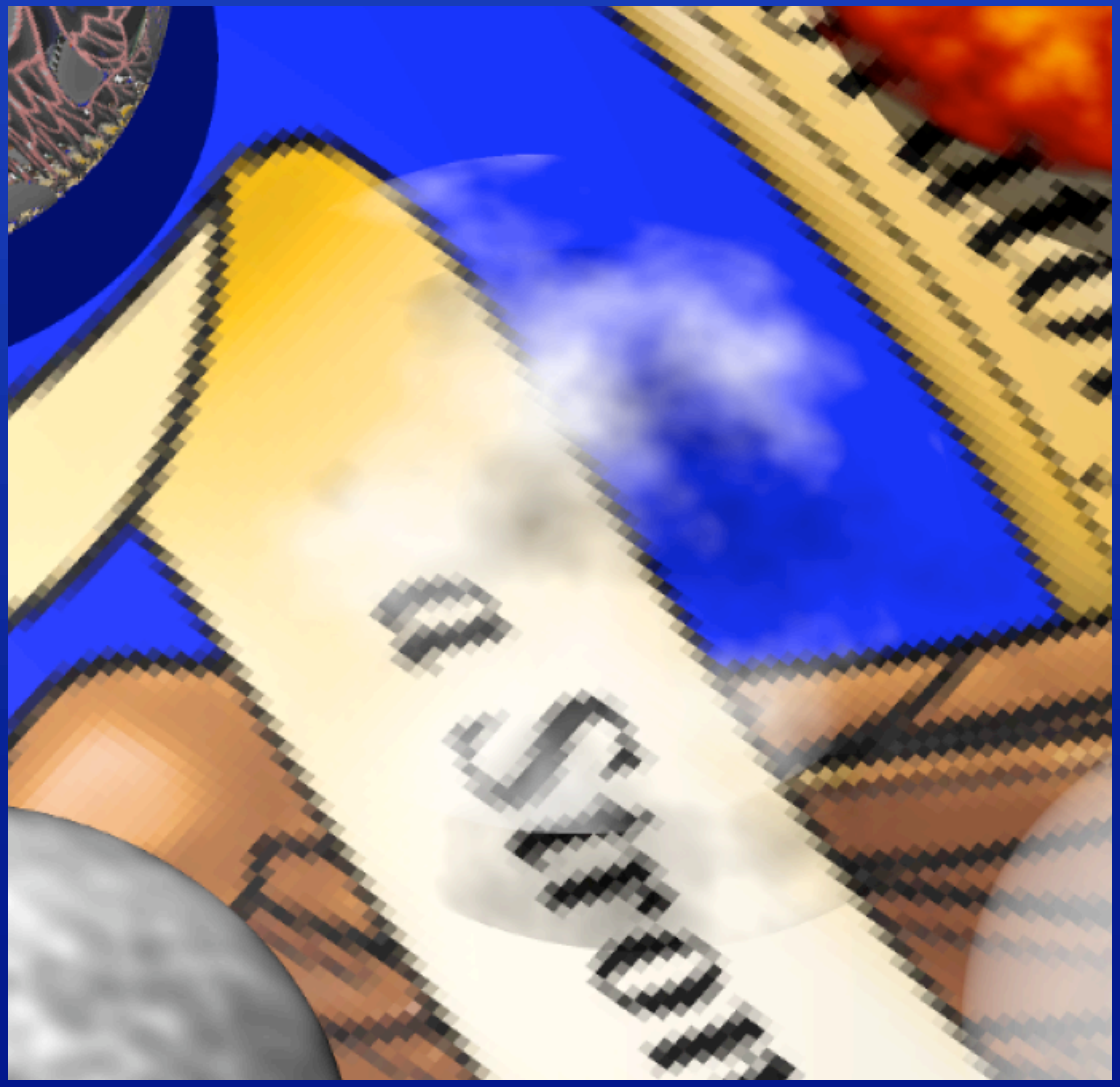
Projection Shader Example

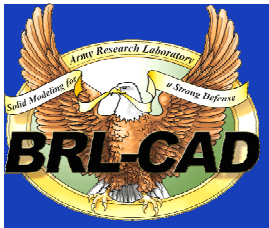


Rtrans Shader Example



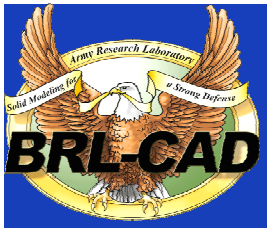
S-Cloud Shader Example





Stack Shader

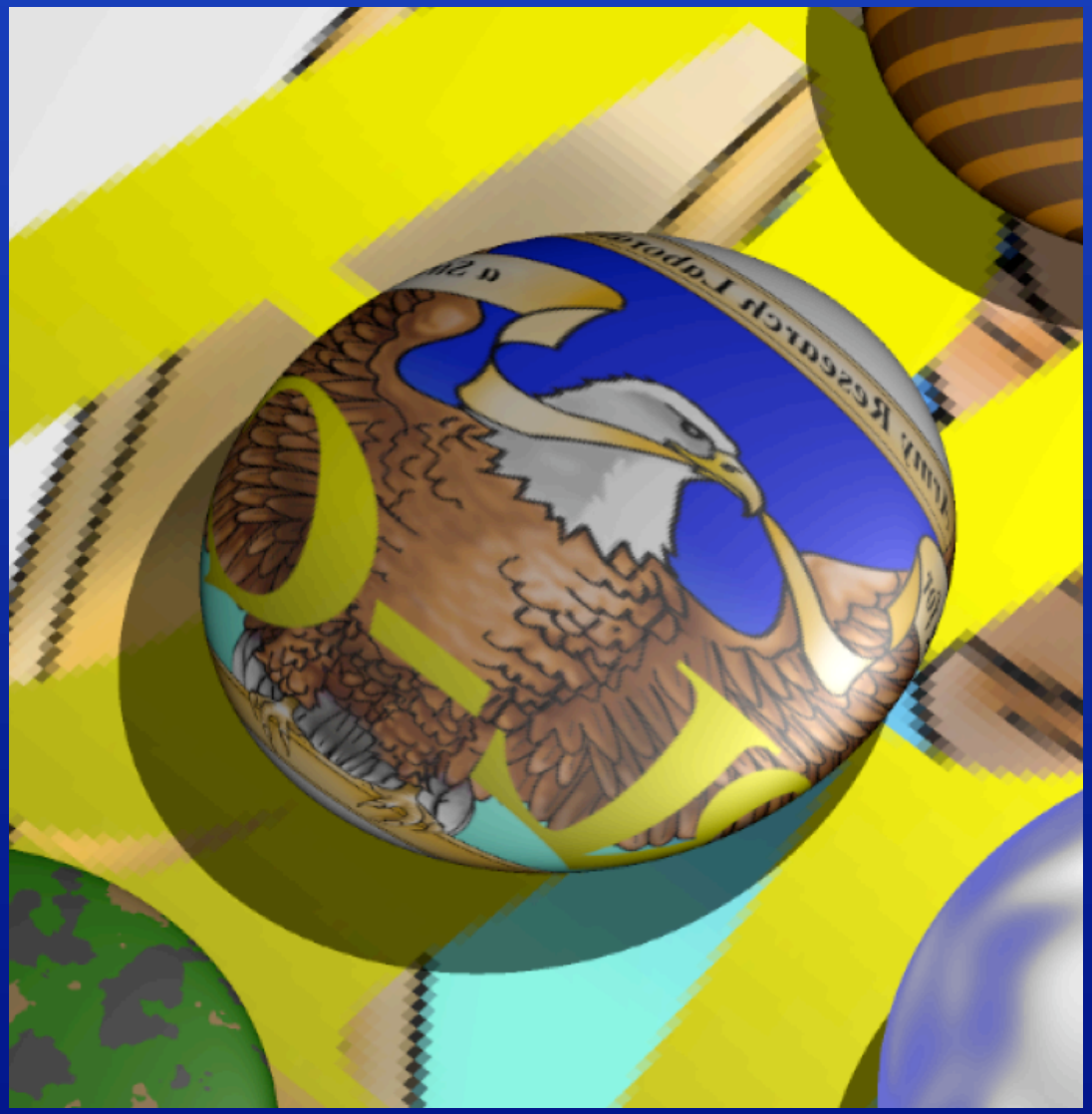
- Is the mechanism for combining several shaders to get a more complex effect
- The example images shown are all stacked with the Phong shader using the default plastic values, with the exception of the Flat shader example.



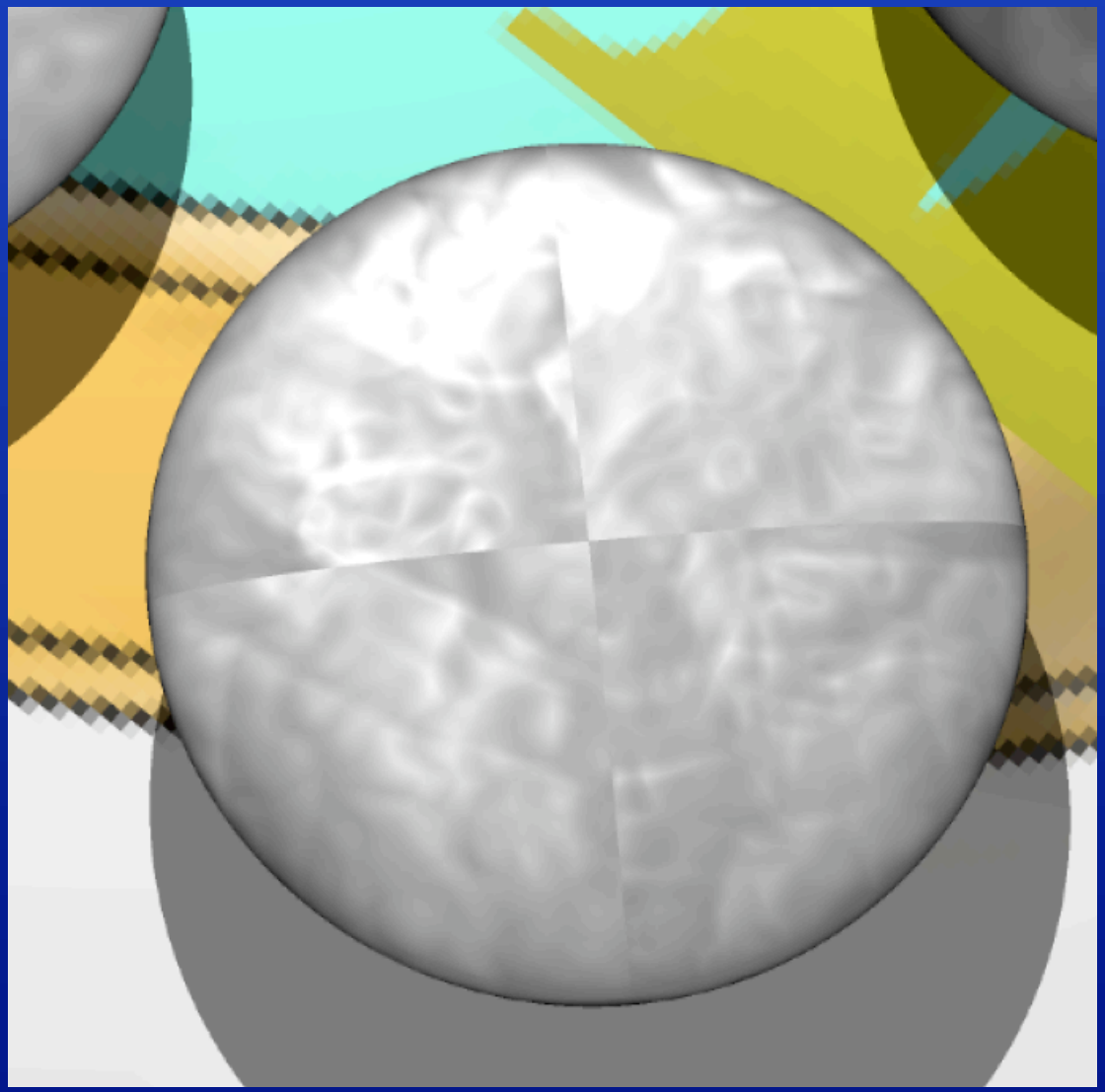
TclShaders

- Enables you to use any Tcl procedure as a shader
- Not a good idea where performance matters
- Should only be considered acceptable to use only when access to the source code is not possible

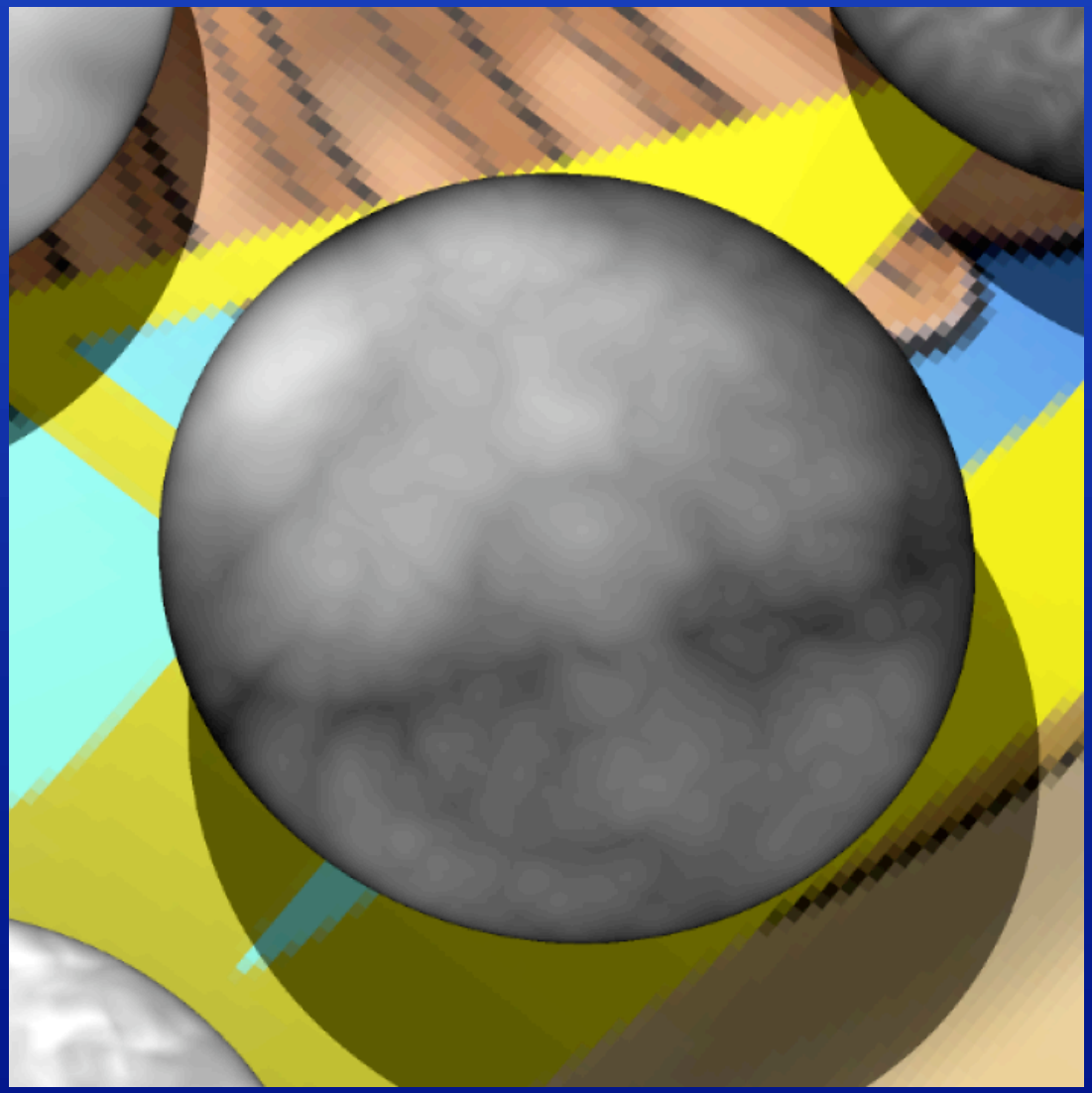
Texture Shader Example



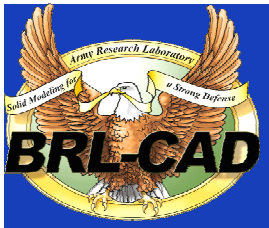
Turbump Shader Example



Turcolor Shader Example

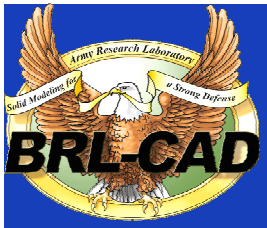


Wood Shader Example



Other Information

- All shaders are in the source distribution in `liboptical/`
- They are grouped according to functionality and parameters into the `sh_*.c` files
- See `liboptical/sh_xxx.c` for details on how to write a new shader from scratch
- See `liboptical/sh_null.c` for a rather simple example of a shader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BRL-CAD

End