

**SM2231 :: 3D Animation I :: Basic**

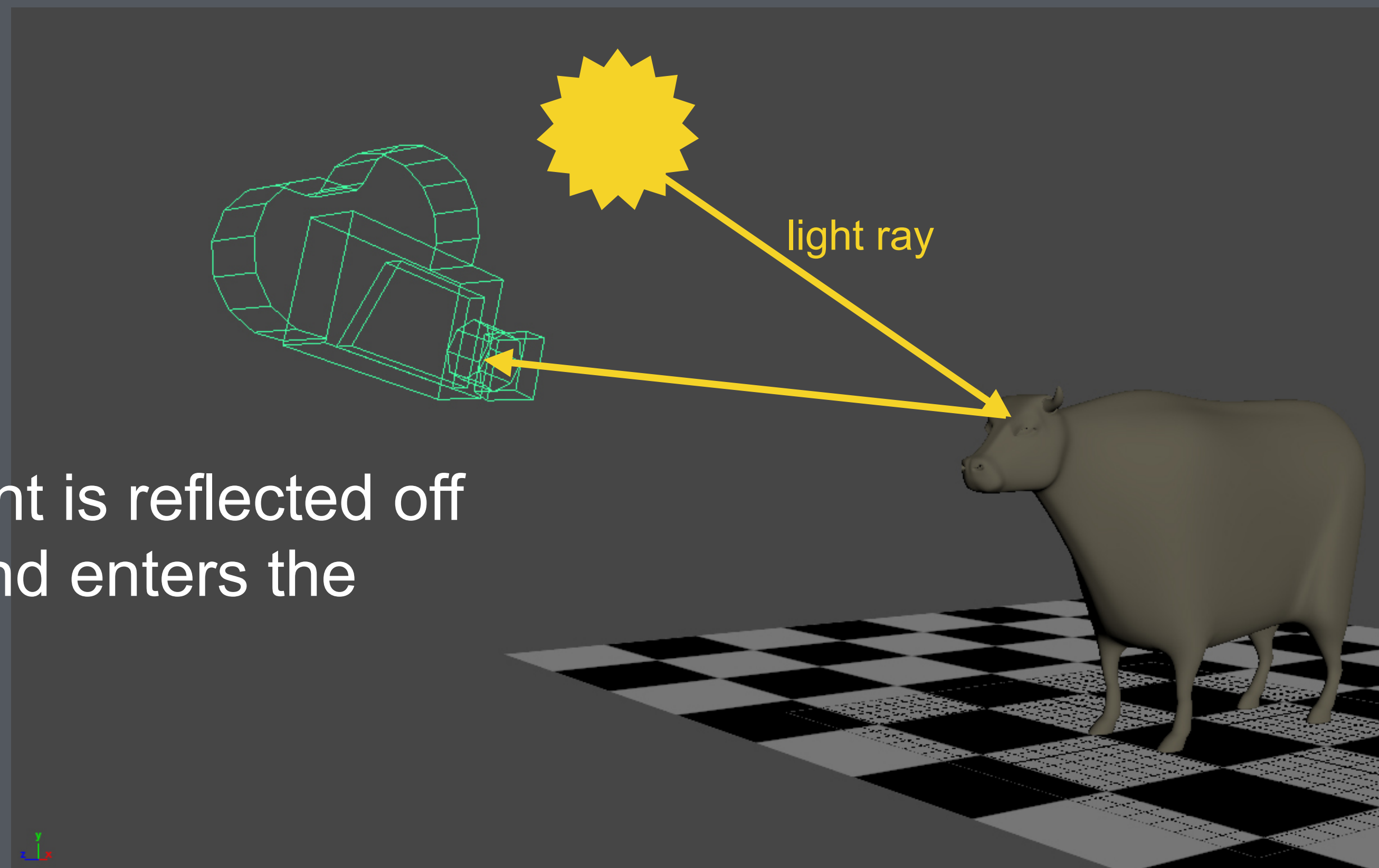
**Surfacing**

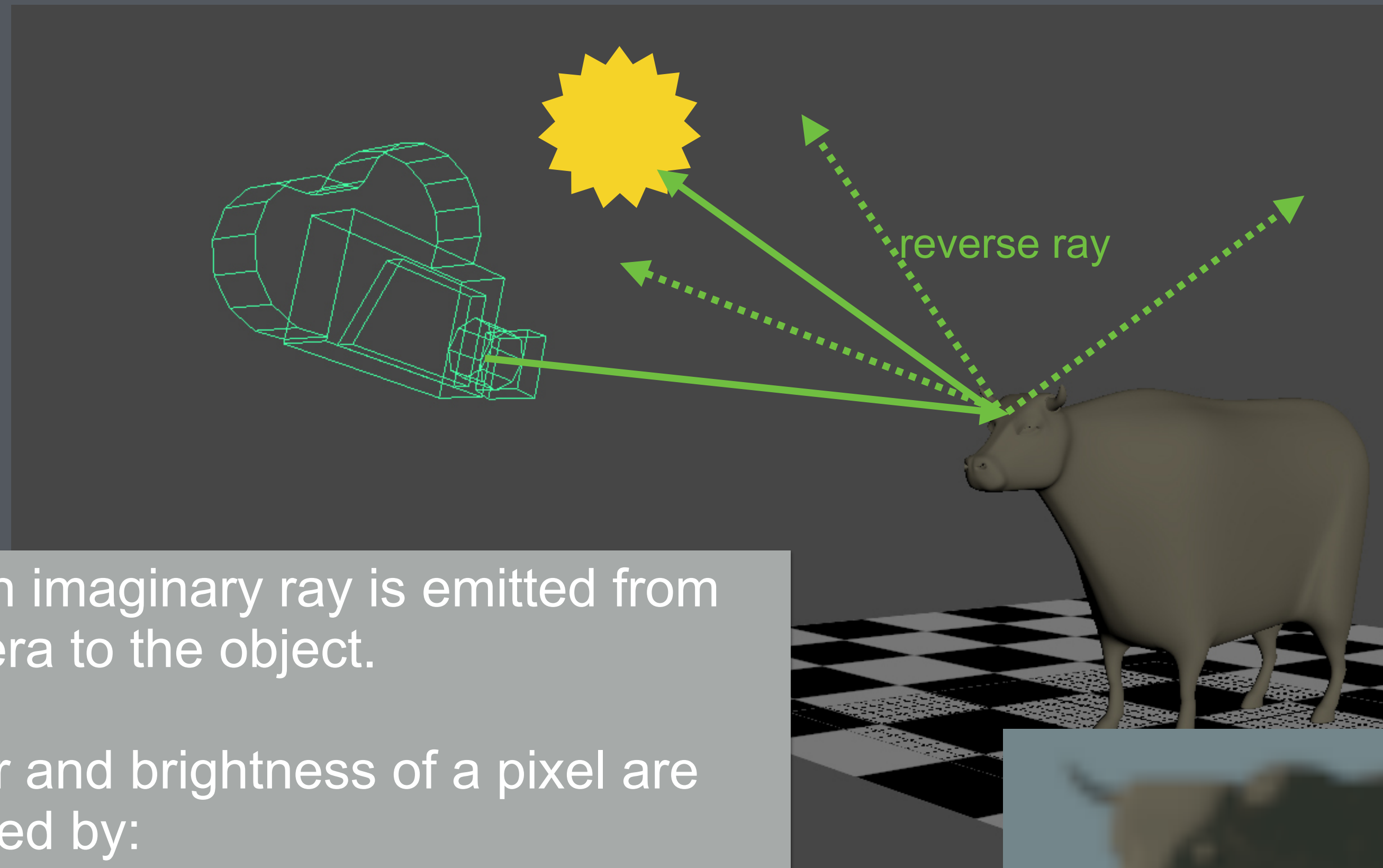
# Terminology

- Shading
- Surface Material
- Texture

**Shading**

In real life, light is reflected off of surfaces and enters the camera





In CG, an imaginary ray is emitted from the camera to the object.

The color and brightness of a pixel are determined by:

- Surface material
- Direction and Intensity of all incident light rays.

This mechanism is called “Shading”



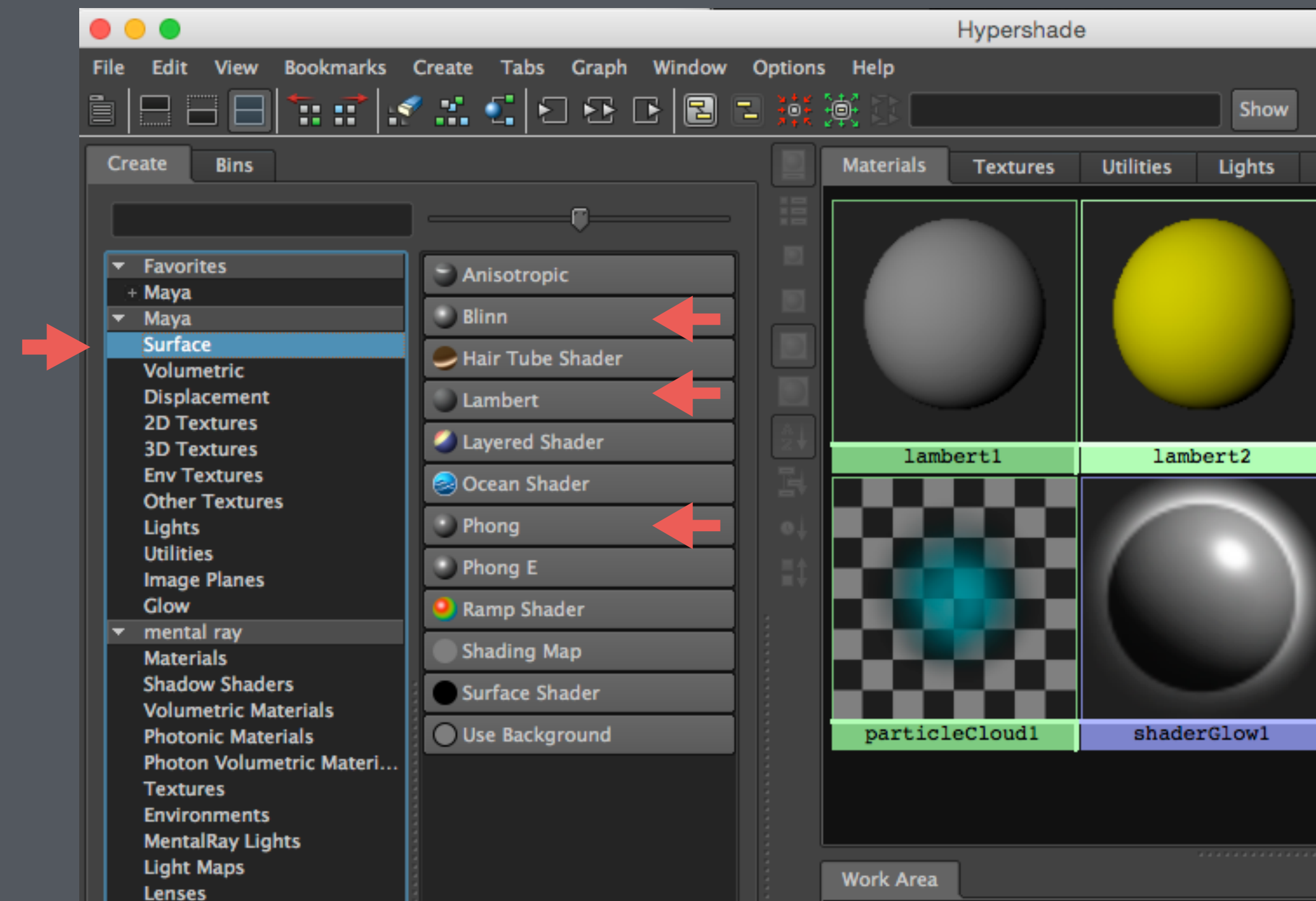
# Surface Materials

# Basic Surface Materials

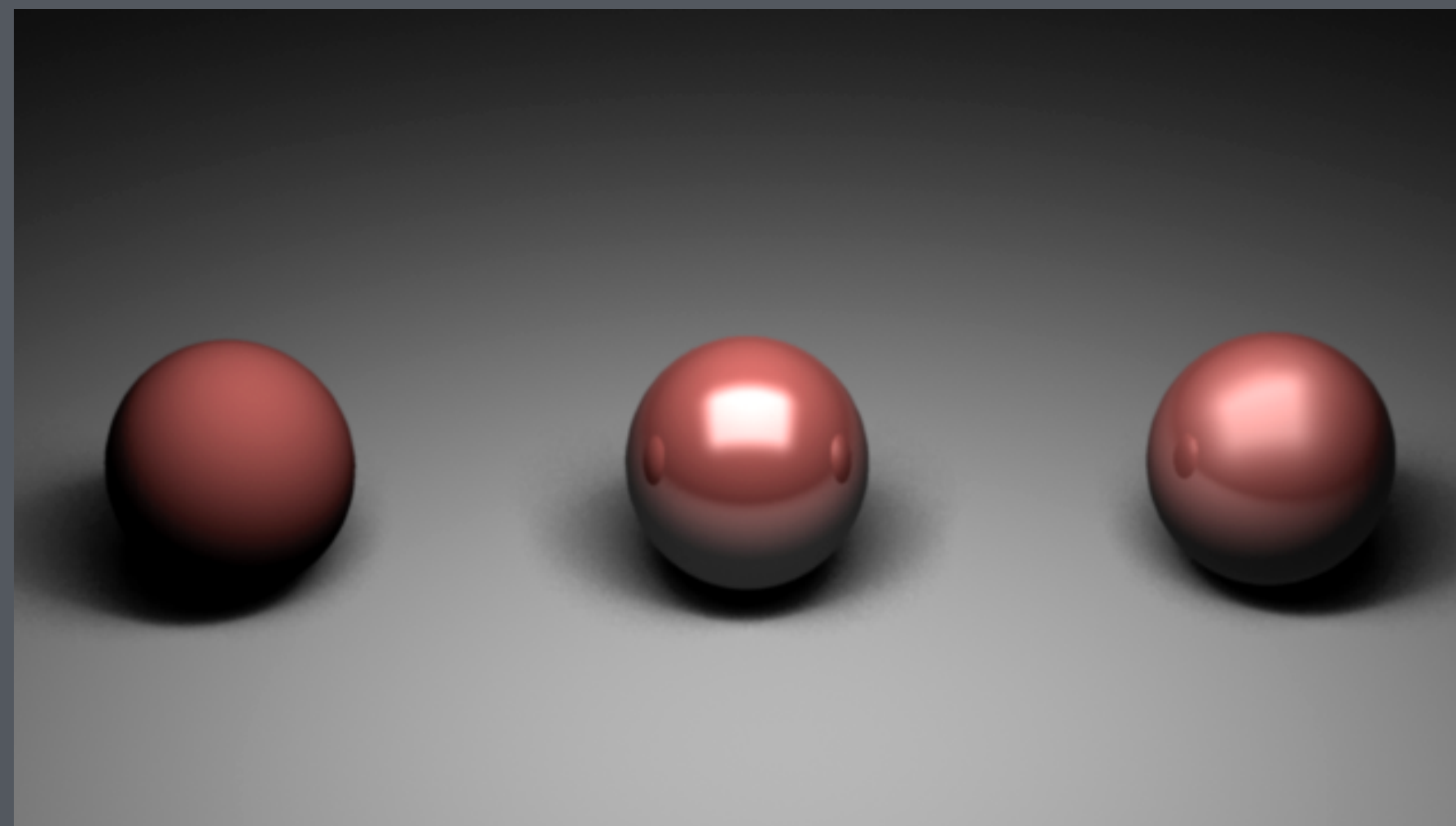
- Lambert
- Phong
- Blinn
- ...

Shading algorithms are named after the person who invented them

# Basic Maya Surface Materials







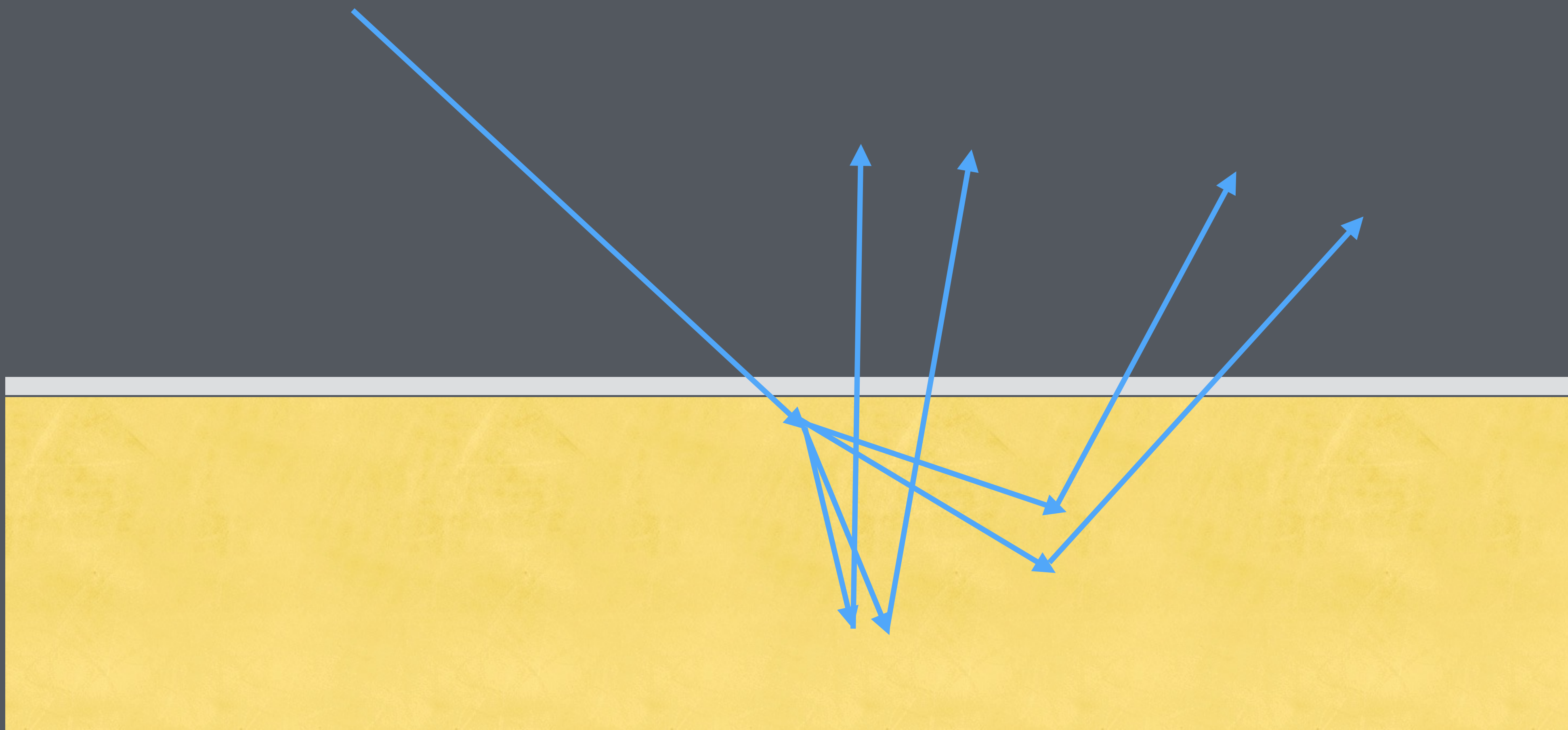
Lambert

Phong

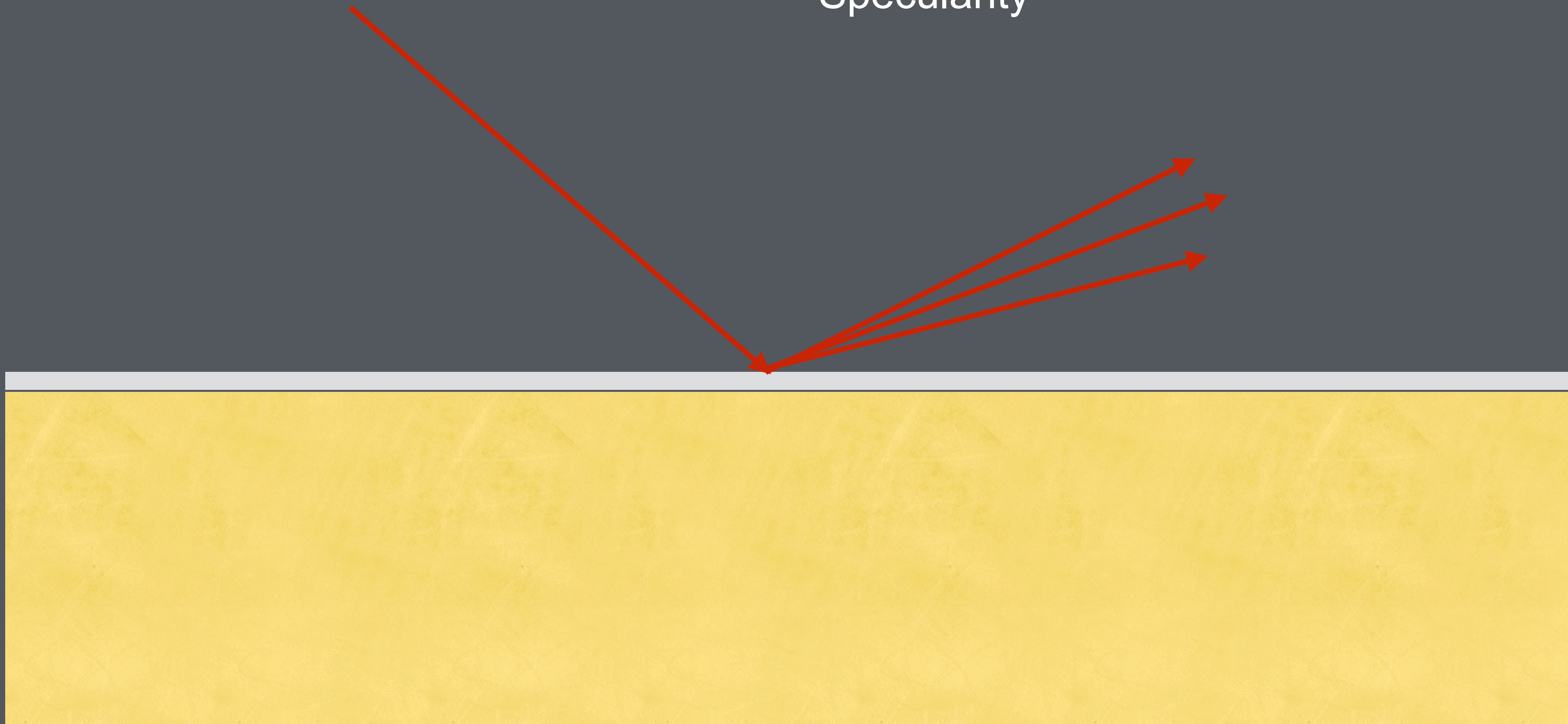
Blinn

	<b>Lambert</b>	<b>Phong</b>	<b>Blinn</b>
<b>Reflective?</b>	No	Yes	Yes
<b>Glossy?</b>	No	Yes	Yes
<b>Examples</b>	Rubber, Paper	Plastic, Metal	Brushed Metal

Diffuse

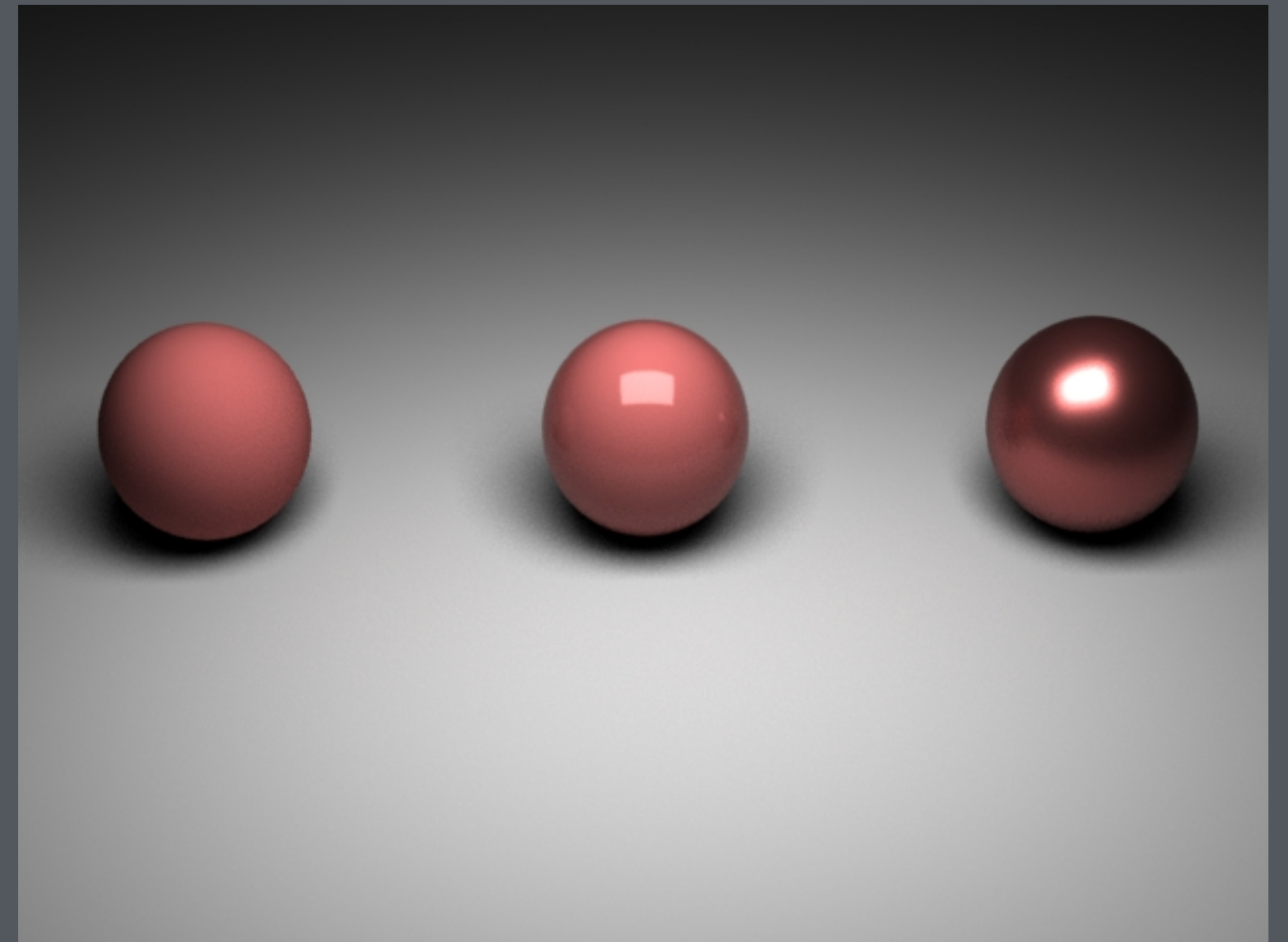


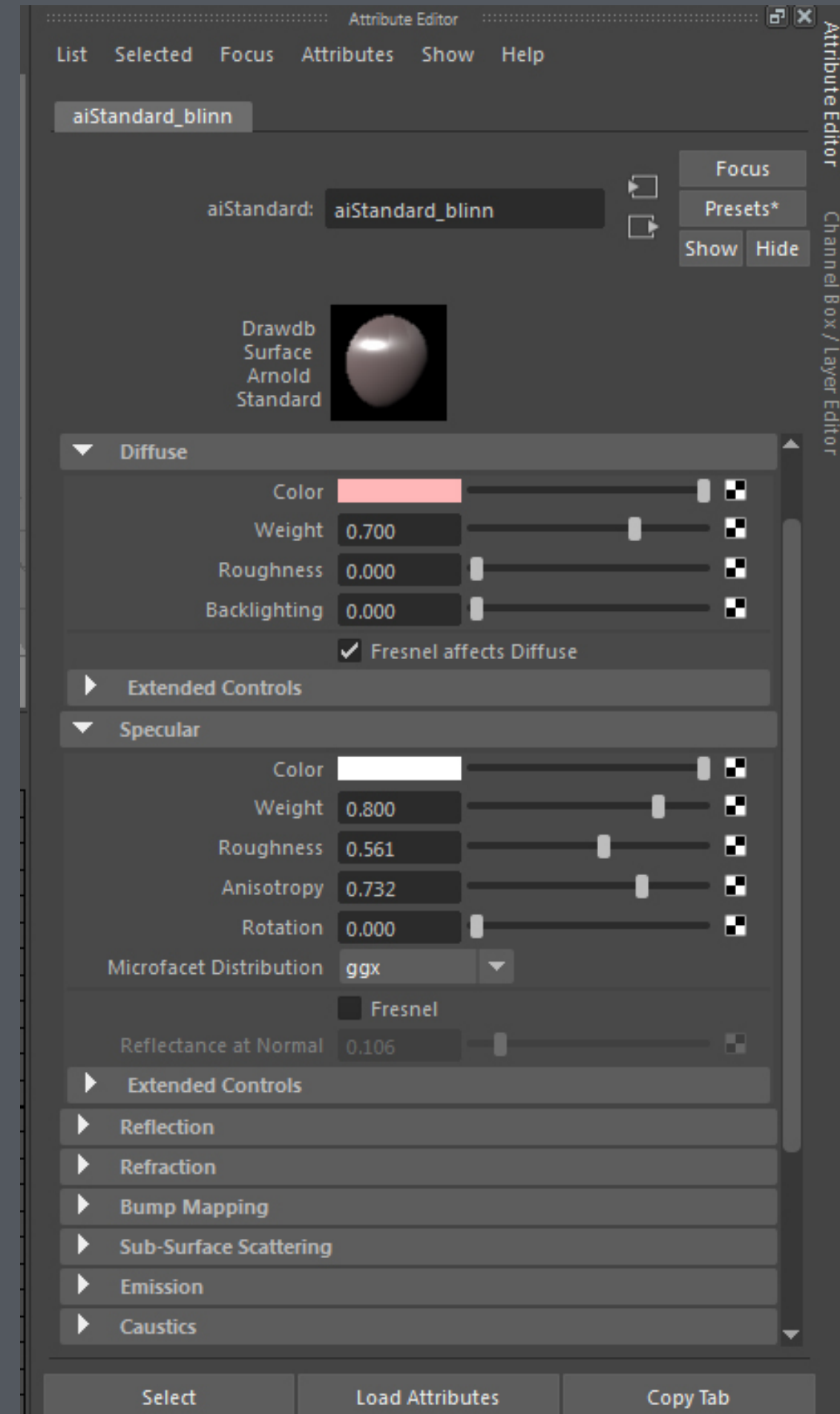
Specularity



# Arnold Standard Material

- In Arnold, the *aiStandard* surface material possesses all the capabilities of the traditional Phong, Lambert and Blinn.





**Textures**

# Textures

- Textures add details to a surface
- E.g. Adding color variation
- E.g. Adding variation to roughness



# File Texture

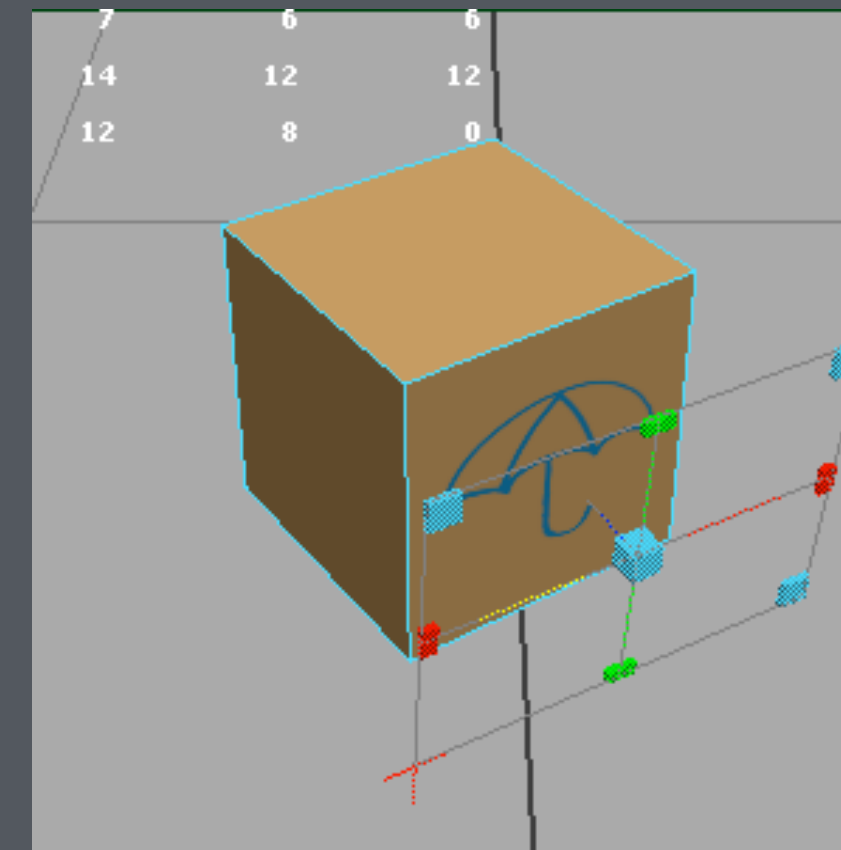
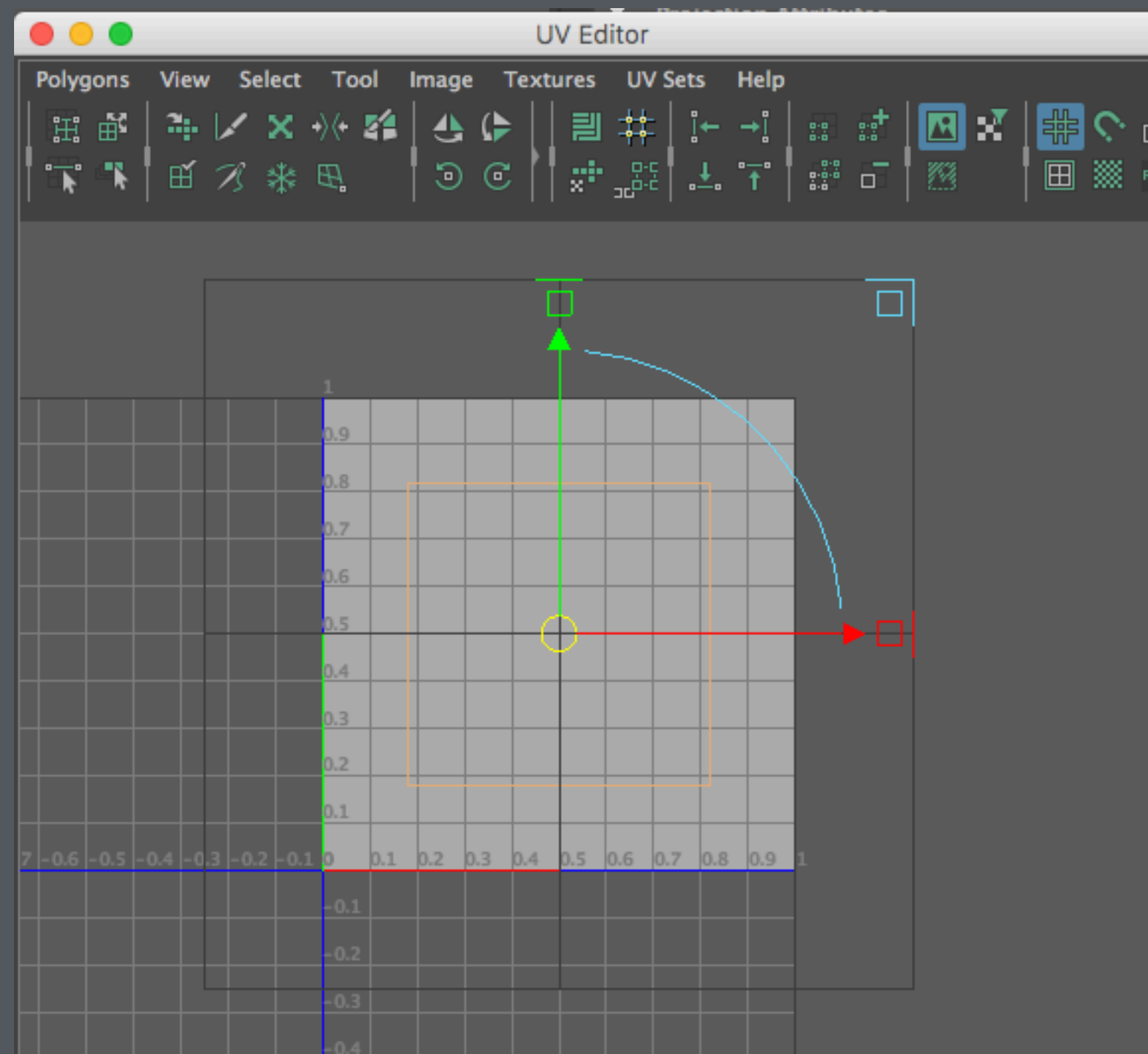


# UV Mapping

# UV Mapping

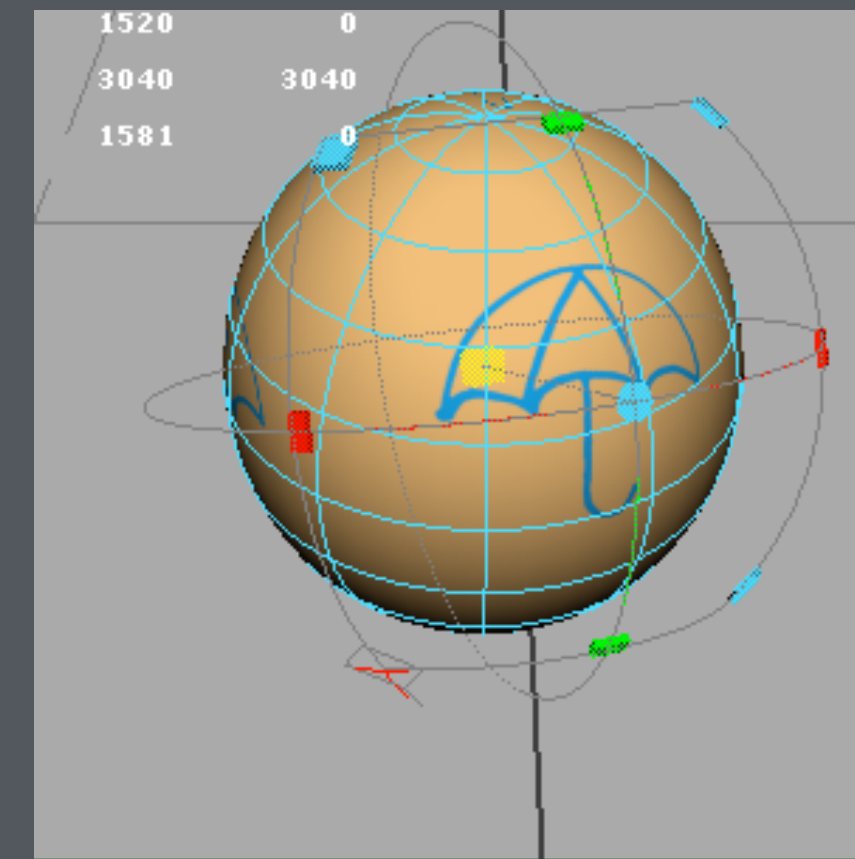
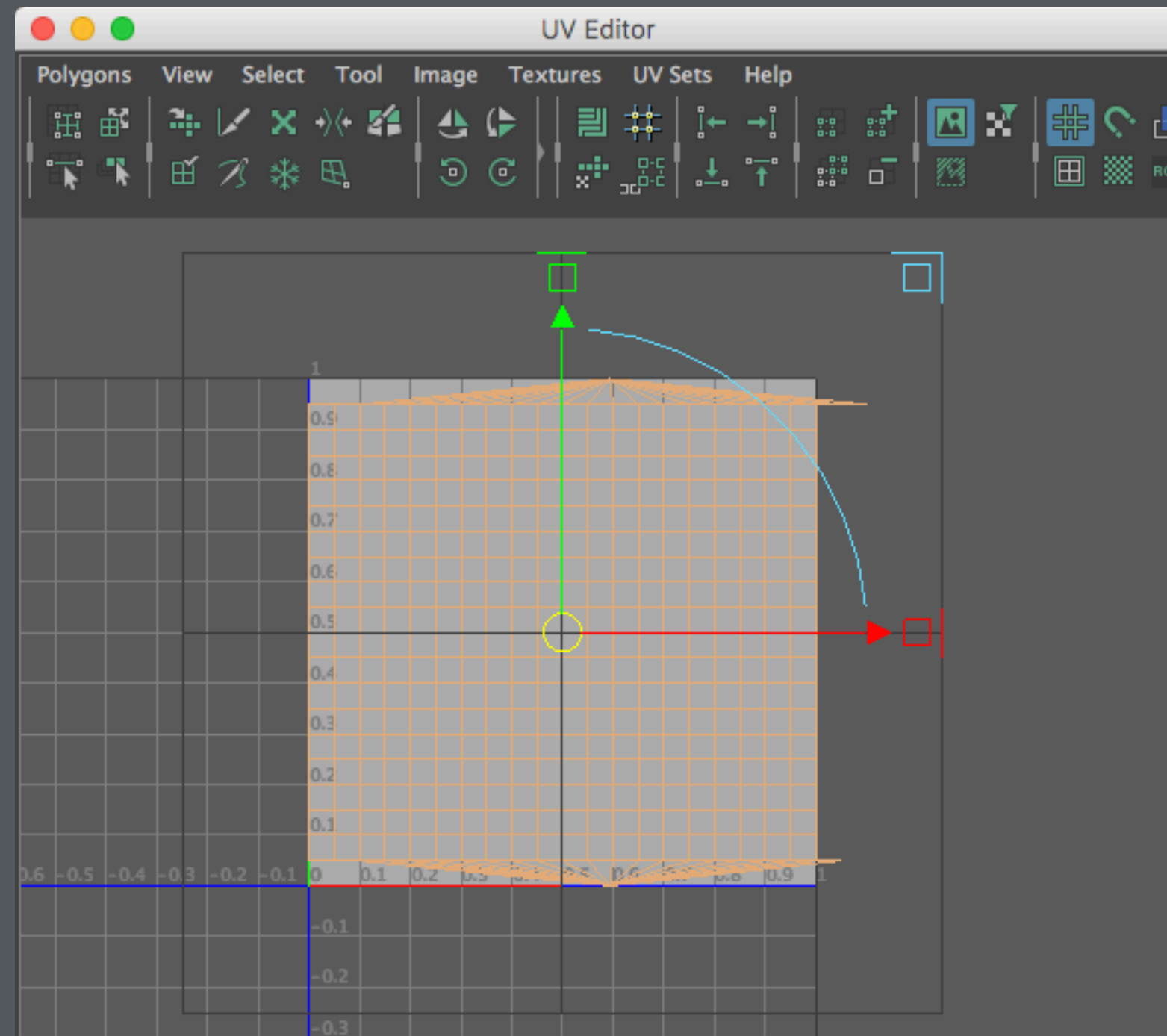
- Flatten the 3D surface onto a 2D space
- The 2D space has two axes - U and V

# UV Mapping



Planar Mapping

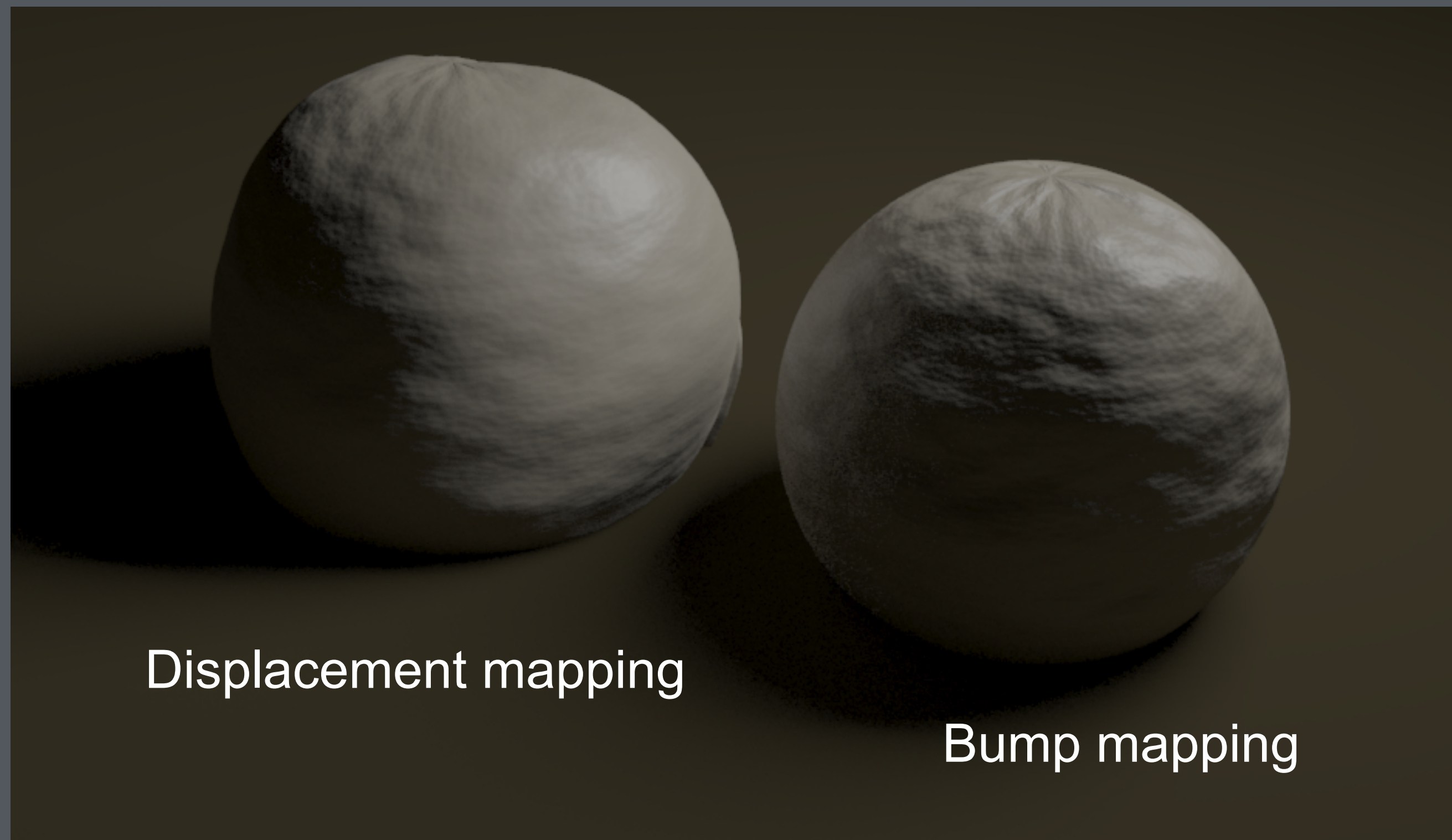
# UV Mapping



Spherical Mapping

# Surface Relief

# 2 ways to create Surface Relief



Displacement mapping

Bump mapping

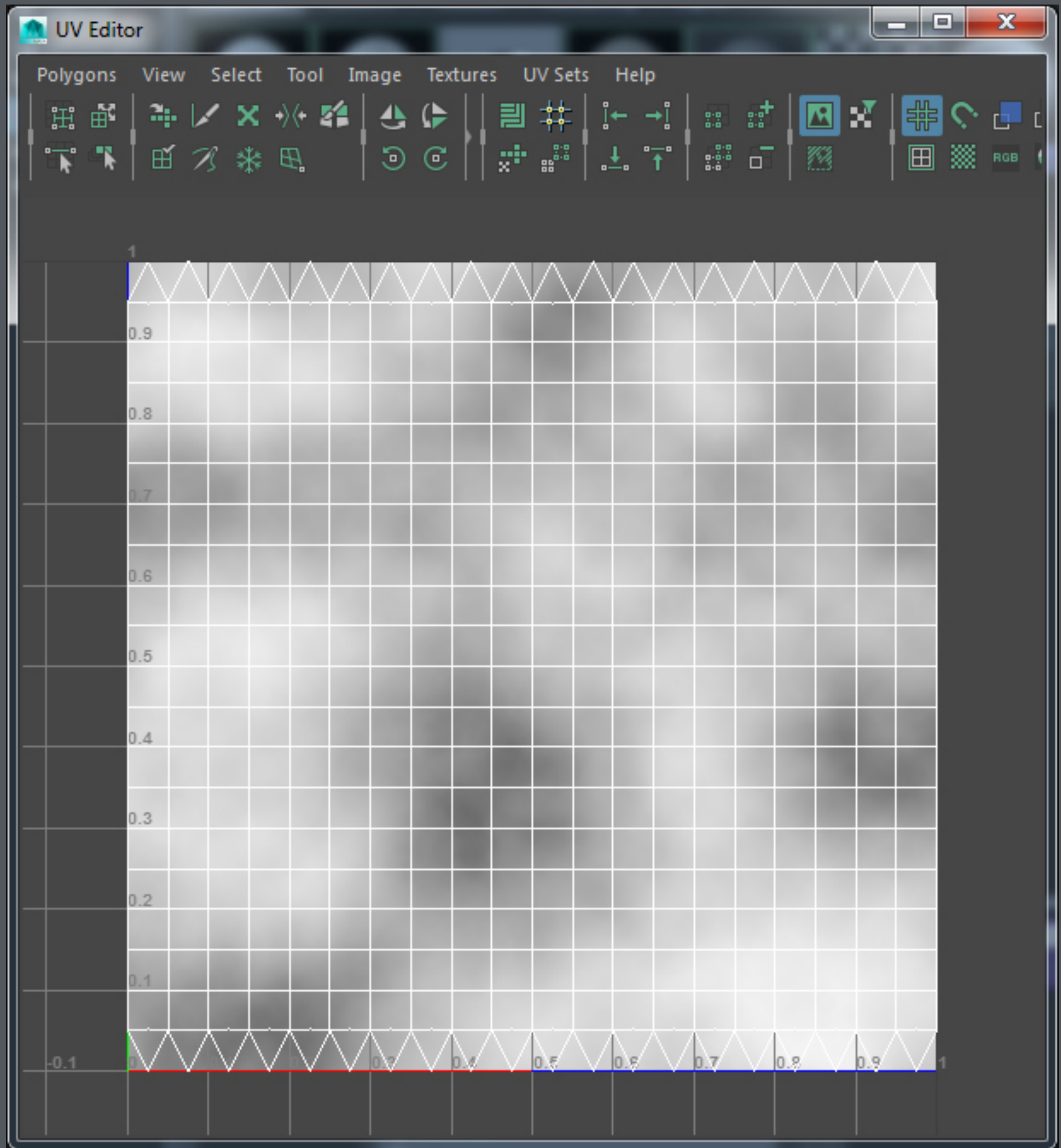
# Bump Mapping

- Cheap way to create illusion of bumpiness
- The surface is not altered
- The illusion is created through the variation of light and shade
- Surface relief not visible on edges



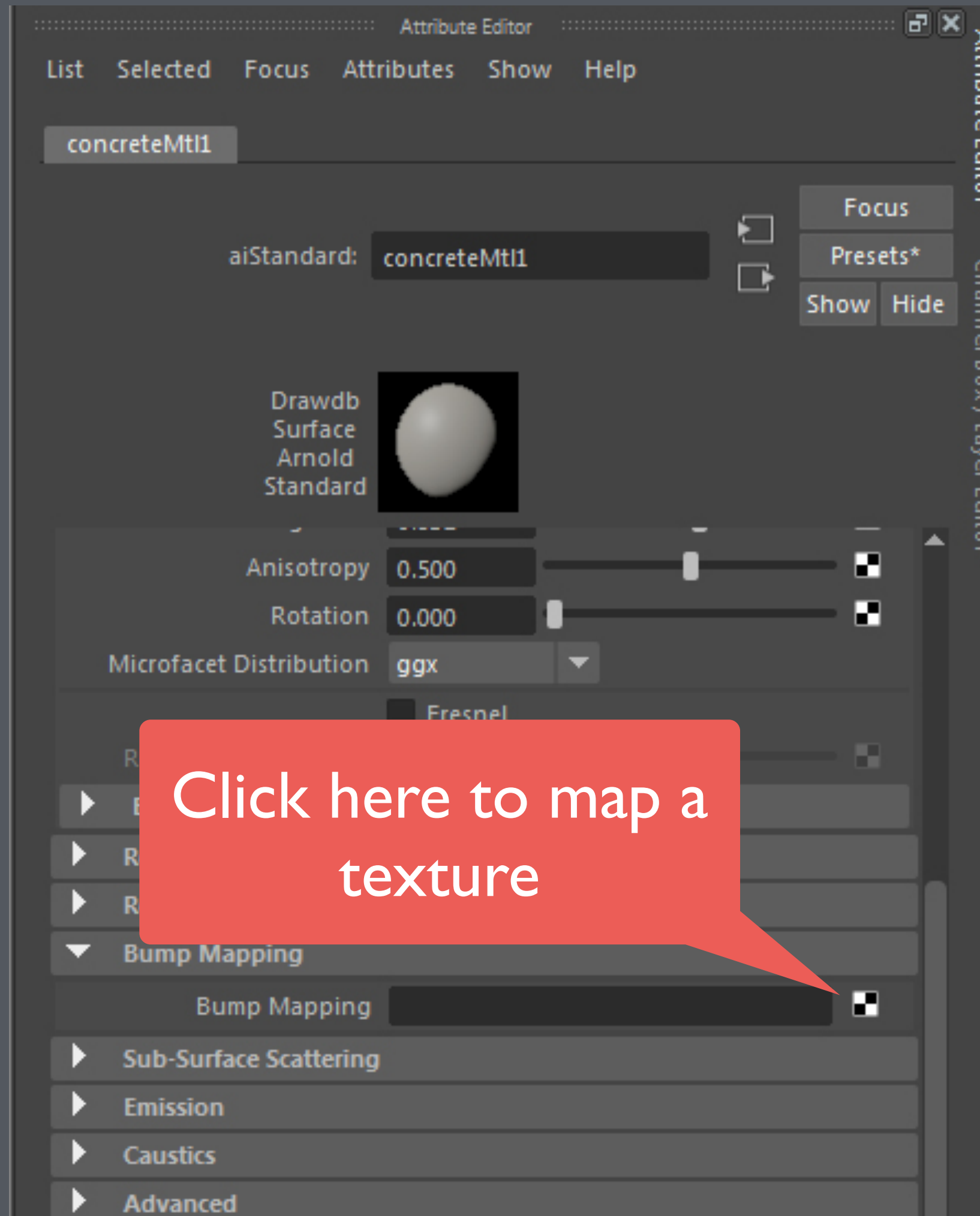
# Displacement Mapping

- Surface is actually subdivided and modulated at render time
- Expensive to render

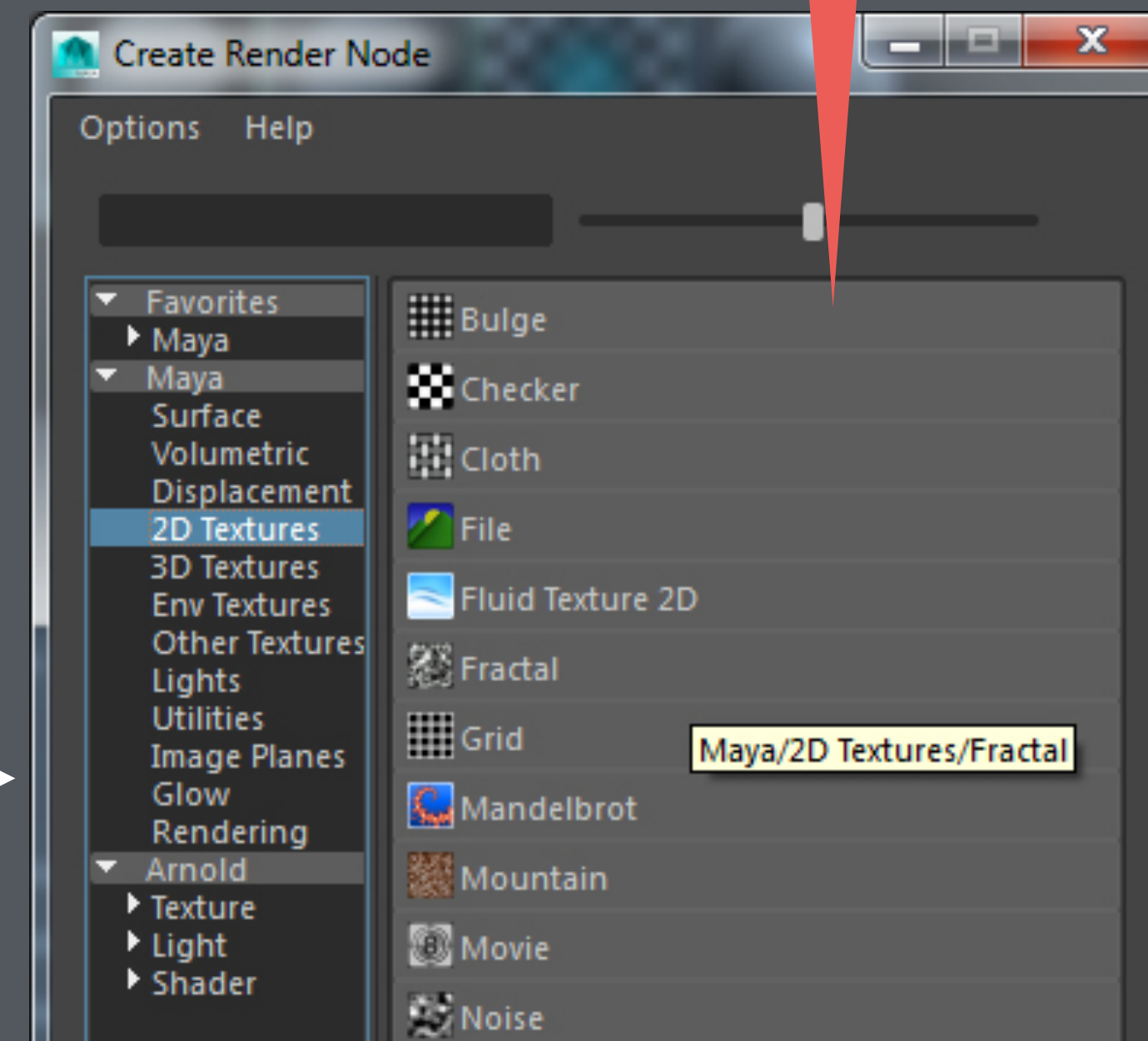


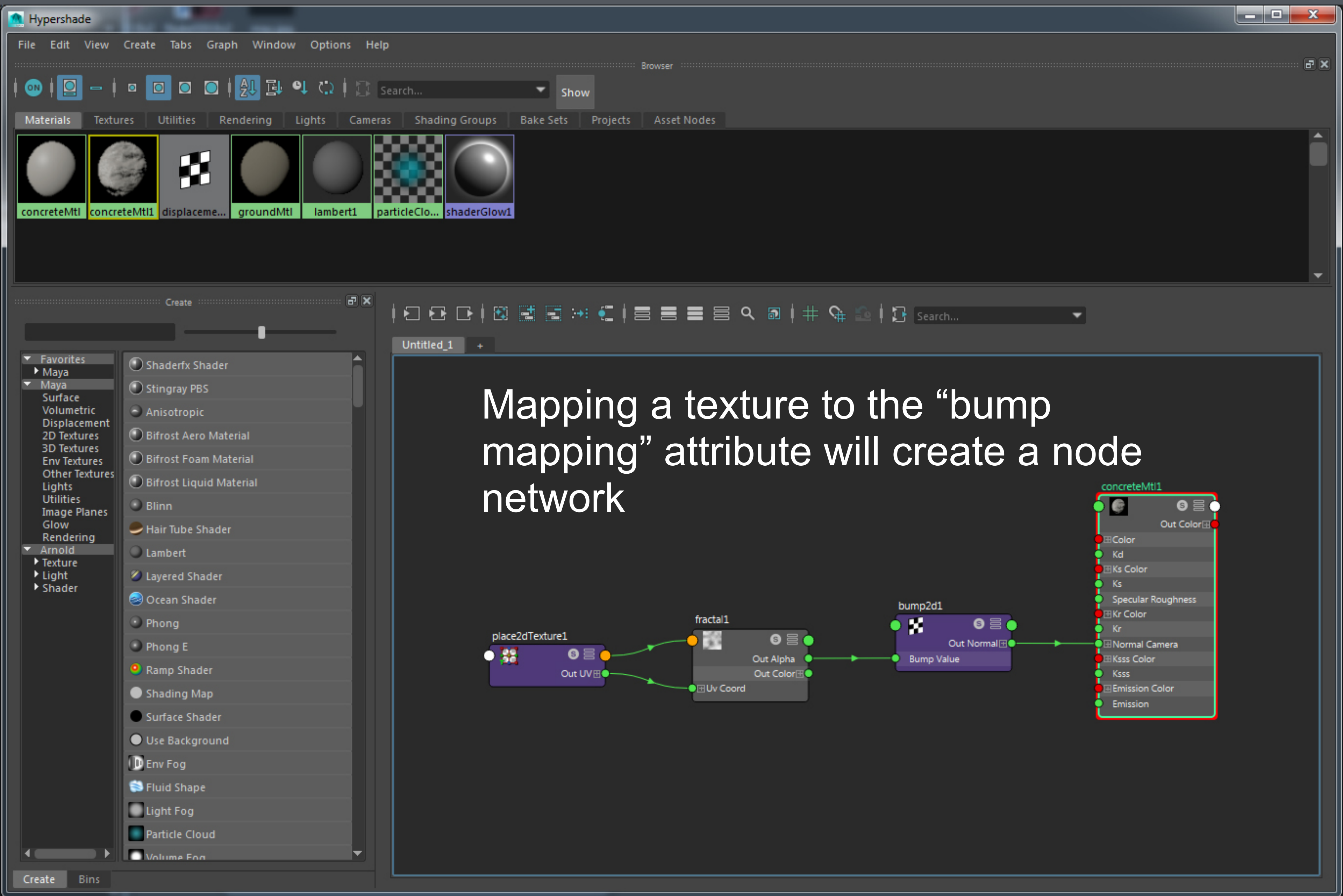
In both displacement and bump mapping, the amount of surface relief is modulated by the variation of the brightness in the texture.

# Creating the Bump Map

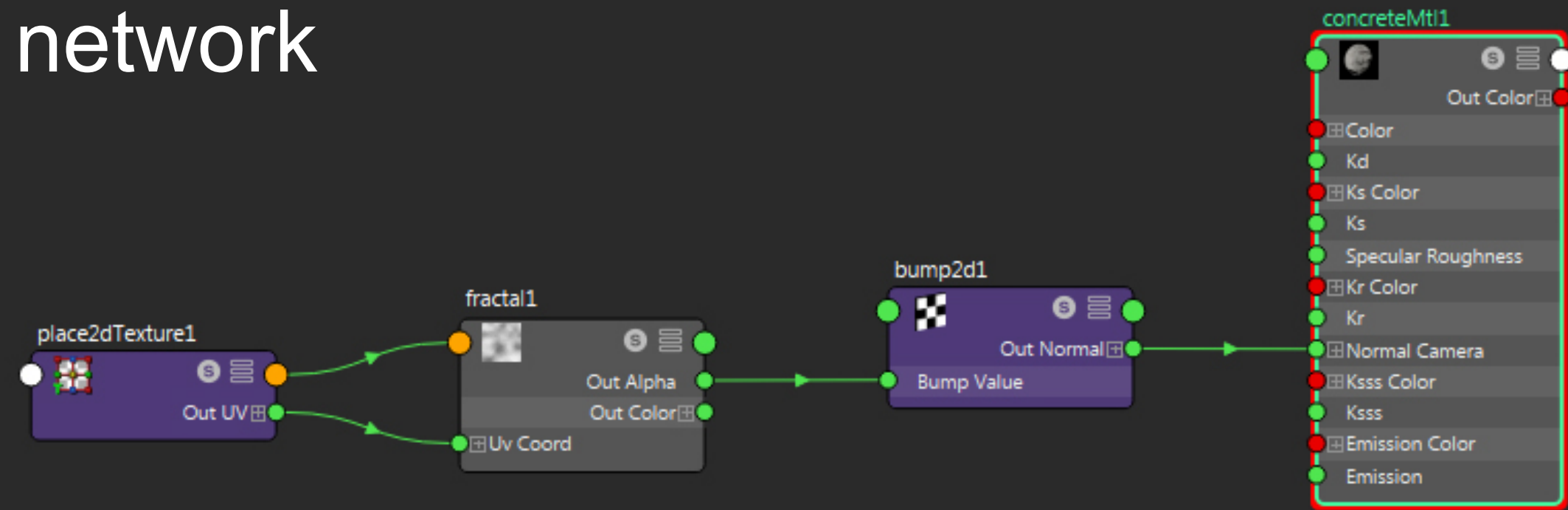


Choose a texture from the list here





Mapping a texture to the "bump mapping" attribute will create a node network



# Displacement Mapping

- The surface is subdivided and altered
- This requires more computing resources (i.e. memory and processing time), therefore, is usually slow to render
- Only use displacement mapping in situations where the surface relief needs to be seen on the edges

# Creating the Displacement Map

