# Specular Light

Basically the reflection of light source on a surface

This is very straight-forward if surface is a mirror

See for example the Chicago "Egg"...

# Non-mirror surfaces

It is more complex if surface is not a perfect mirror

The right sphere is fairly "glossy", but not a mirror

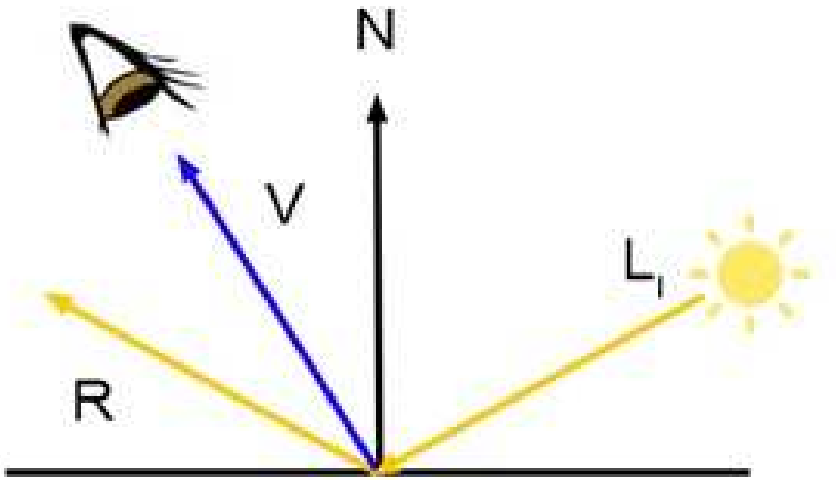
Roughness / imperfections on surface scatter light

And cause the specular spot to "spread"

# Implementing Specular Spread

See how far off the view angle "V" is from the "perfect mirror" light reflection vector "R"

The closer the view is to reflection direction, the brighter you paint the pixel !



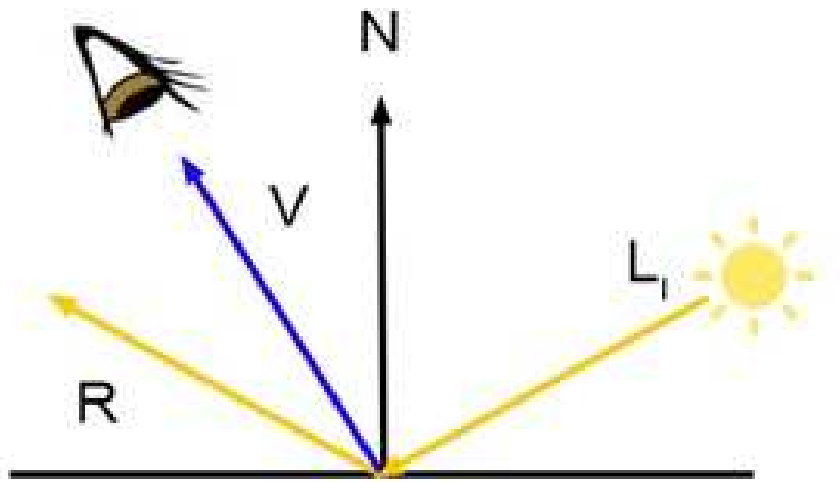
# The Maths

To determine the difference in direction,

calculate the dot product of "Reflection" & "View"

DP ranges from 1.0 (when directions are identical)

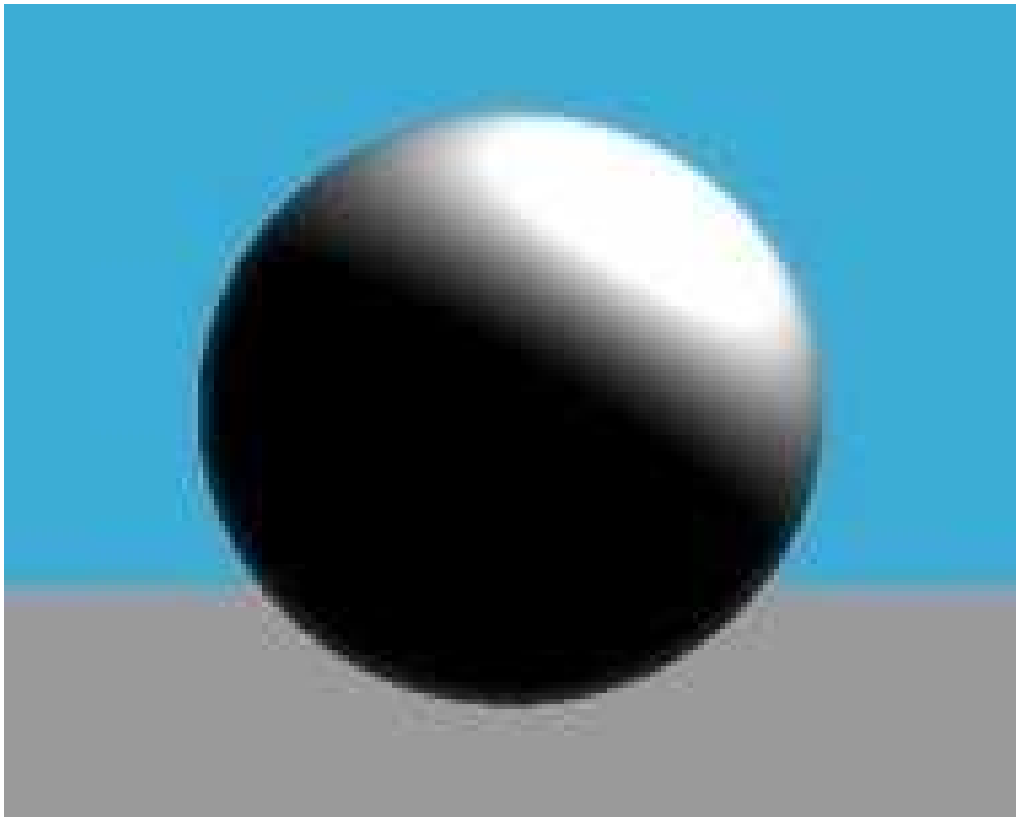
and reaches 0 when the directions are perpendicular



# Applying the Result

We then use this number to set pixel brightness

Problem is that this results in a very broad spread...



# Specular Exponent

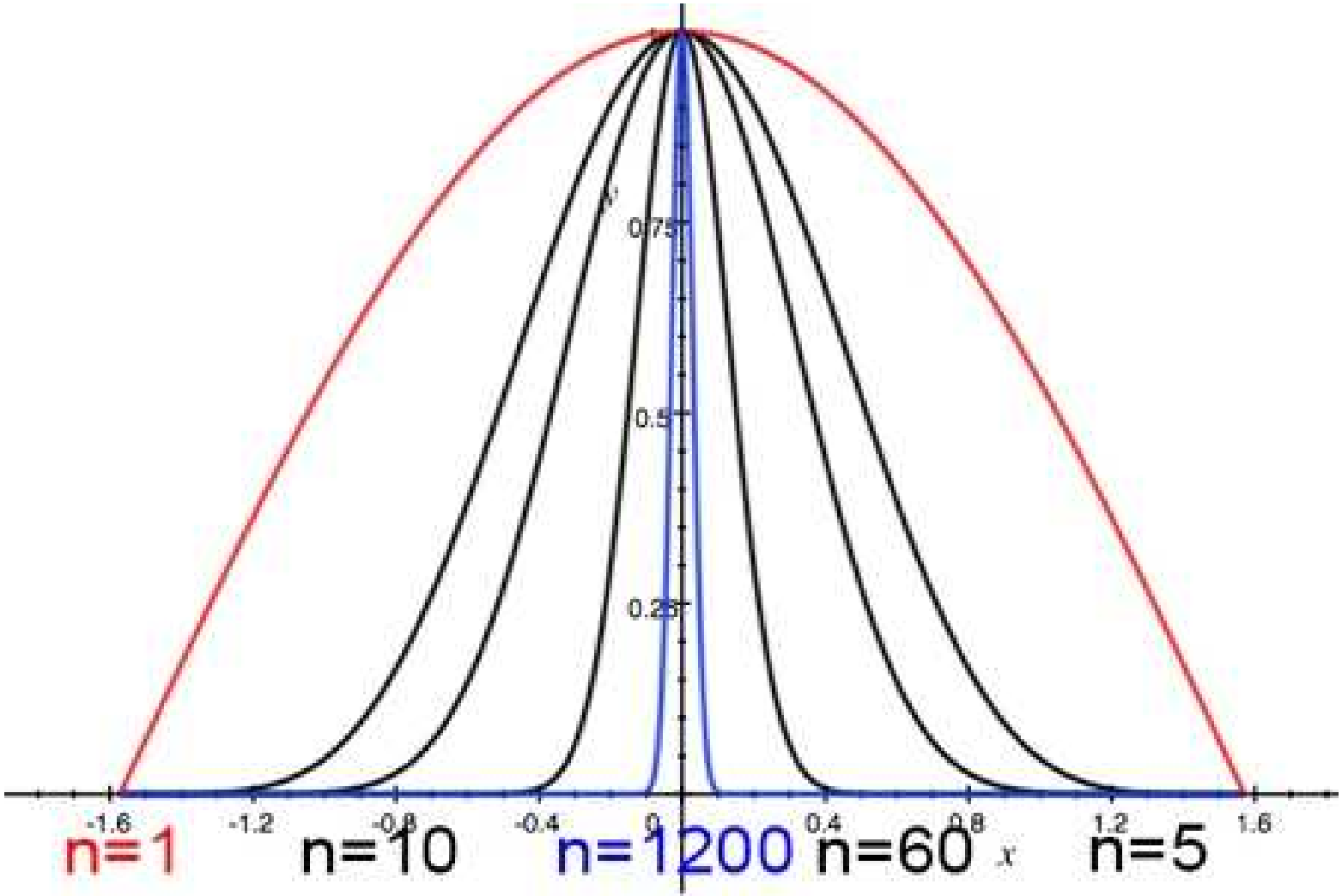
We can adjust spread by raising result to power n

$$( V \cdot R )^n$$

The value we give this exponent depends on how glossy/matt we want surface to appear

Higher the number, the tighter the "spot"
and the glossier/shinier the surface will appear...

# Specular Exponent Spread Patterns



# Specular Exponent Appearance