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NOV
02

# Brianna Wu on "Gamergate and the War Against Women in Tech"

by HeForShe Advocate for the Math Faculty

Free

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**DESCRIPTION**

Brianna Wu became one of the most high-profile women in the tech industry after standing up to Gamergate, a hate group targeting advocates for inclusion in the game industry. In this talk, she discusses how tech became so hostile to women and how we can fix it.

**DATE AND TIME**

Wed, November 2, 2016
3:30 PM – 5:00 PM EDT
Add to Calendar

# Local Illumination

## Physical principles

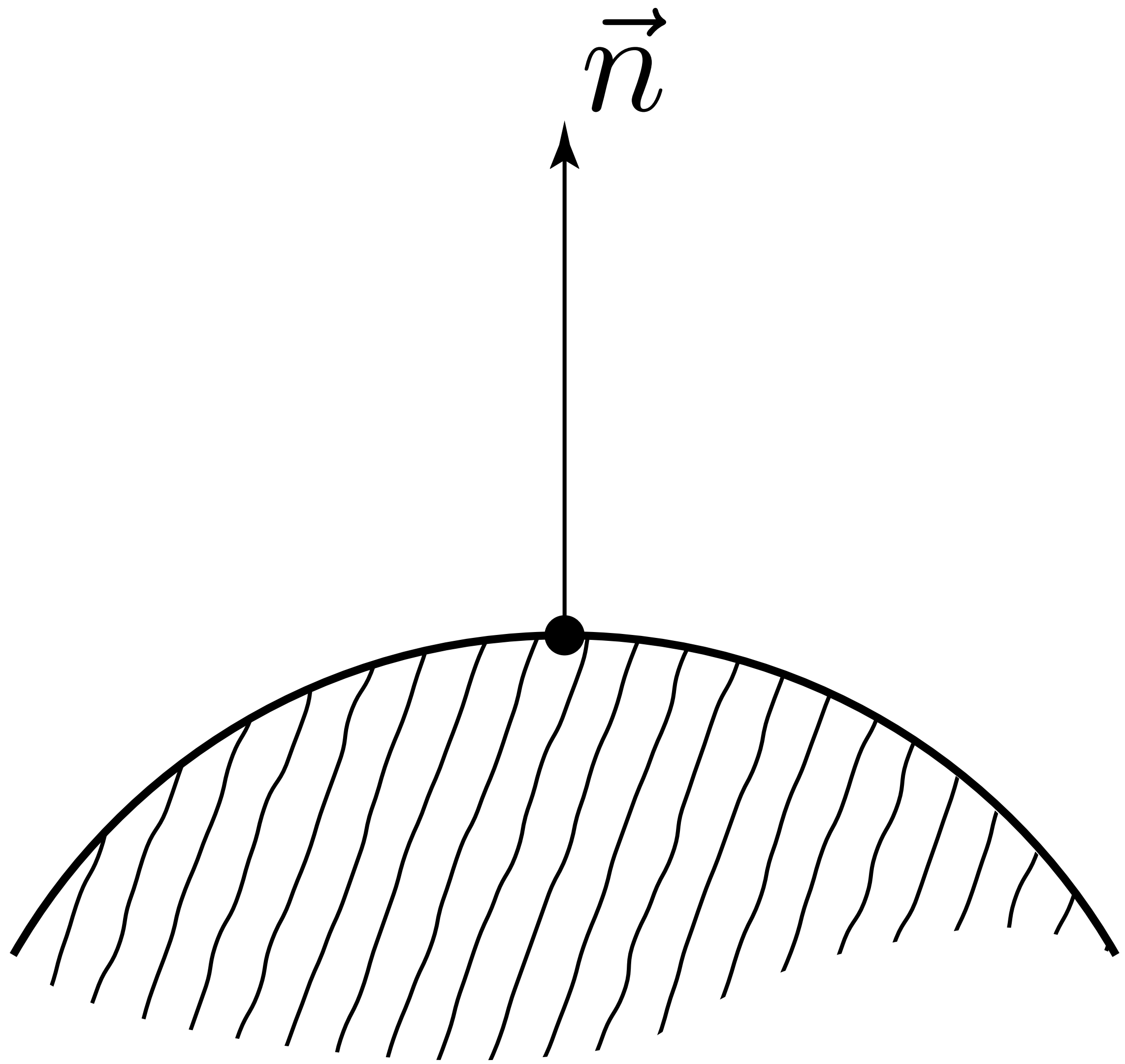
Conservation of energy

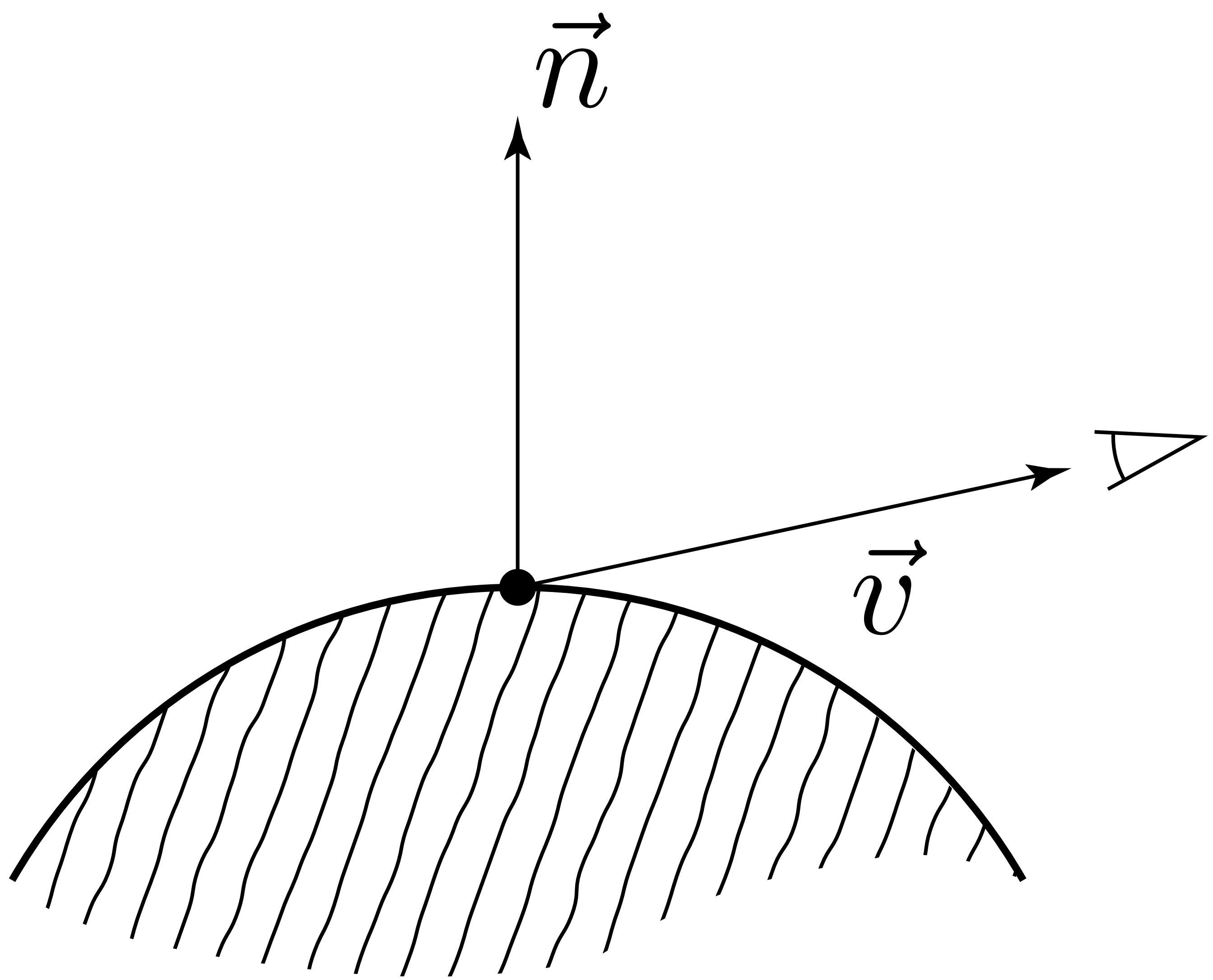
Linearity of reflection

## Simplifying assumptions

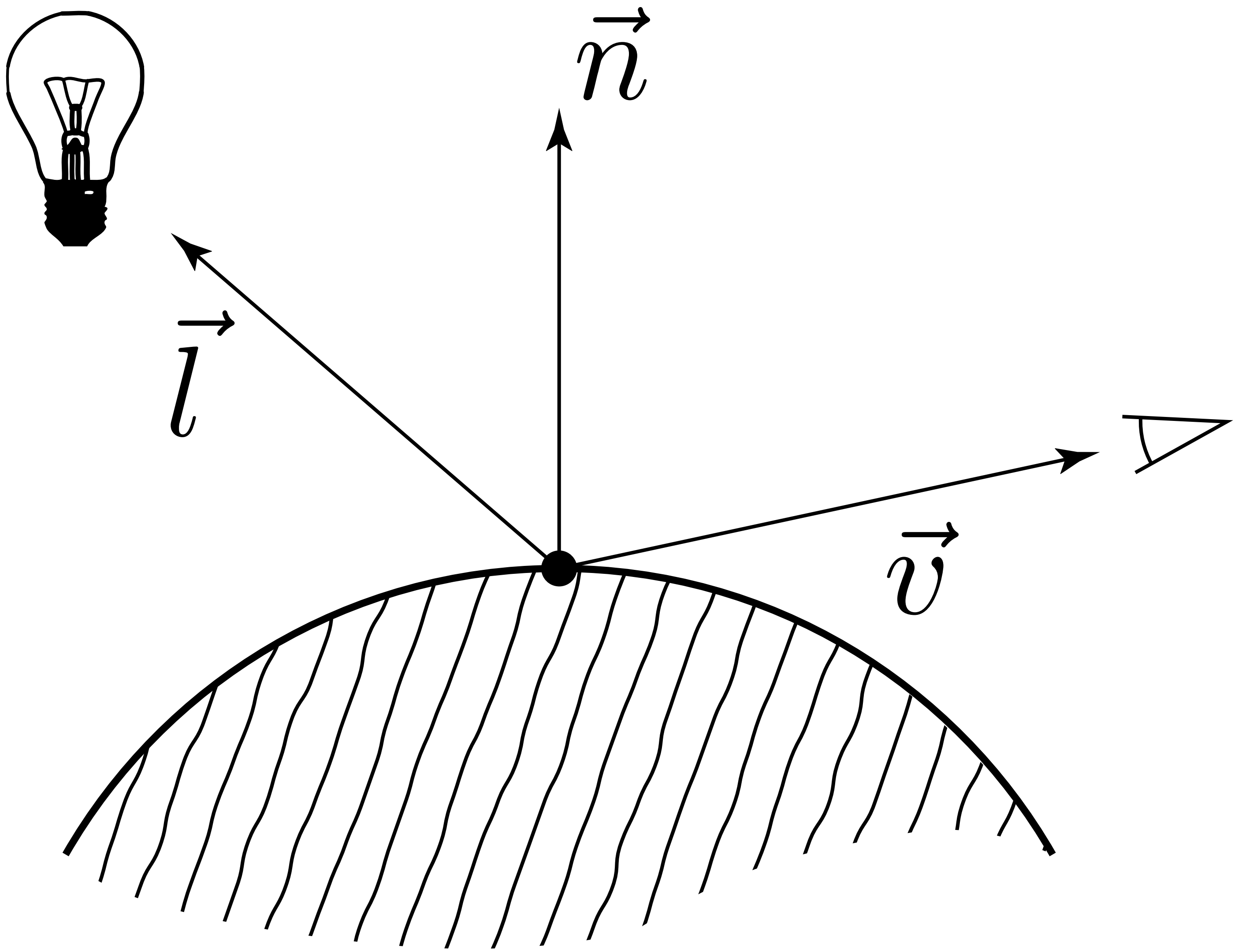
No global illumination

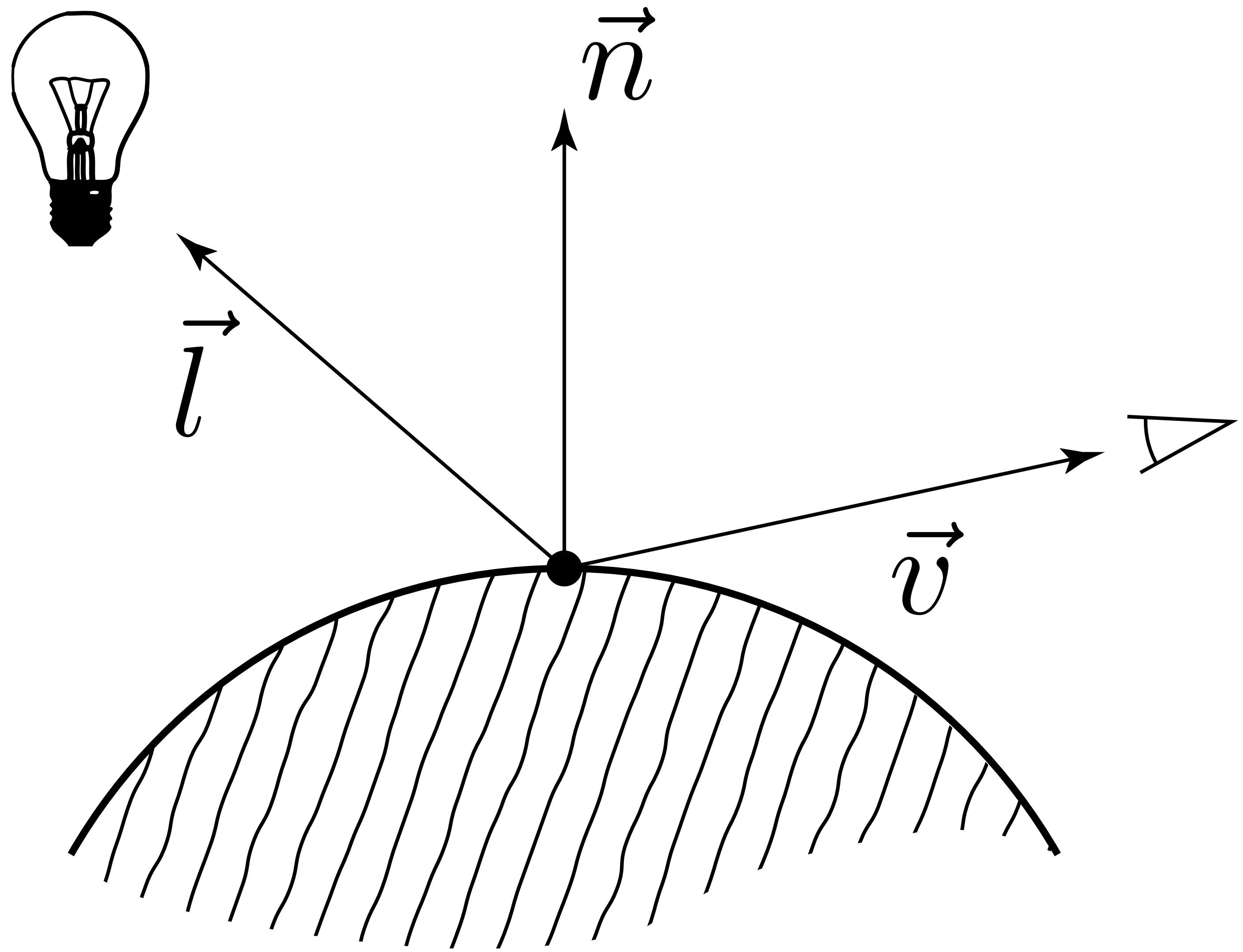
Light is achromatic


$\vec{n}$



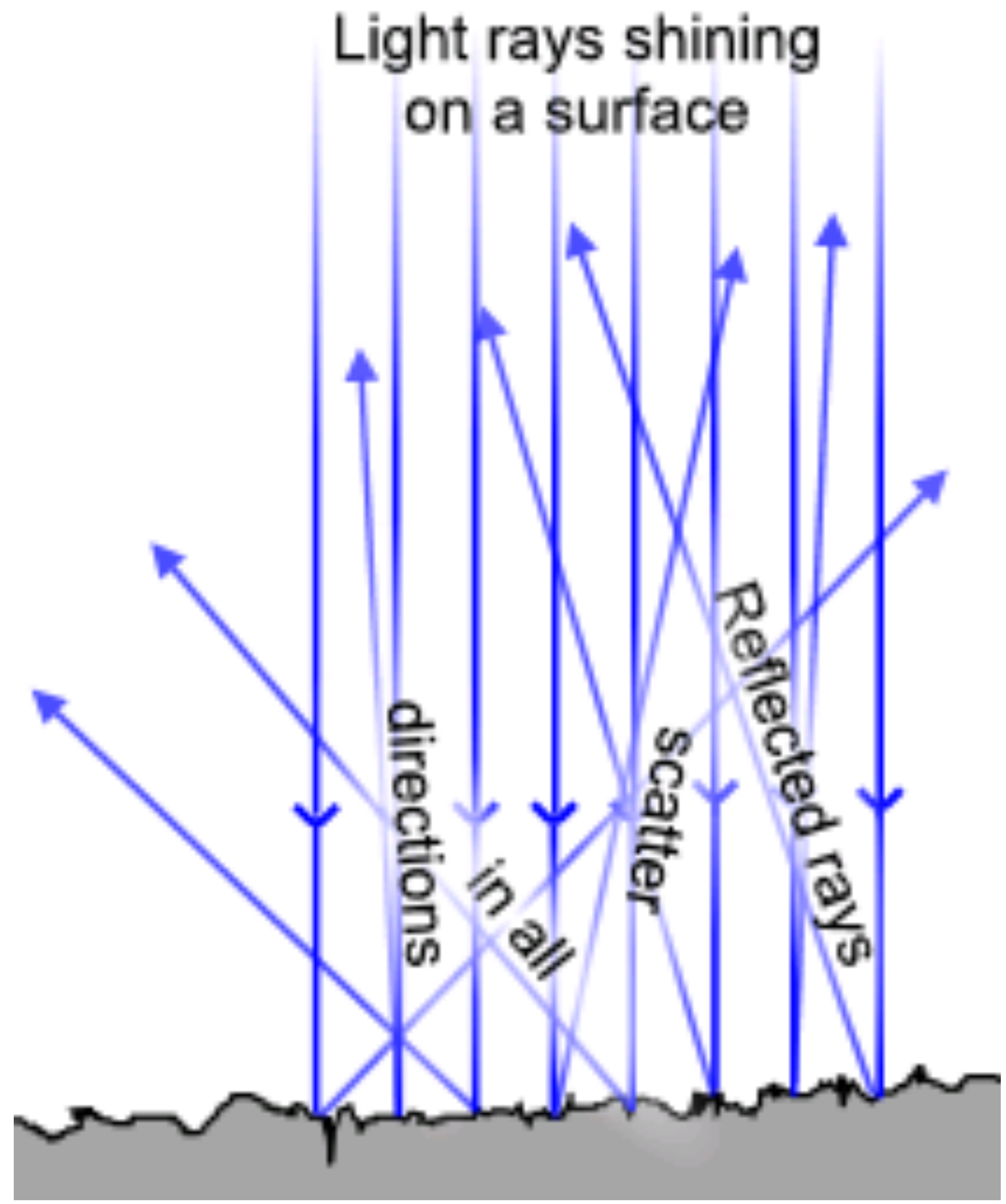
$\vec{n}$
$\vec{v}$

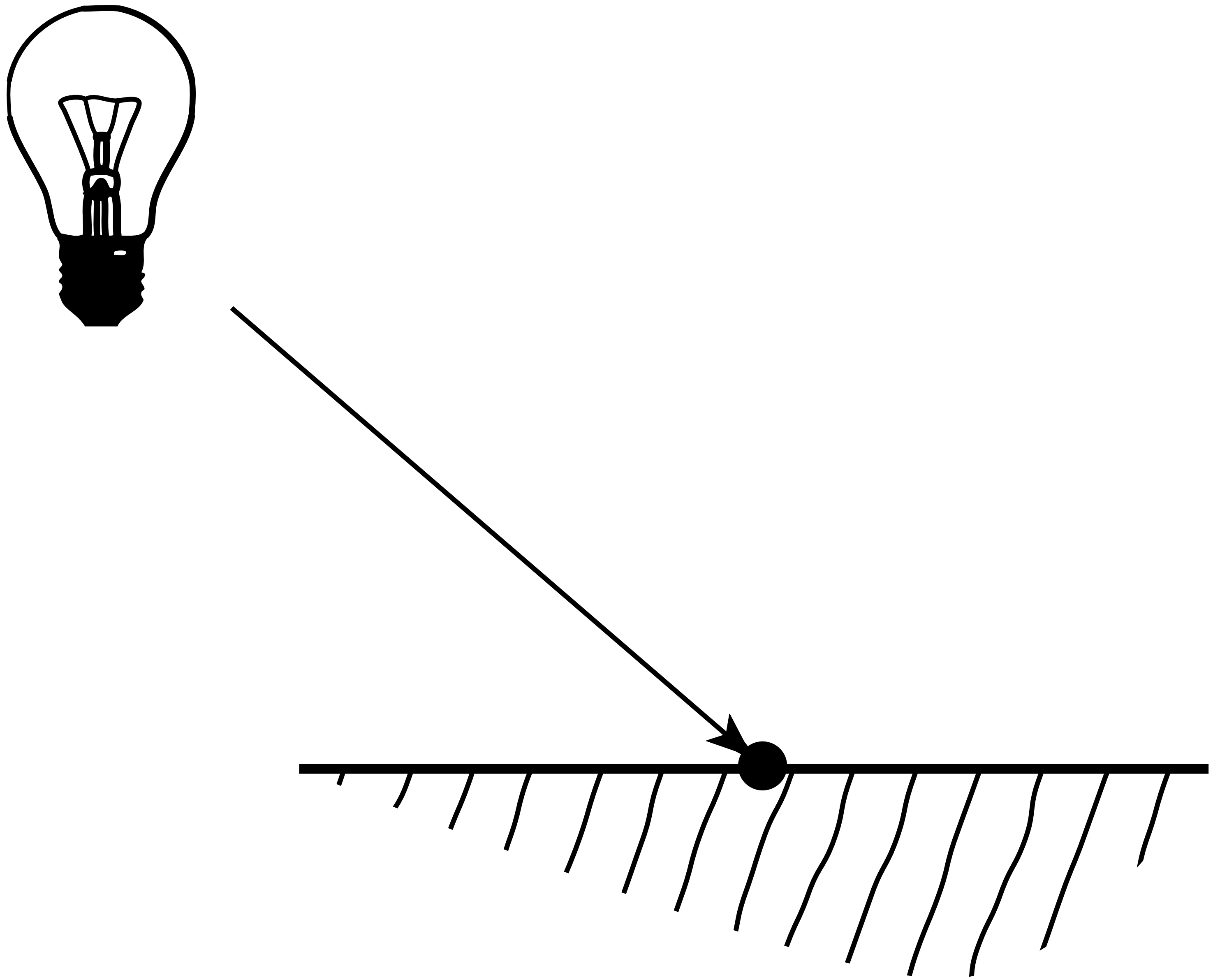

$\vec{n}$
$\vec{l}$
$\vec{v}$

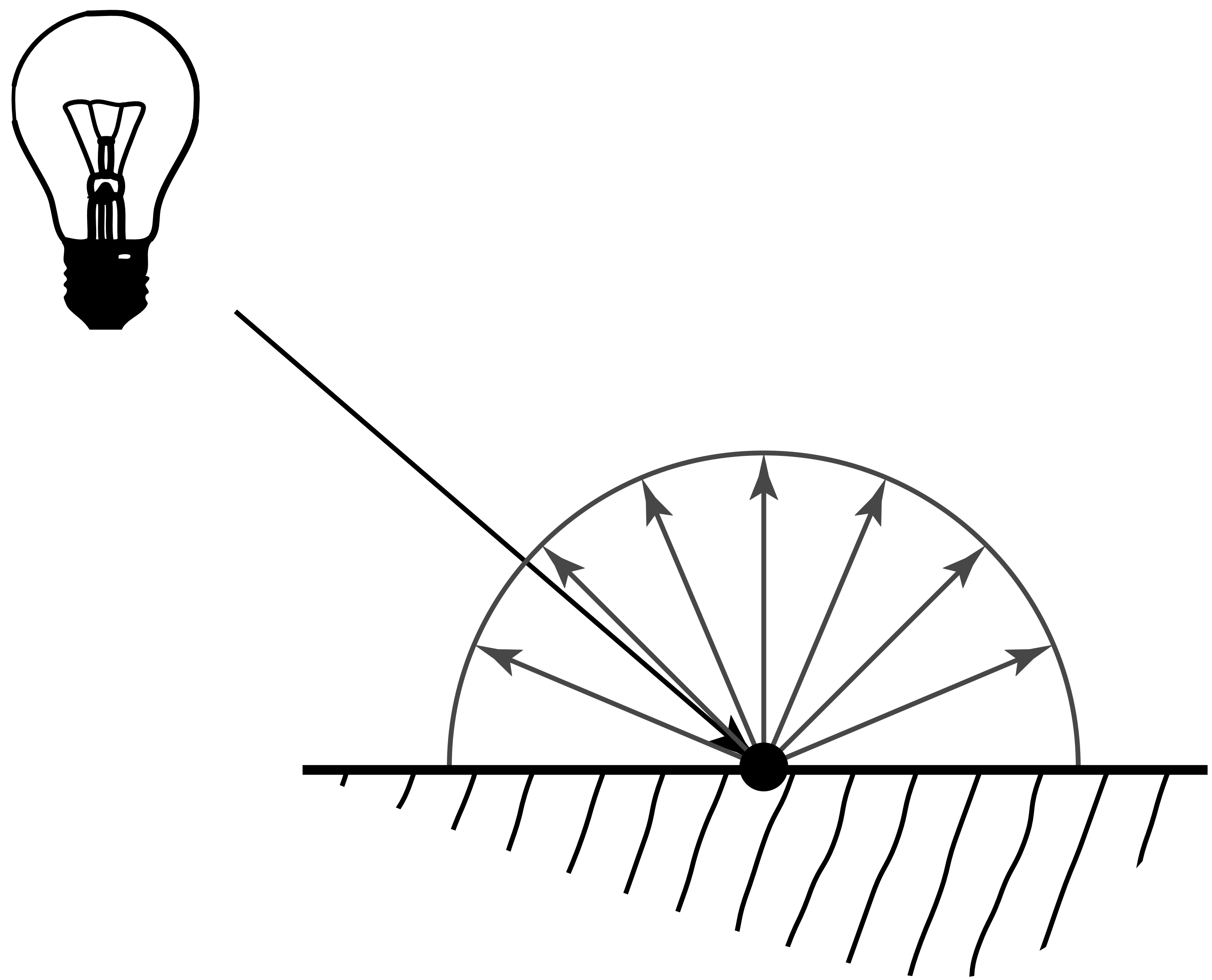



Given light intensity $I$, what is the measured reflectance $\mathrm{L}_{\mathrm{out}}(\vec{v})$ ?

# Step 1: Lambertian Reflection

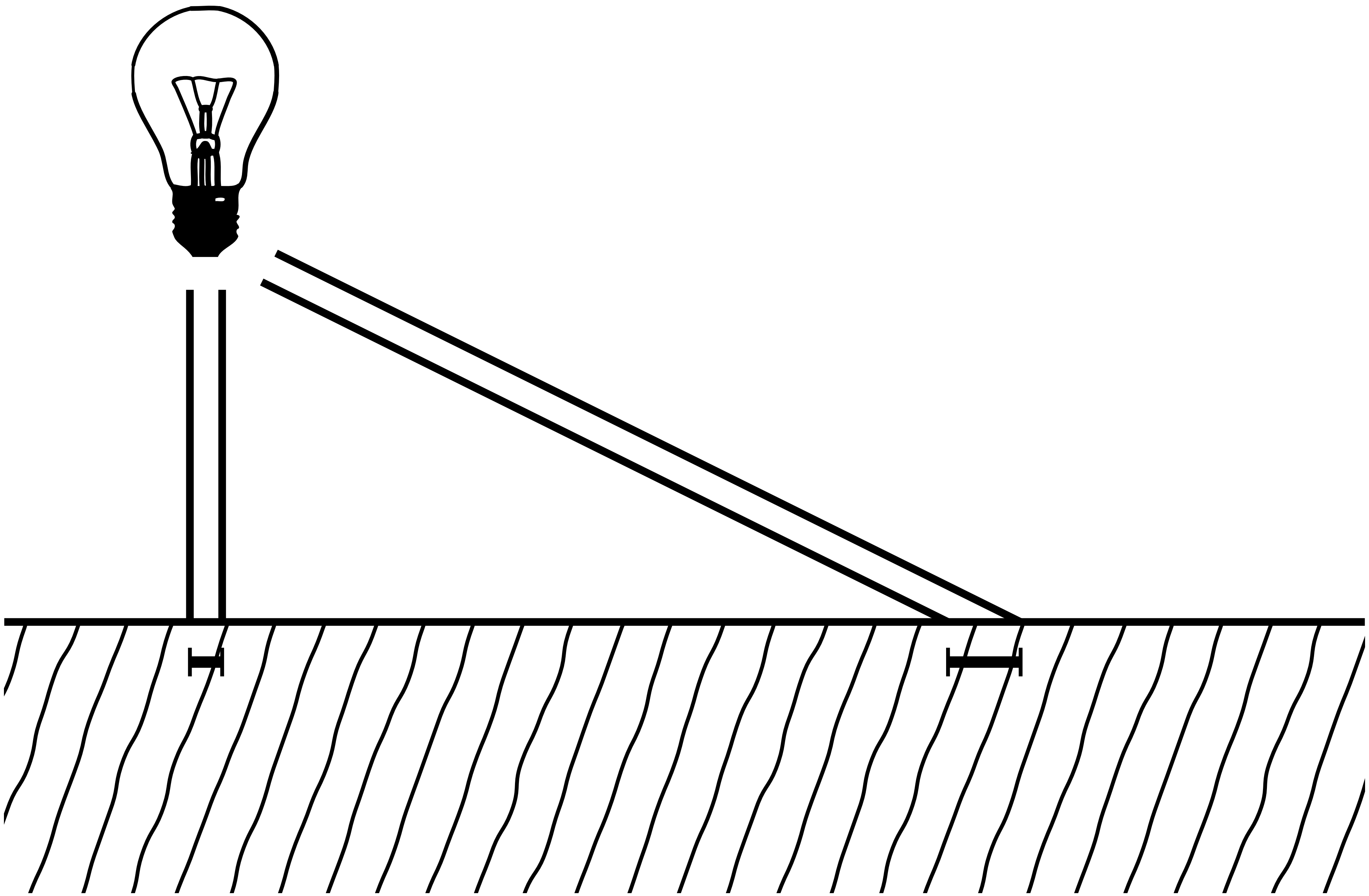


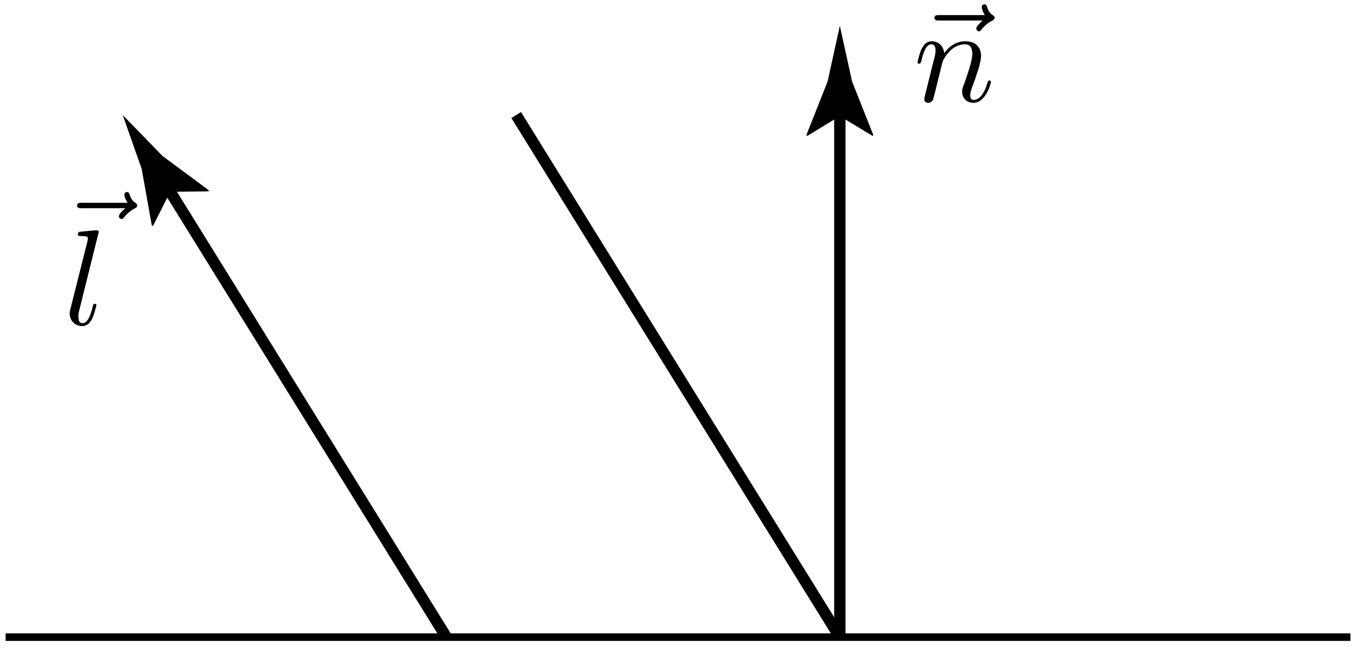




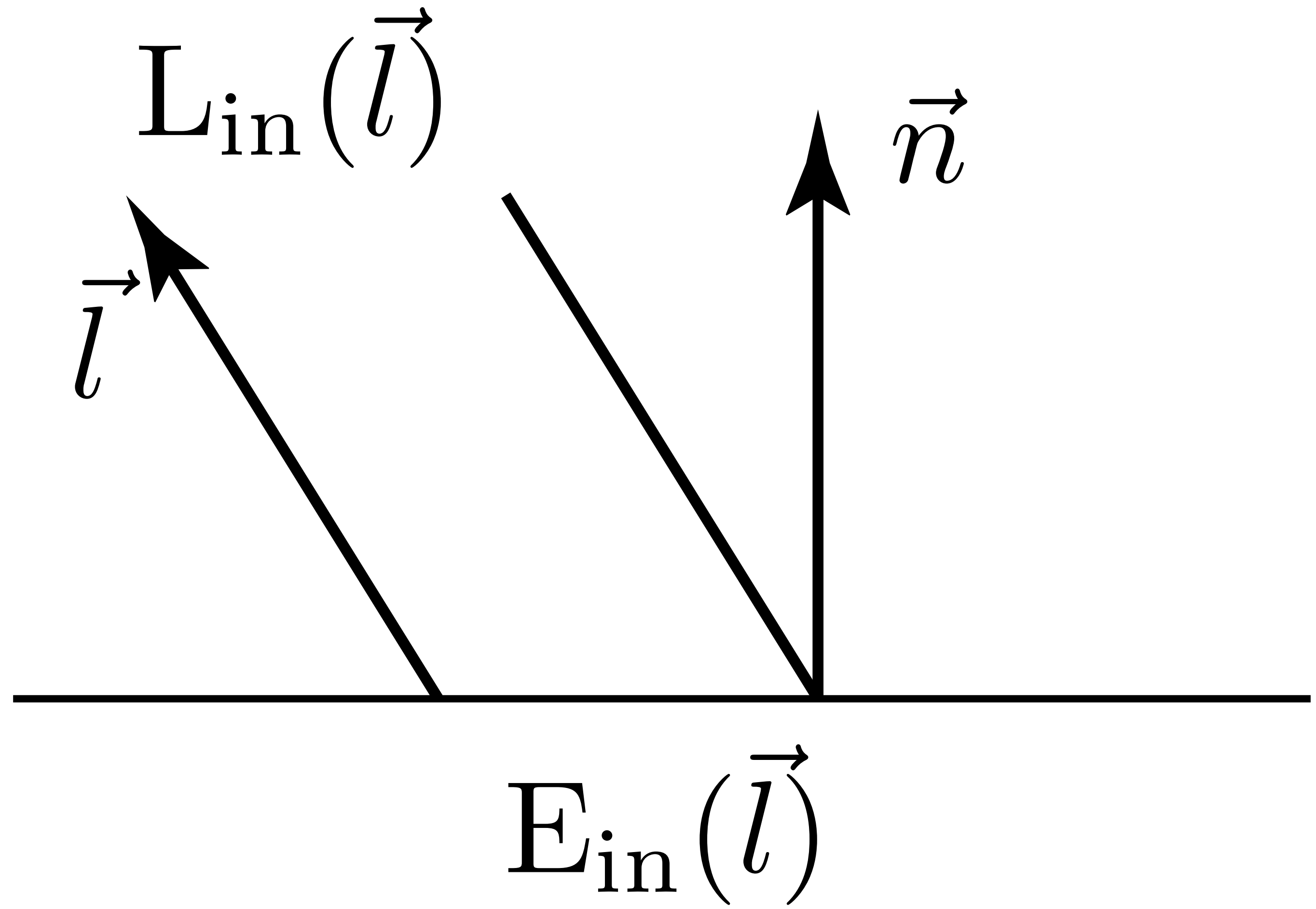
$k_d$: diffuse reflectance of surface (aka albedo)

We don’t necessarily receive all of the light’s energy ($I$) at the surface!



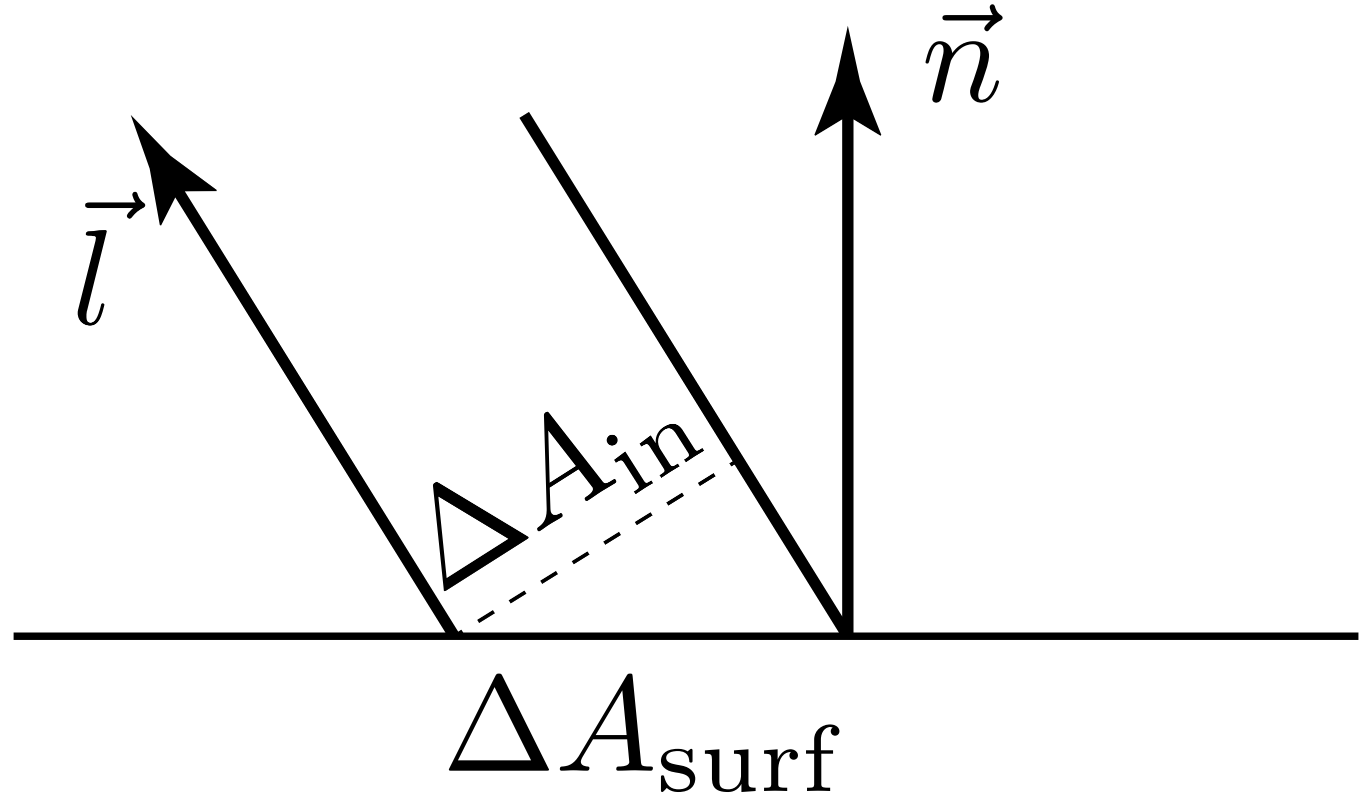


$\vec{l}$
$\vec{n}$

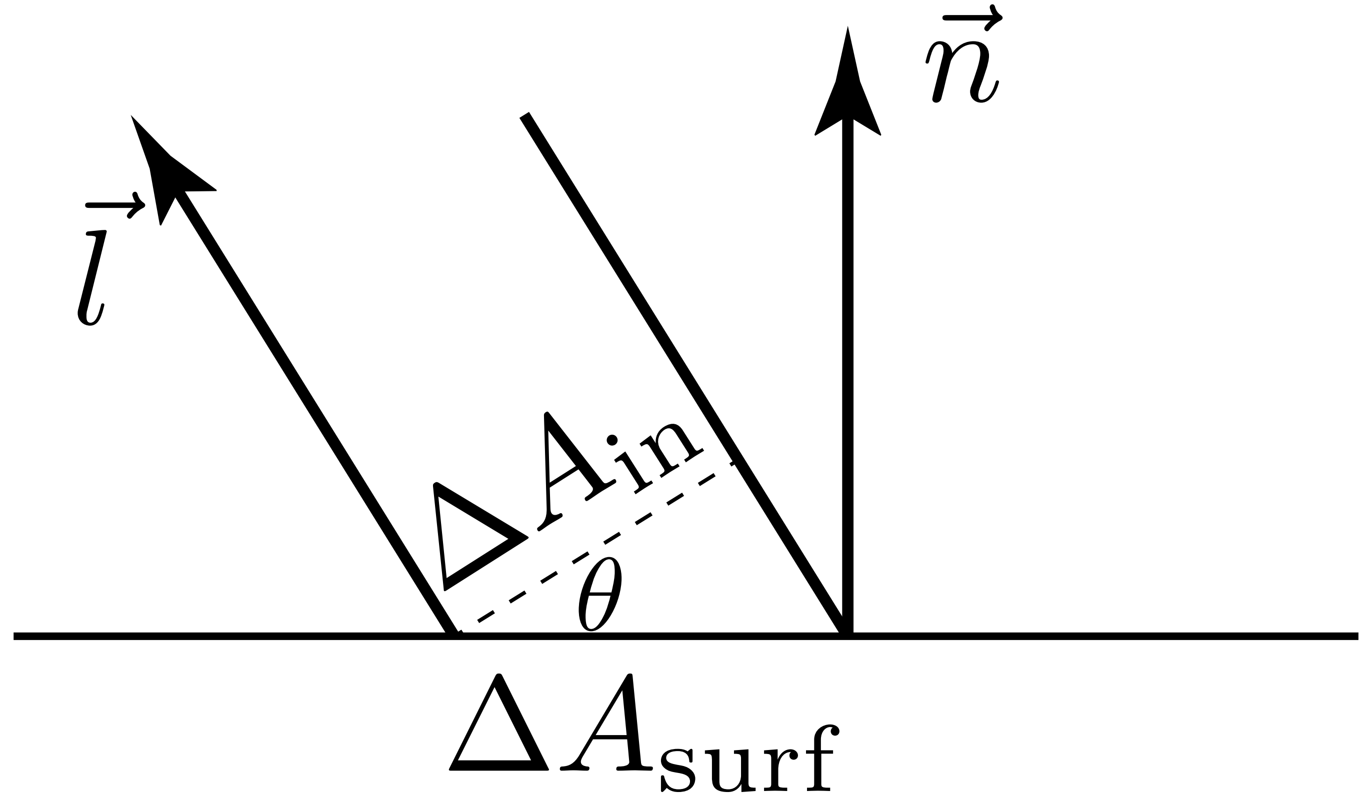



$\mathrm{L_{in}}(\vec{l})$: incoming light energy

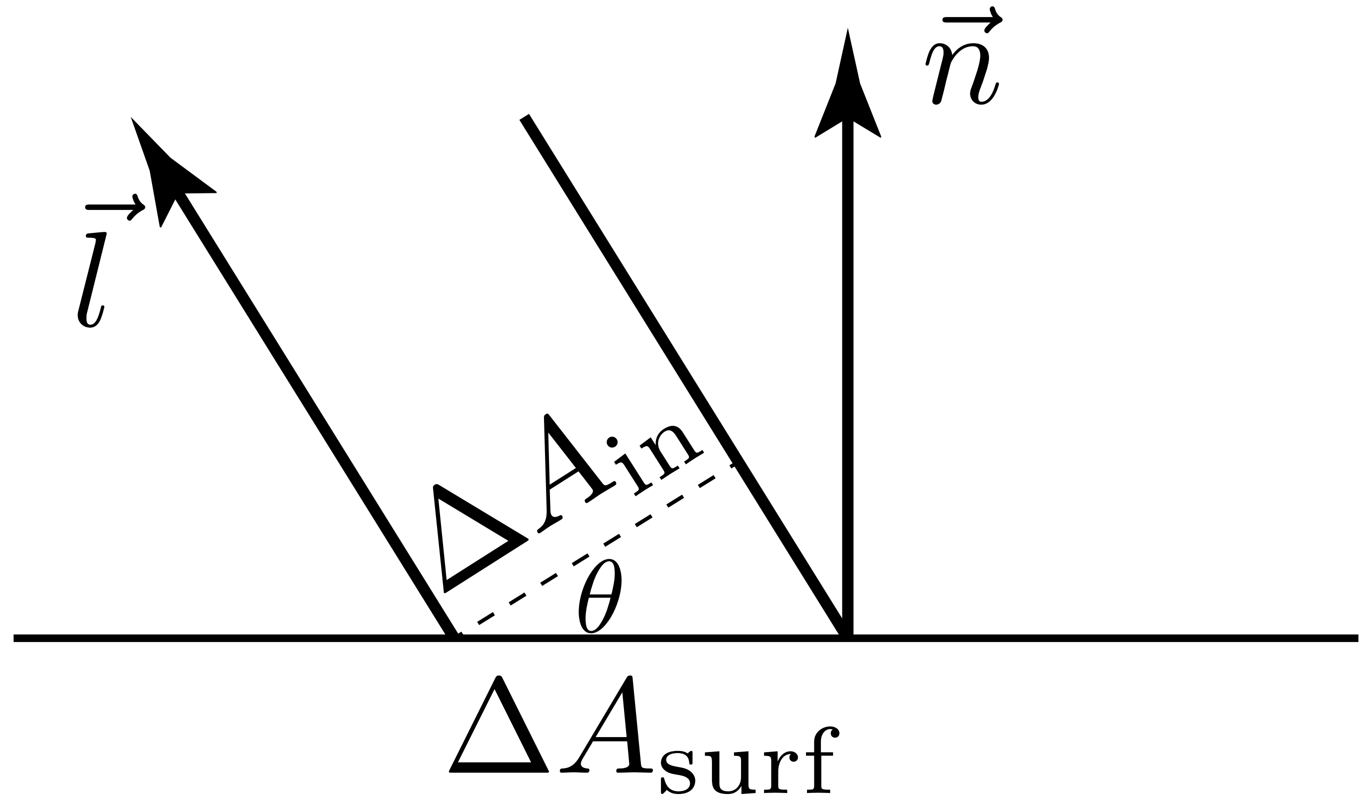
$\mathrm{E_{in}}(\vec{l})$: energy received at surface



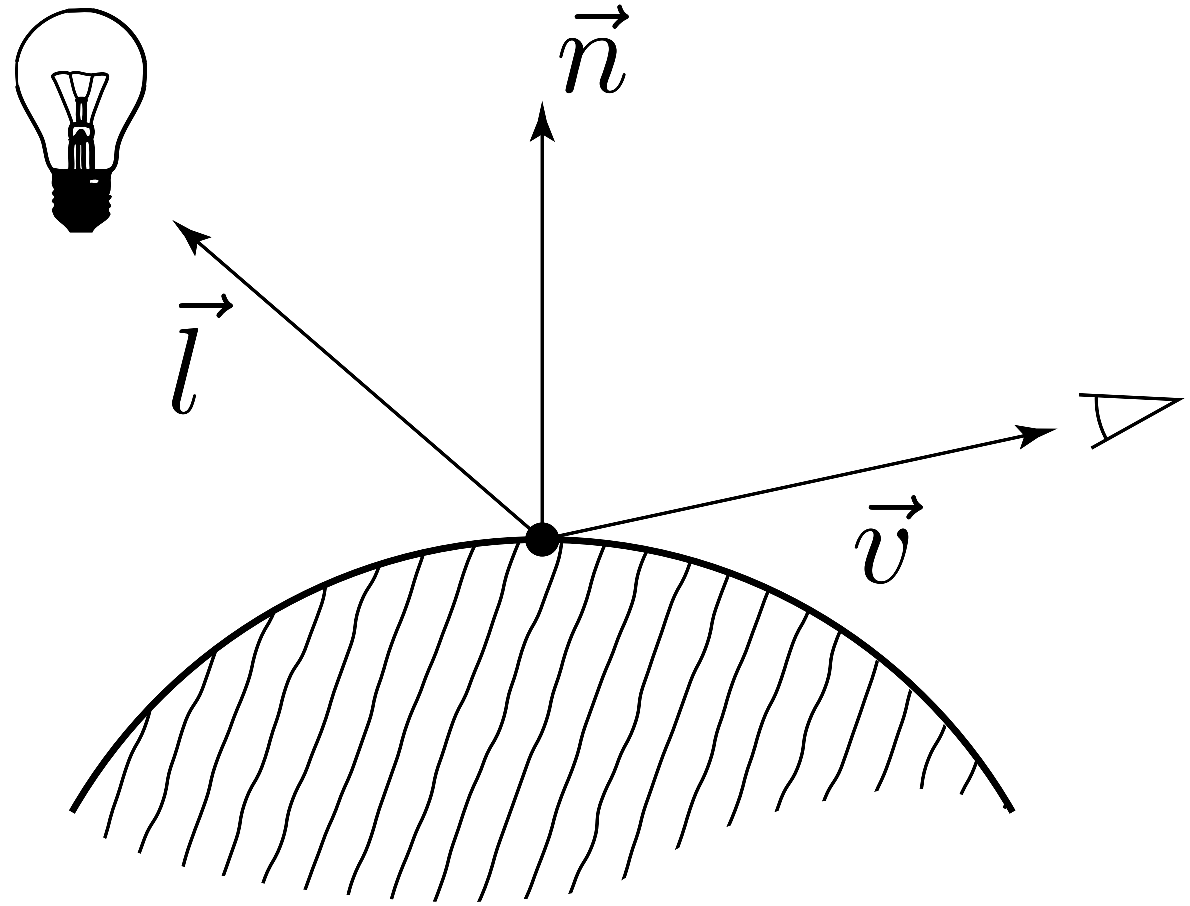

$$\mathrm{E}_{\text{in}}(\vec{l}) = \mathrm{L}_{\text{in}}(\vec{l})\frac{\Delta A_{\text{in}}}{\Delta A_{\text{surf}}}$$



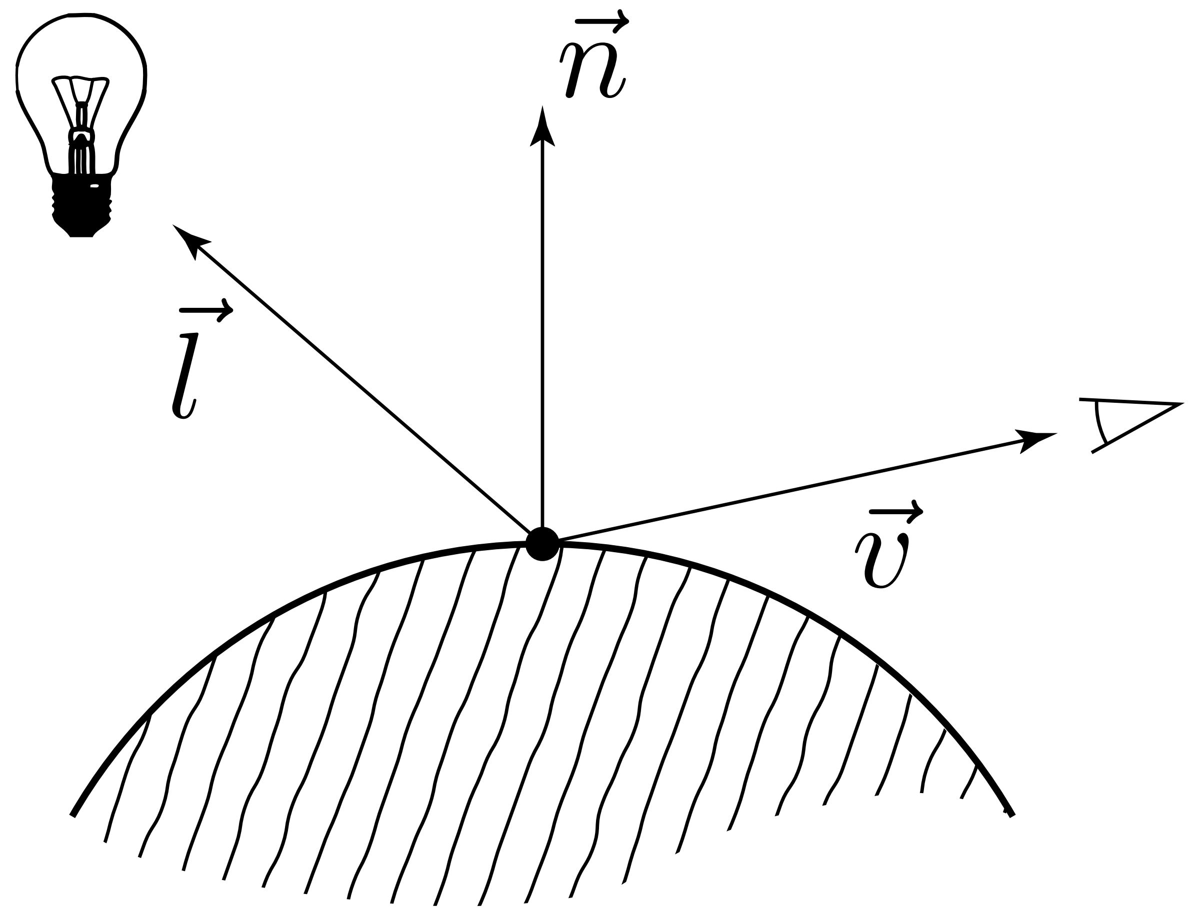

$$\mathrm{E}_{\mathrm{in}}(\vec{l}) = \mathrm{L}_{\mathrm{in}}(\vec{l})\frac{\Delta A_{\mathrm{in}}}{\Delta A_{\mathrm{surf}}} = \mathrm{L}_{\mathrm{in}}(\vec{l})\cos\theta$$




$$\mathrm{E}_{\text{in}}(\vec{l}) = \mathrm{L}_{\text{in}}(\vec{l})\frac{\Delta A_{\text{in}}}{\Delta A_{\text{surf}}} = \mathrm{L}_{\text{in}}(\vec{l})\cos\theta = \boxed{\mathrm{L}_{\text{in}}(\vec{l})(\vec{n}\cdot\vec{l})}$$




$$\mathrm{L}_{\mathrm{out}}(\vec{v}) = k_d I(\vec{n} \cdot \vec{l})$$




$$\mathrm{L}_{\mathrm{out}}(\vec{v}) = \underbrace{k_d}_{\text{Material}}\,\underbrace{I}_{\text{Light}}\,\underbrace{(\vec{n}\cdot\vec{l})_+}_{\text{Geometry}}$$

# Step 1b: Attenuation

$$\mathrm{L}_{\mathrm{in}}(\vec{l}) = \frac{I}{f_{\mathrm{att}}}$$

$f_{\mathrm{att}}$ : attenuation due to light rays spreading out

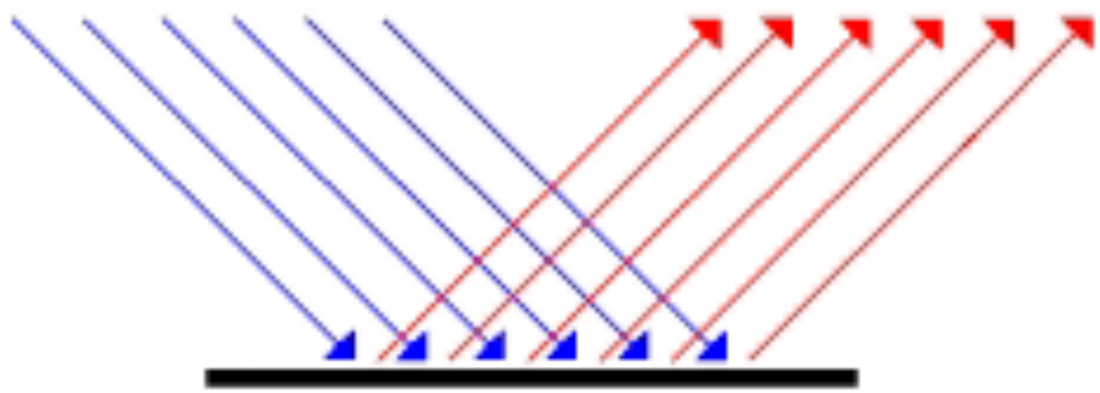
Directional lights:

$$f_{\mathrm{att}} = 1$$

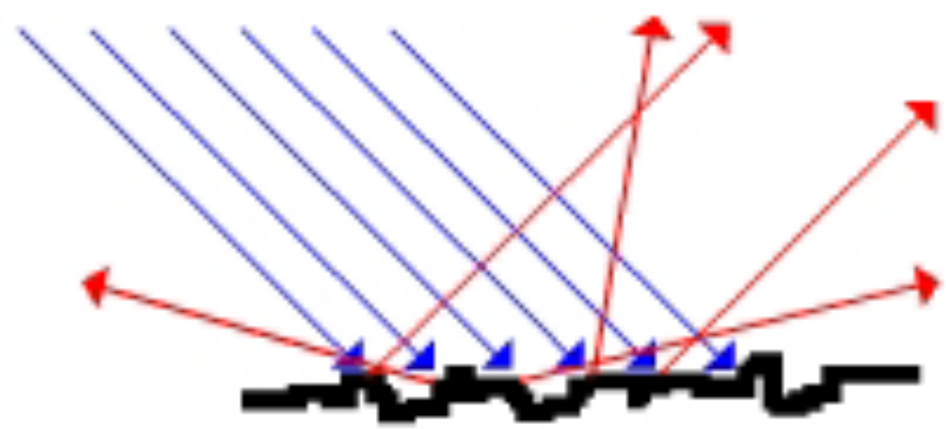
Point lights:

$$f_{\mathrm{att}} = c_1 + c_2 r + c_3 r^2$$

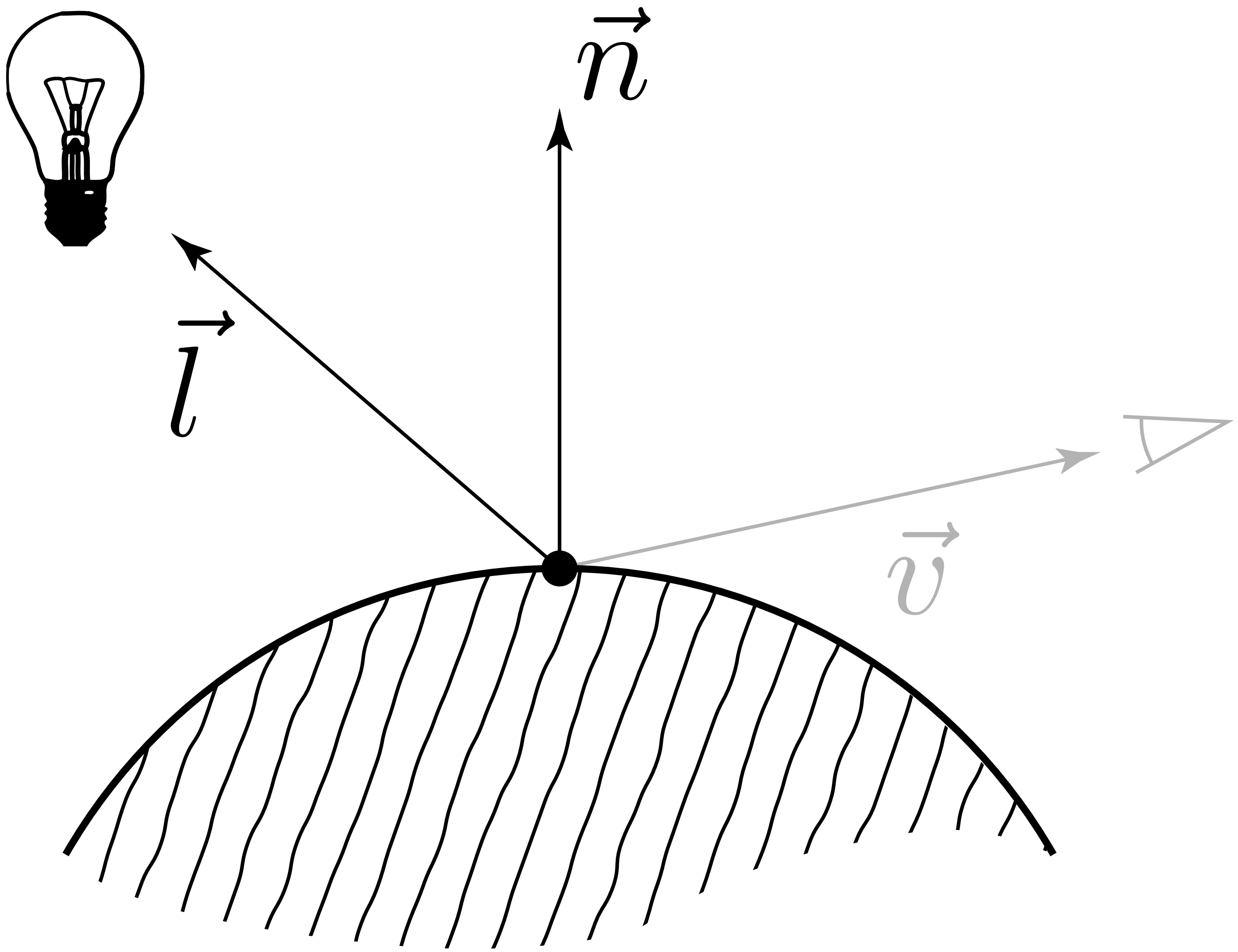
# Step 2: Specular Reflection



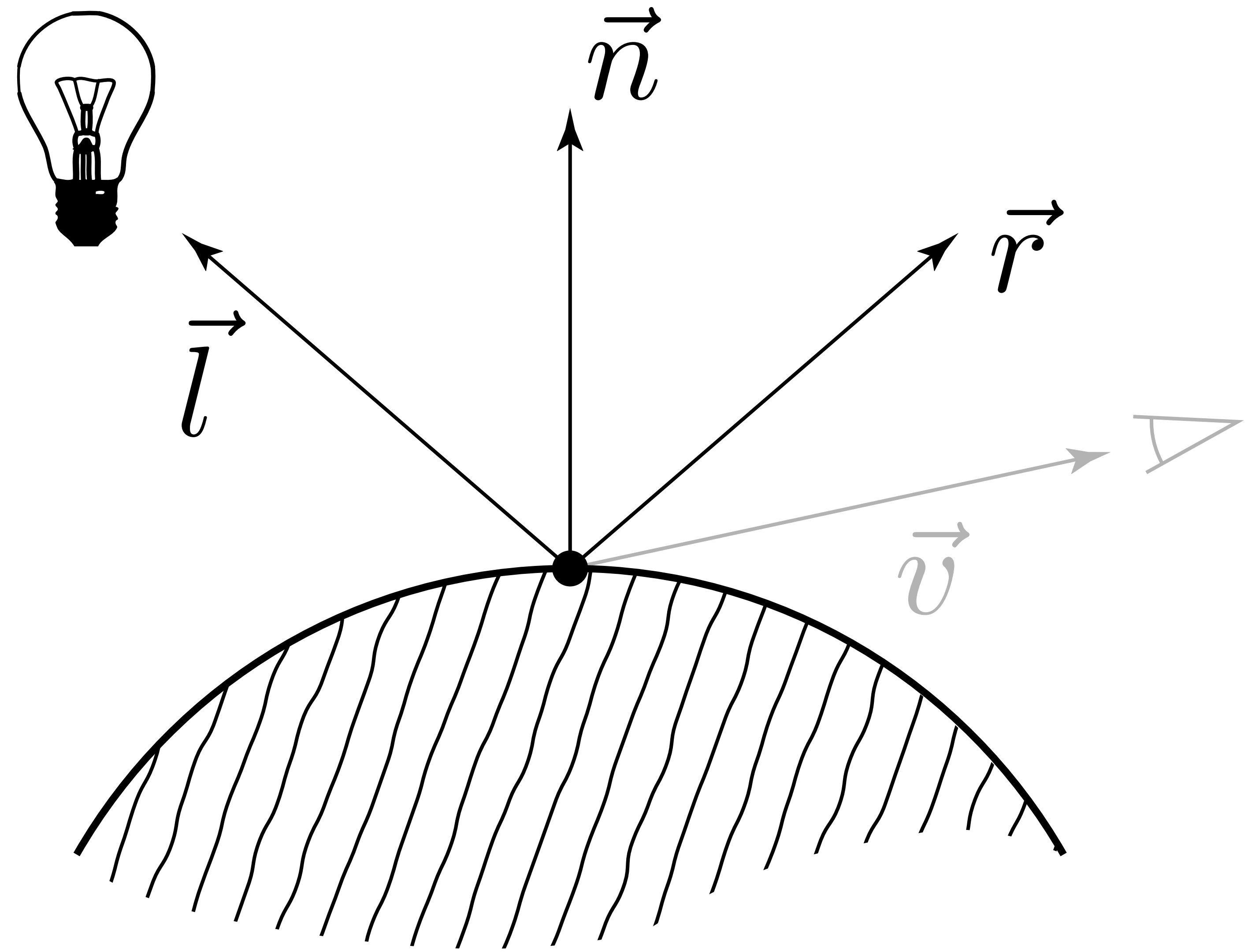
Specular Reflection
(smooth surfaces)



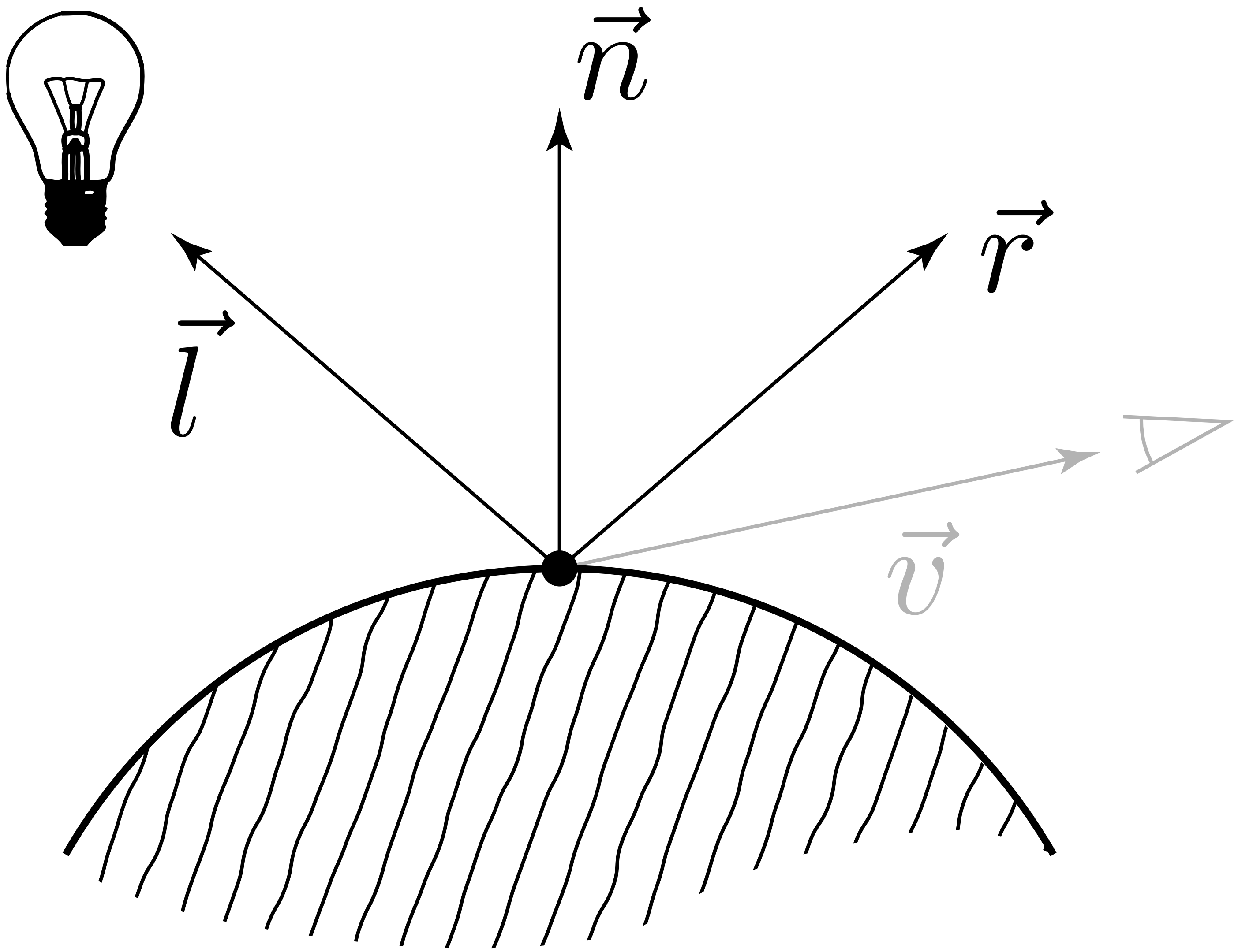
Diffuse Reflection
(rough surfaces)



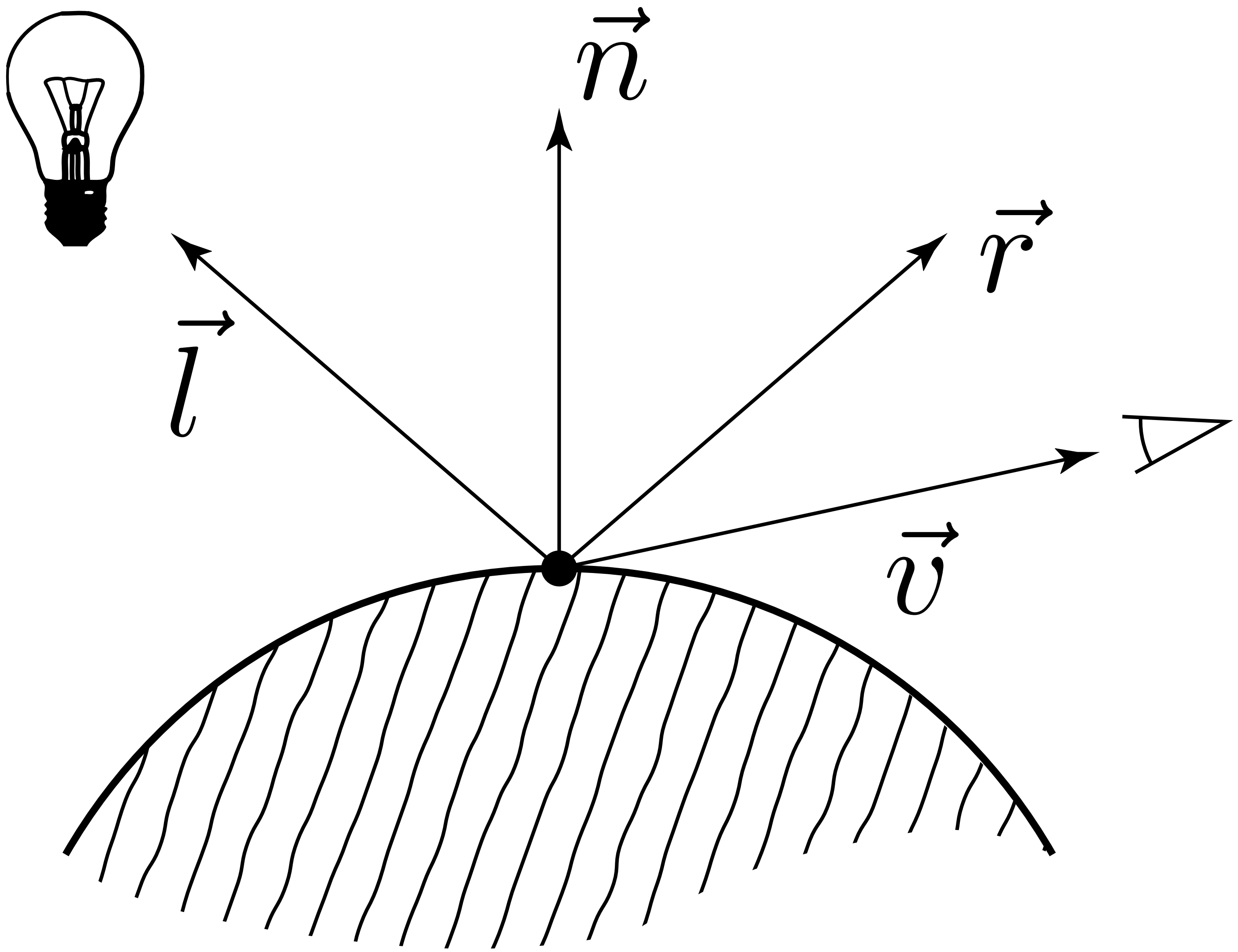
$\vec{n}$
$\vec{l}$
$\vec{v}$

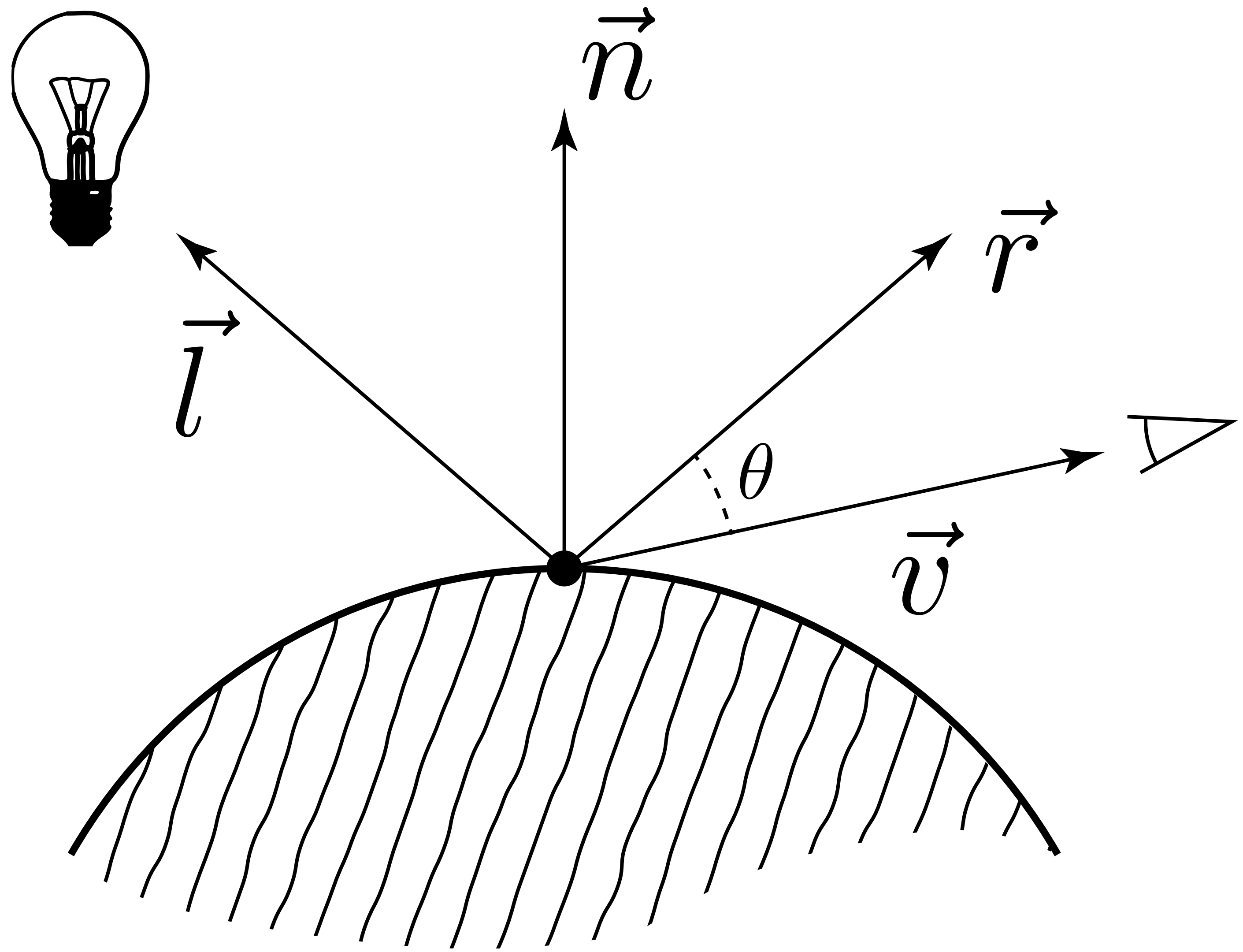



Angle of incidence equals angle of reflection

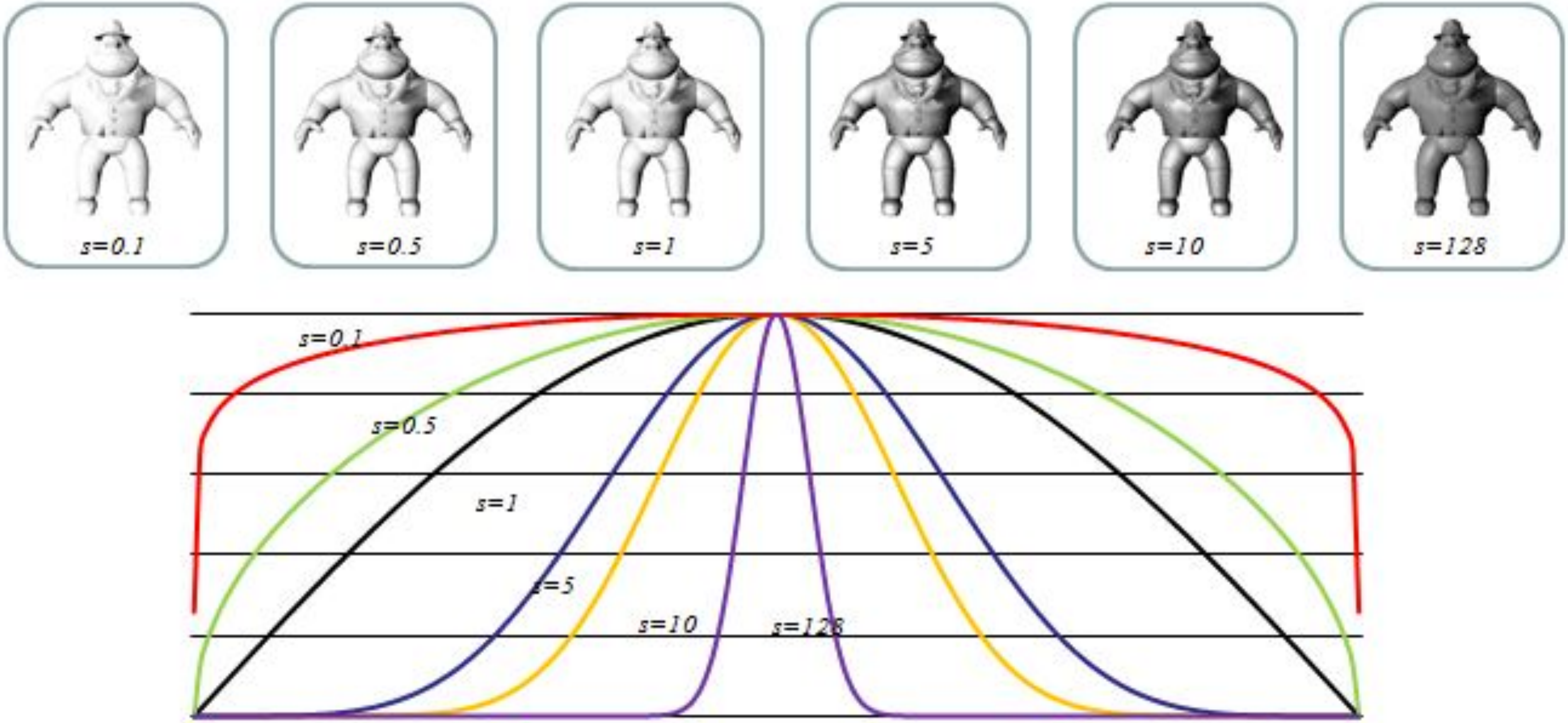



$$\vec{r} = 2(\vec{n} \cdot \vec{l})\vec{n} - \vec{l}$$

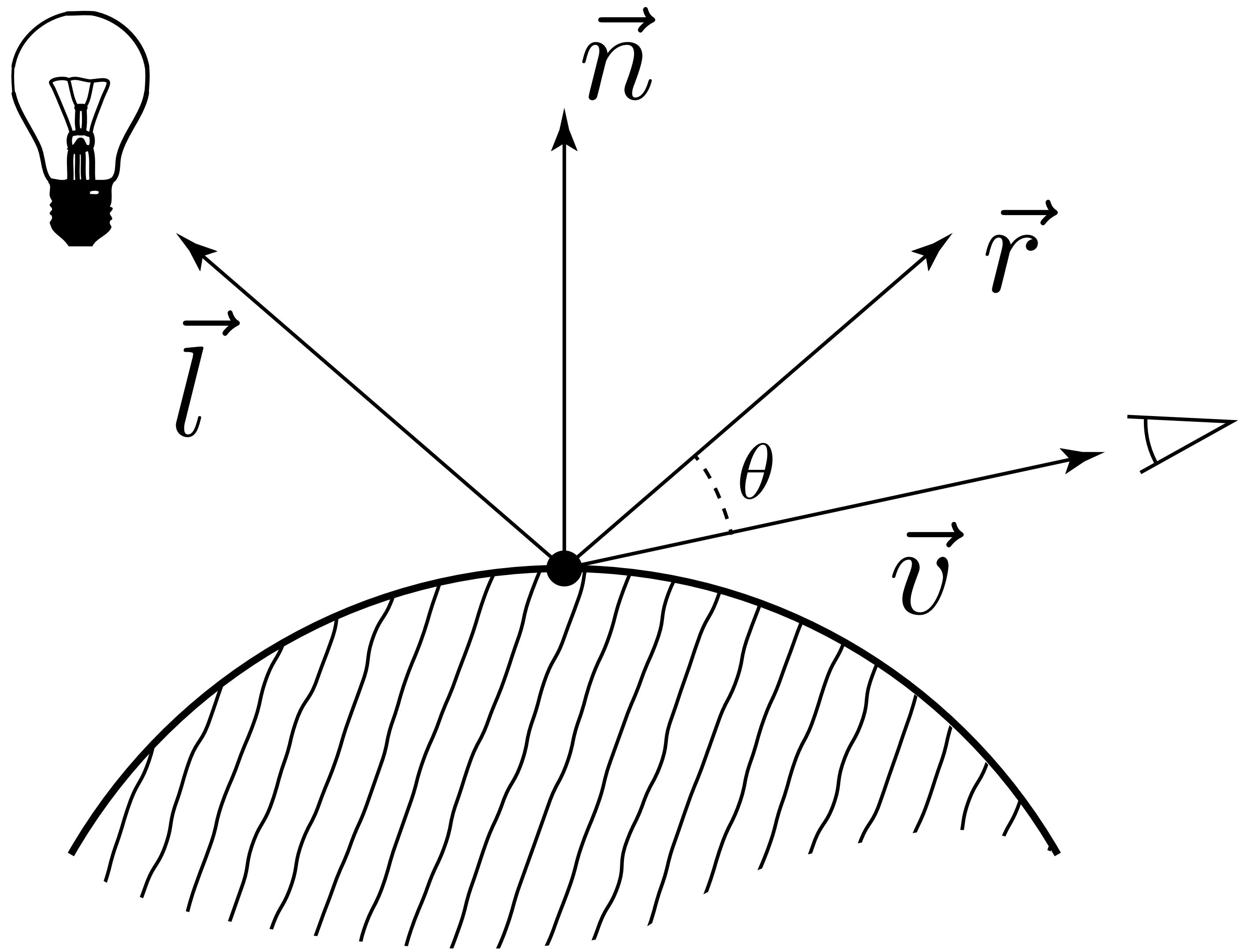

$\vec{n}$
$\vec{r}$
$\vec{l}$
$\vec{v}$




$$\mathrm{L}_{\mathrm{out}}(\vec{v}) = k_s I (\vec{r} \cdot \vec{v})_+$$

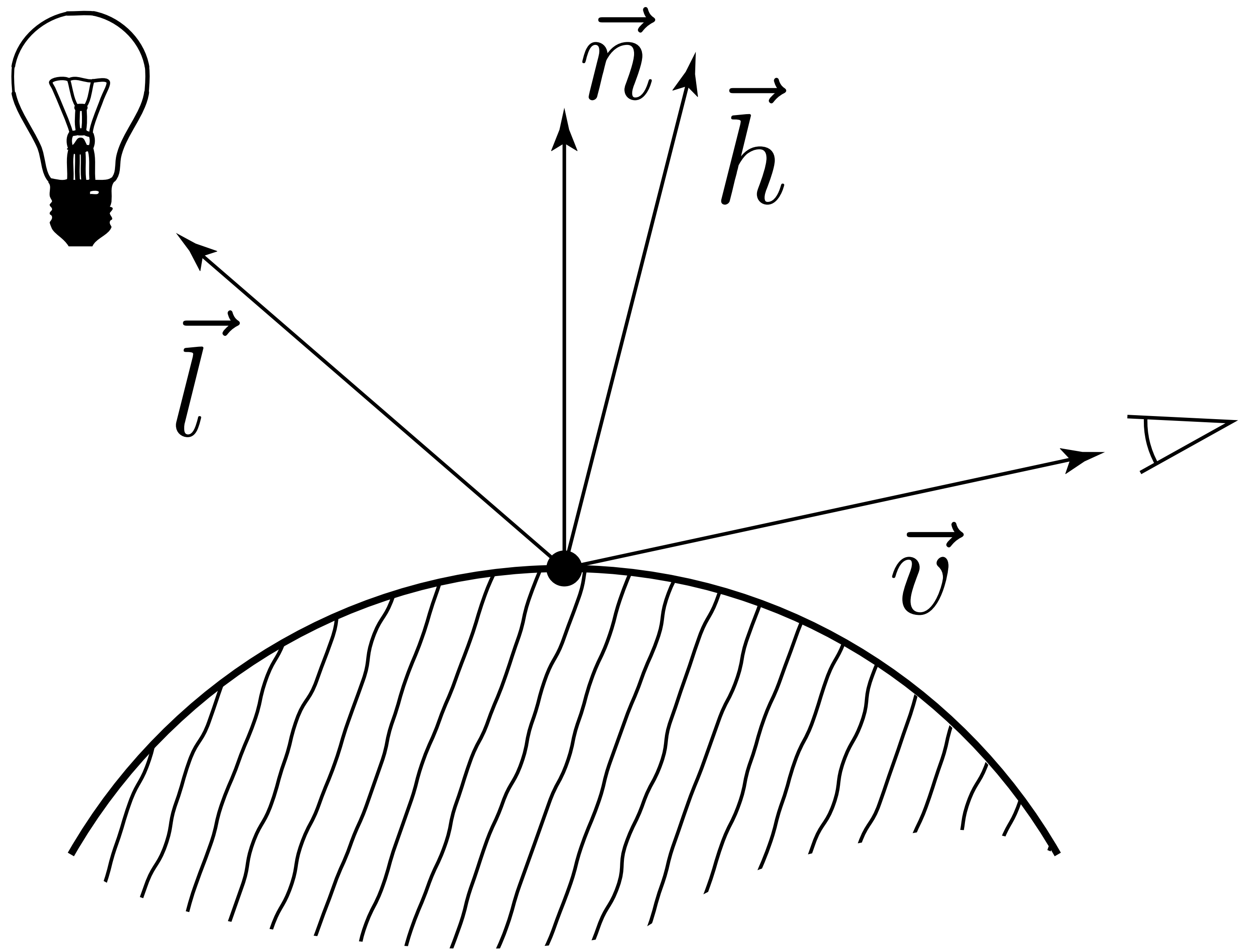

s=0.1
s=0.5
s=1
s=5
s=10
s=128
s=0.1
s=0.5
s=1
s=5
s=10
s=128

# Shininess




$$\mathrm{L_{out}}(\vec{v}) = k_s I (\vec{r} \cdot \vec{v})_+^s$$

# Alternatively…




$$\vec{h} = \frac{\vec{v} + \vec{l}}{||\vec{v} + \vec{l}||} \qquad \mathrm{L}_{\mathrm{out}} = k_s I(\vec{h} \cdot \vec{n})_+^s$$

$$\mathrm{L}_{\mathrm{out}}(\vec{v}) = k_d \frac{I}{f_{\mathrm{att}}}(\vec{n} \cdot \vec{l})_+ + k_s \frac{I}{f_{\mathrm{att}}}(\vec{r} \cdot \vec{v})_+^s$$

# Multiple lights

Use linearity of reflection!

$$\mathrm{L}_{\mathrm{out}}(\vec{v}) = \sum_i [k_d \frac{I_i}{f_{\mathrm{att}}}(\vec{n} \cdot \vec{l})_+ + k_s \frac{I_i}{f_{\mathrm{att}}}(\vec{r} \cdot \vec{v})_+^s]$$

# Coloured lights

Treat intensities as RGB triples, add and multiply pointwise.

# Step 3: Ambient Reflection

Define a global ambient light $I_a$.

$$\mathrm{L}_{\mathrm{out}}(\vec{v}) = k_a I_a$$

# Phong Illumination

$$\mathrm{L}_{\mathrm{out}}(\vec{v}) = k_a I_a + \sum_i [k_d \frac{I_i}{f_{\mathrm{att}}}(\vec{n} \cdot \vec{l})_+ + k_s \frac{I_i}{f_{\mathrm{att}}}(\vec{r} \cdot \vec{v})_+^s]$$

# Blinn-Phong Illumination

$$\mathrm{L}_{\mathrm{out}}(\vec{v}) = k_a I_a + \sum_i [k_d \frac{I_i}{f_{\mathrm{att}}}(\vec{n} \cdot \vec{l})_+ + k_s \frac{I_i}{f_{\mathrm{att}}}(\vec{h} \cdot \vec{n})_+^s]$$