

# Physical Rendering

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# 1 Measurements

## 1.1 Radiant Flux

The radiant flux (or power)  $\Phi$  is the total amount of energy passing through a surface per second and is measured in  $[W]$  (watts) as  $\frac{J}{s}$ .

## 1.2 Irradiance

The irradiance  $E$  is the measurements of the radiant flux per *unit area* and is measured in  $[W][M]^{-2}$  as  $\frac{\Phi}{m^2}$ .

## 1.3 Radiance

The radiance  $L$  is the irradiance per unit solid angle (steradian) and is measured in  $[W][M]^{-2}[M]^{-2}[sr]^{-1}$  as  $\frac{E}{sr}$ .

# 2 Terminology

- $\hat{V}$  direction towards the camera
- $\hat{N}$  surface normal
- $\hat{L}$  vector pointing toward the light source
- $\hat{R}$  reflected ray direction
- $\theta_i \theta_r$  incident and reflected angles

$$\hat{R} = \hat{L} - 2\hat{N}(\hat{L} \cdot \hat{N})$$

### 3 Rendering equation

The rendering equation tells us how much light is exiting a *surface point* in a given direction