Particle-Wave Duality

Is light a particle or a wave? What does that mean?

**PARTICLE** | **COMMON** | **WAVE**
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The Electromagnetic Spectrum

- Gamma ray
- Ultraviolet
- Visible
- Infrared
- Radio
- X-ray

X-rays
- Opposite of photoelectric effect.
- Roentgen - 1895
- Laue - 1912 Scattering from crystals.
- Bragg - 1912 Bragg diffraction
- Duane-Hunt rule: \[ \lambda = \frac{hc}{eV} \text{ (electron-volt) unit of energy} \]

Compton Scattering
- Why is the sky blue?
- Why doesn't the sun fry us?
- Rayleigh Scattering, \[ R \approx \lambda^4 \]
- Compton effect caused by non-classical scattering of "photons"

\[ \lambda_2 - \lambda_1 = \lambda_0 (1 - \cos \theta) \]