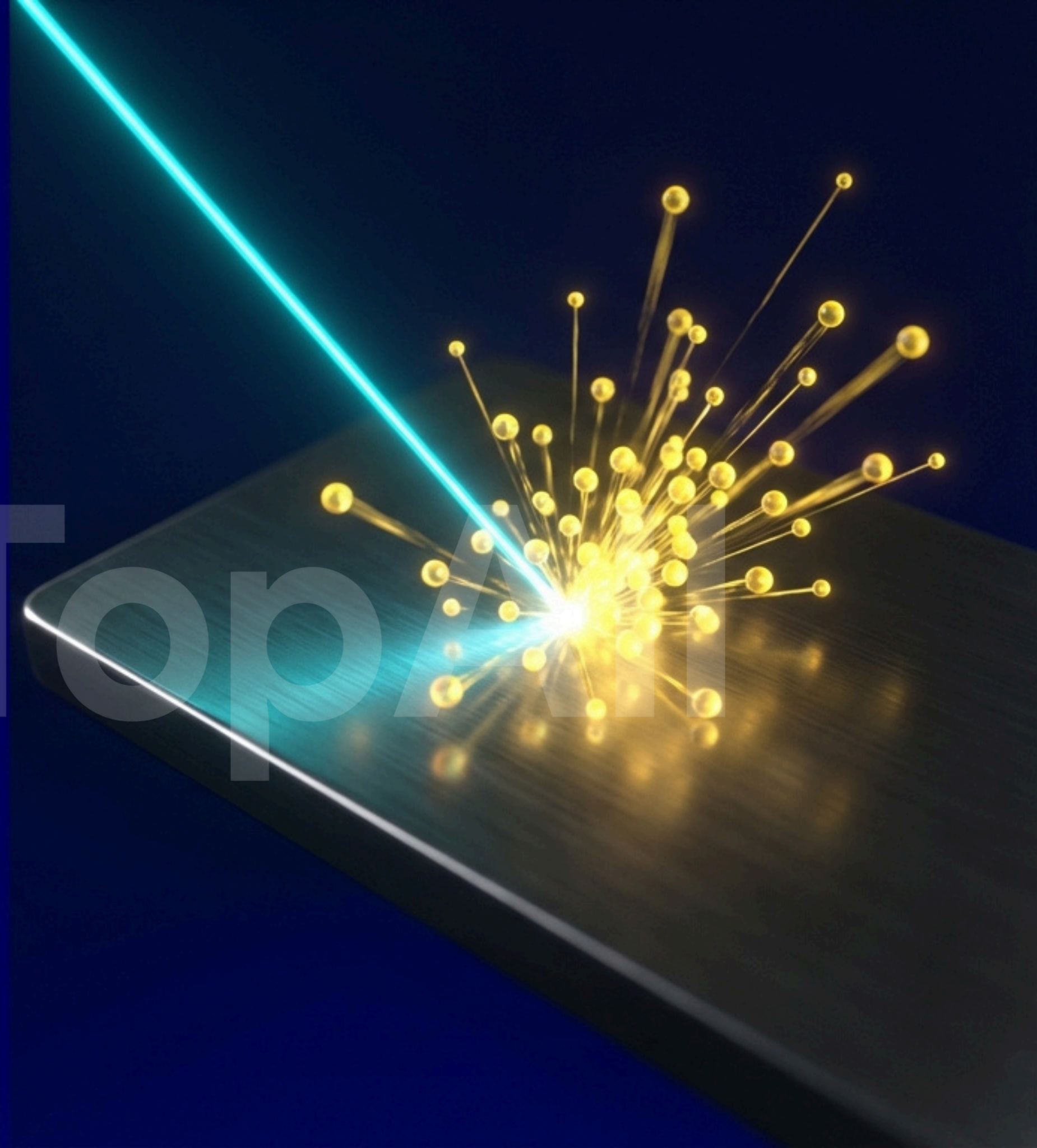




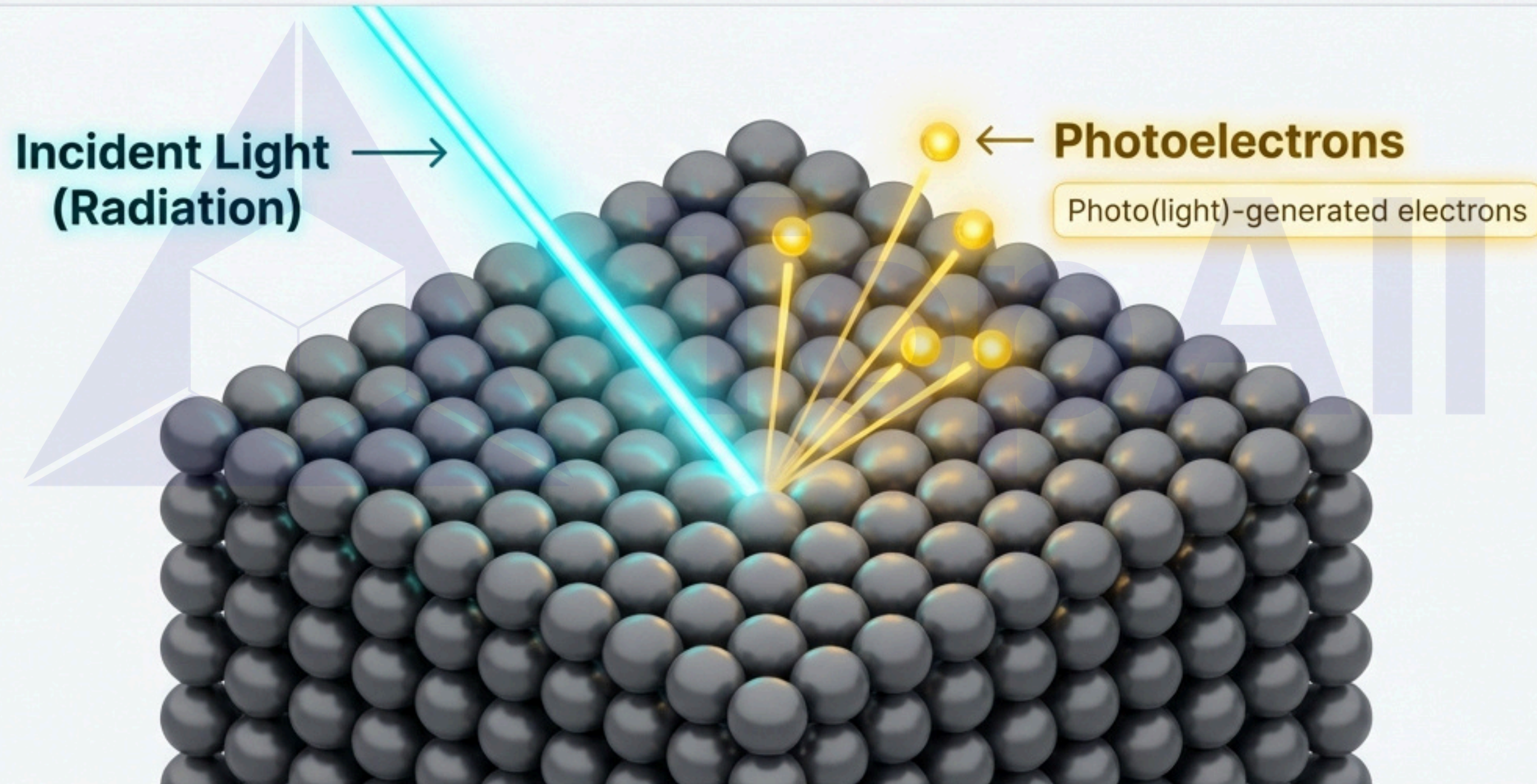
Photoelectric Effect

When light ejects electrons from a metal.

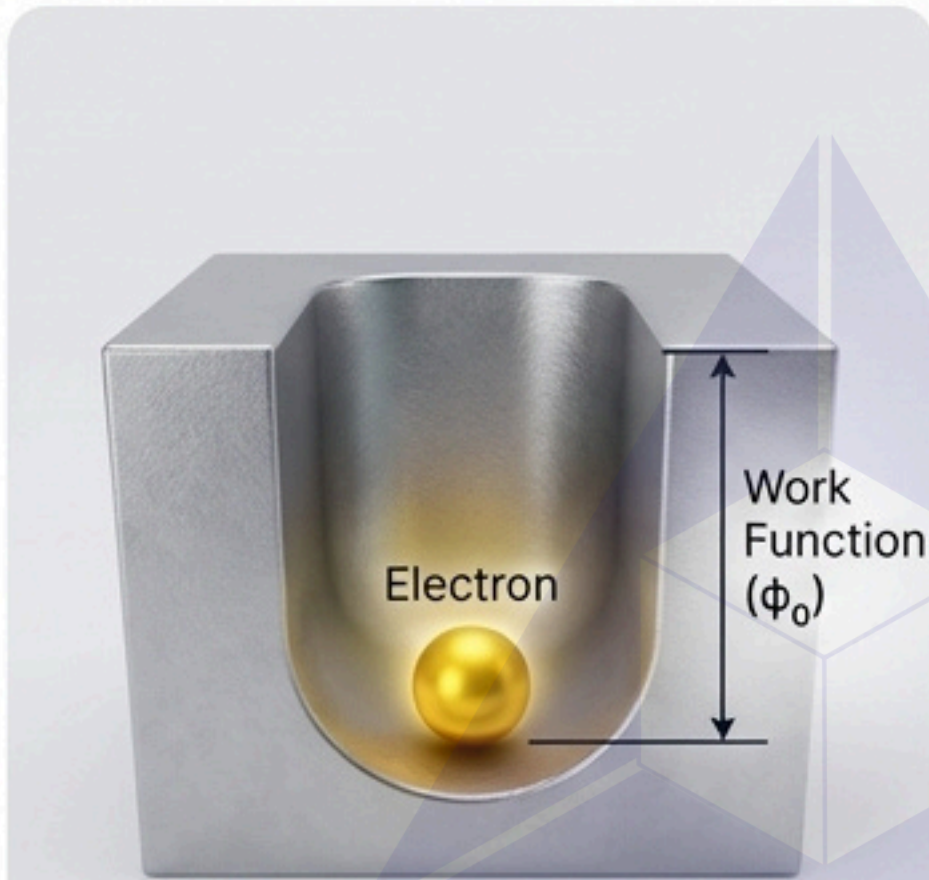


What Is the Photoelectric Effect?

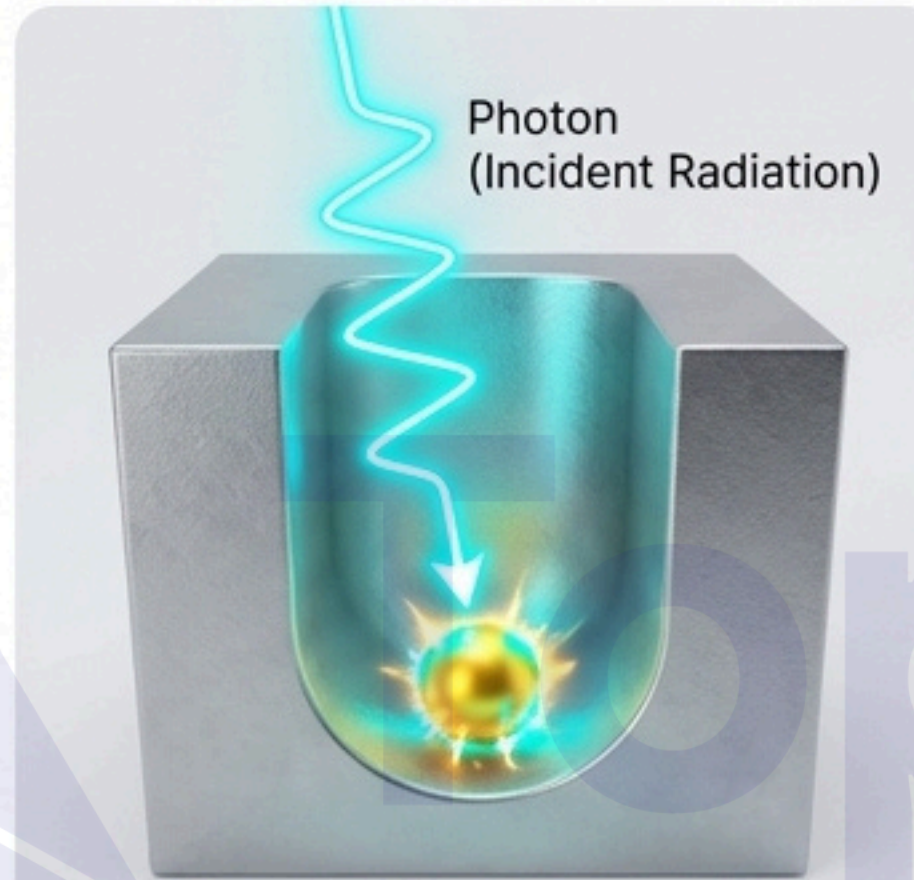
The phenomenon where light of a suitable frequency illuminates a metal surface , causing the immediate emission of electrons.



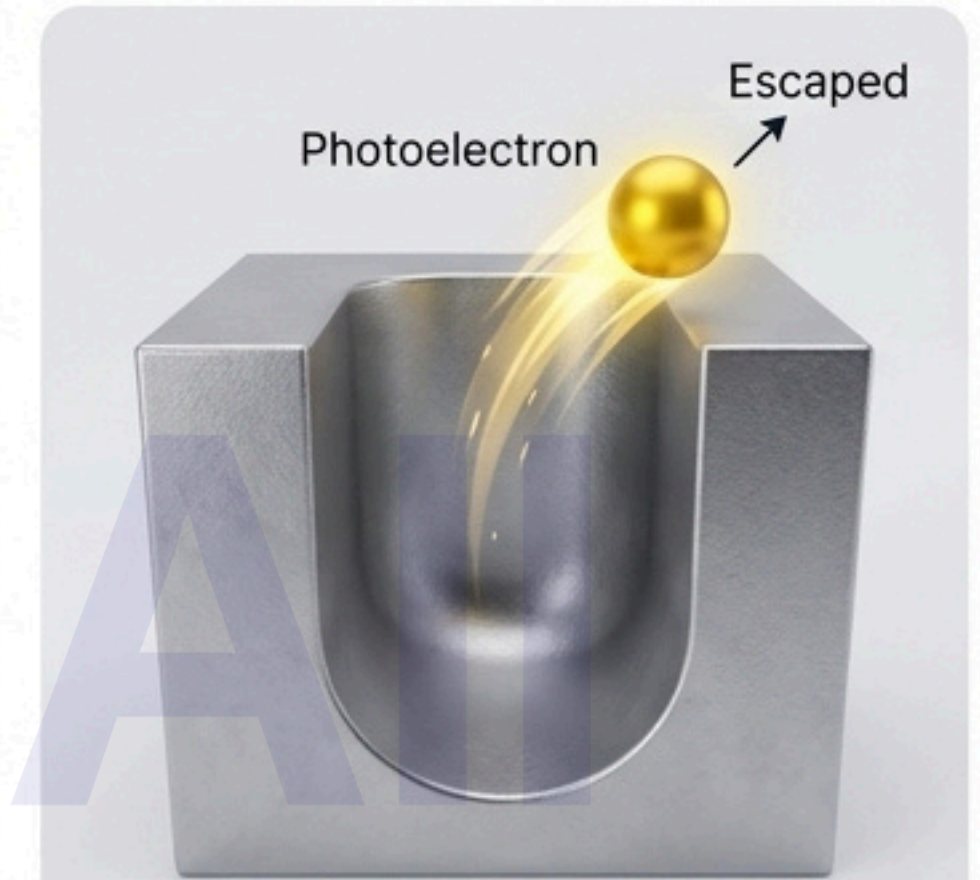
The Great Escape: What Are Photoelectrons?



Trapped: Electrons are held inside the metal by the attractive forces of positive ions.



Absorbing Energy: An electron near the surface absorbs energy from the incident radiation.



Breaking Free: If the energy exceeds the Work Function (ϕ_0)—the absolute minimum energy required to escape—the electron bursts free.



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The Frequency Rule: Threshold Frequency (ν_0)

Below a specific minimum frequency, absolutely no emission occurs.

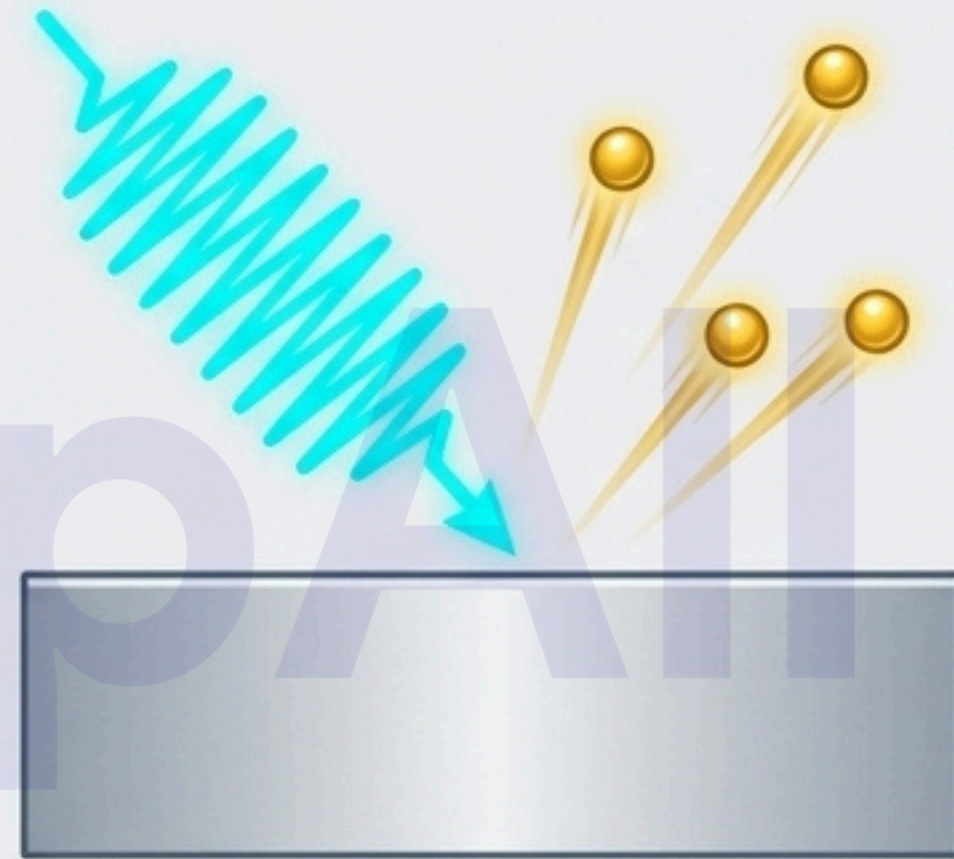
✗



Low Frequency ($\nu < \nu_0$)

No electrons are emitted, no matter how intensely the light shines or how long it hits the surface.

✓

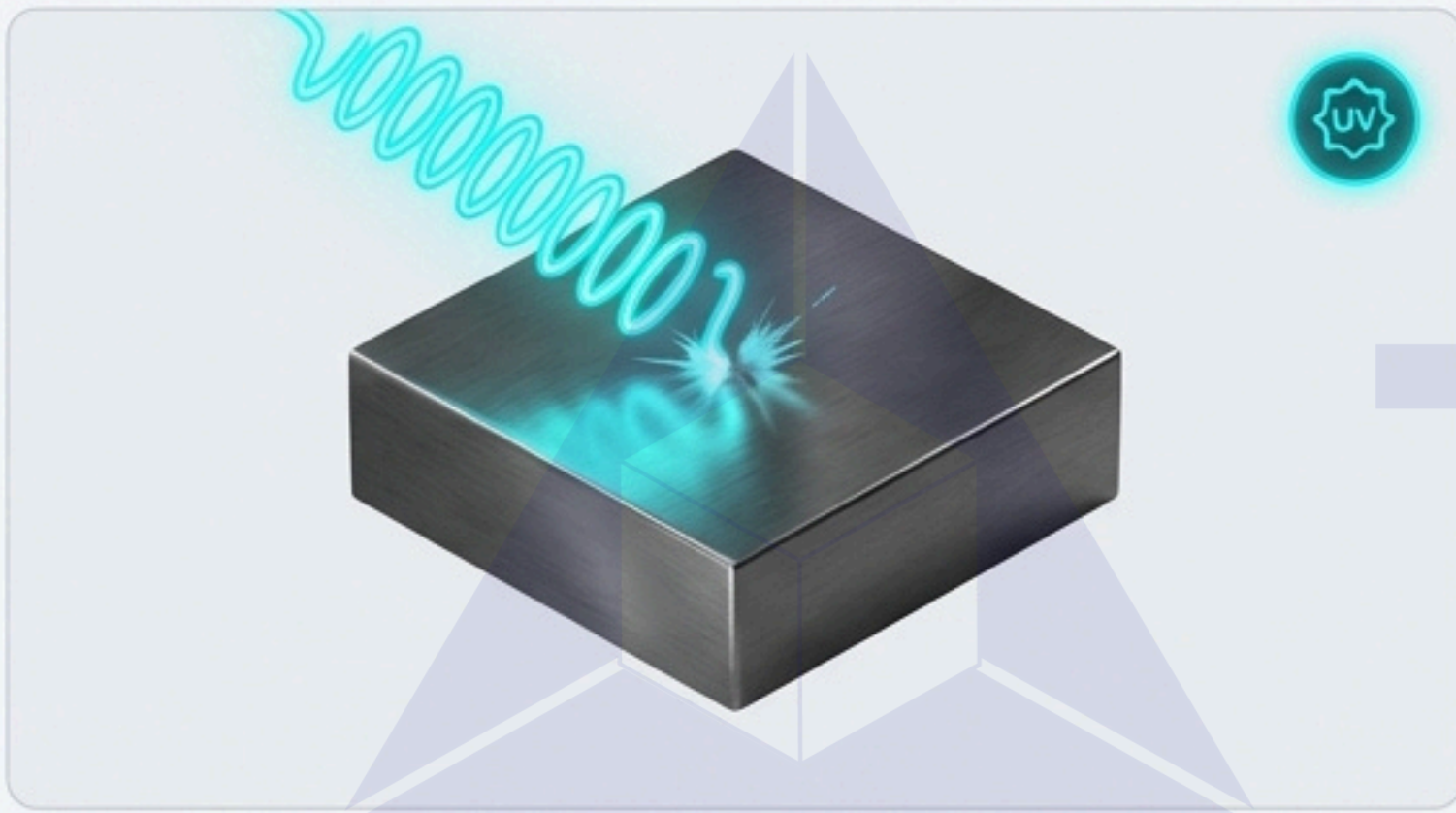


High Frequency ($\nu > \nu_0$)

Instantaneous emission of photoelectrons.

Material Matters: Not All Metals React the Same

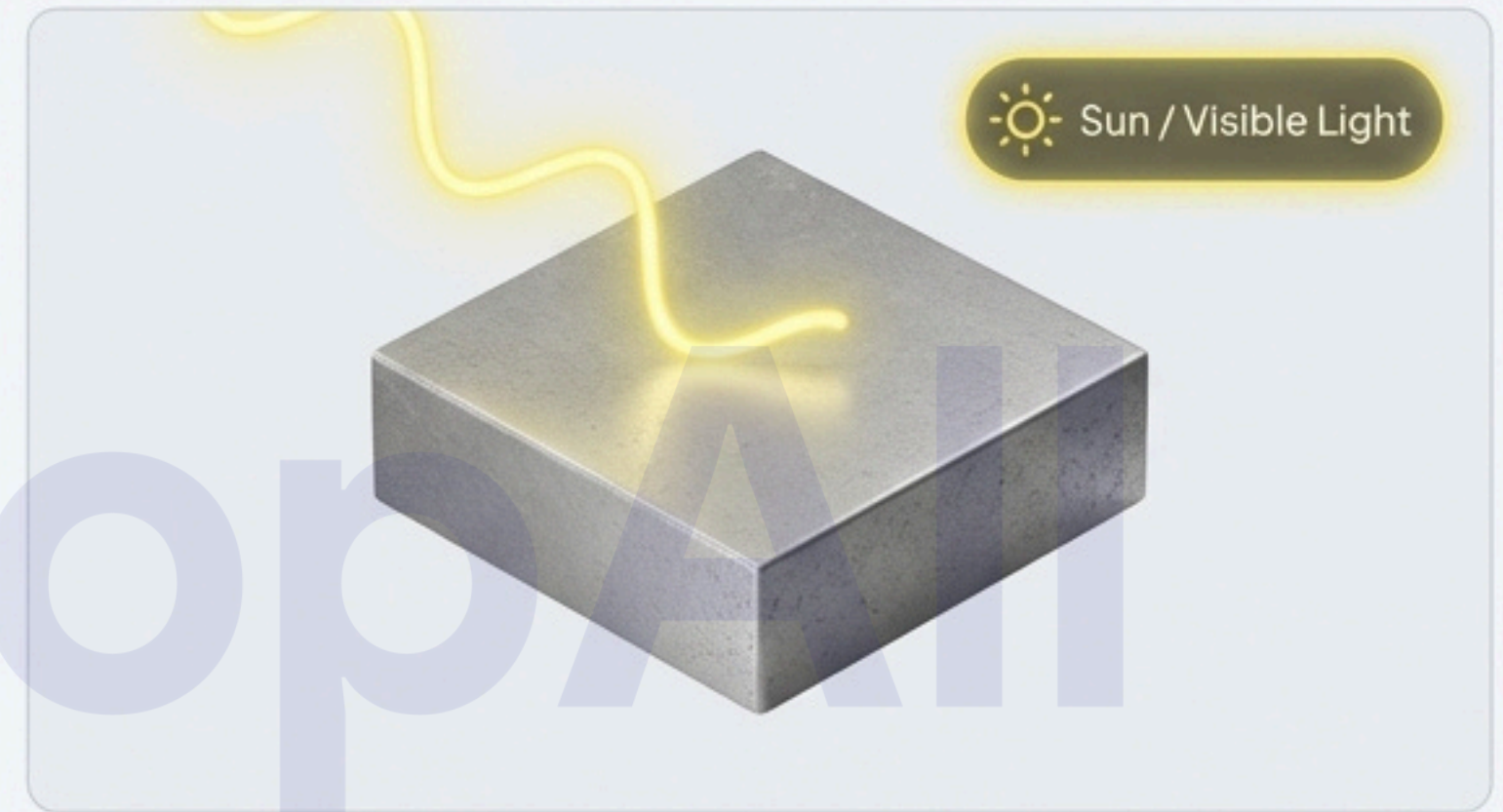
The threshold frequency (ν_0) depends entirely on the nature of the emitter material.



UV-Sensitive Metals

Examples: Zinc, Cadmium, Magnesium

Details: High work function. Requires short-wavelength, high-energy ultraviolet light to cause electron emission.

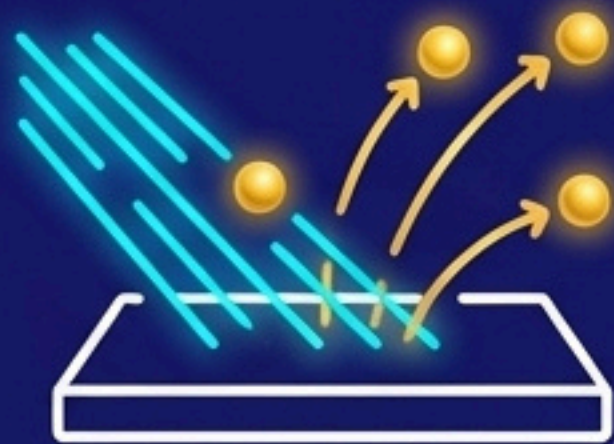


Visible-Light Sensitive

Examples: Alkali metals (Lithium, Sodium, Potassium)

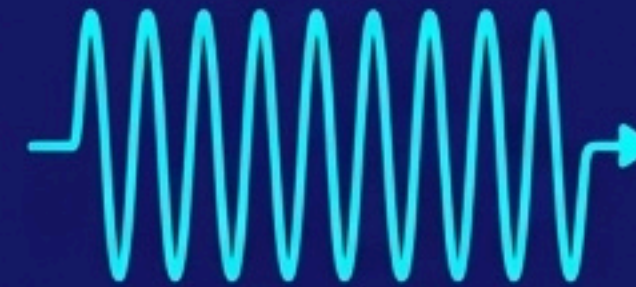
Details: Low work function. Highly sensitive; even standard visible light triggers the photoelectric effect.

The Quantum Blueprint: Key Takeaways



Light Ejects Electrons.

Illuminating a metal surface with suitable light instantaneously generates photoelectrons.



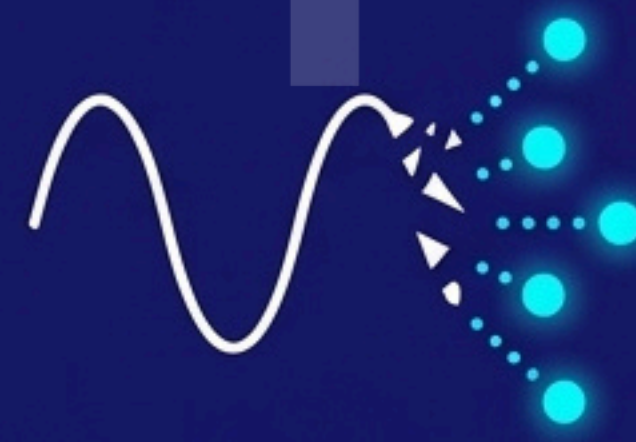
Frequency Rules.

Emission strictly requires a minimum threshold frequency (ν_0), regardless of light intensity.



Material Dictates the Lock.

Different metals have different work functions, determining what type of light (UV vs. Visible) triggers the effect.



The Paradigm Shift.

These rules challenge classical wave theory. If light were purely a continuous wave, even low-frequency light would eventually build up enough energy to eject an electron. The instantaneous, frequency-dependent nature of this effect proves that light must also act as a particle.



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