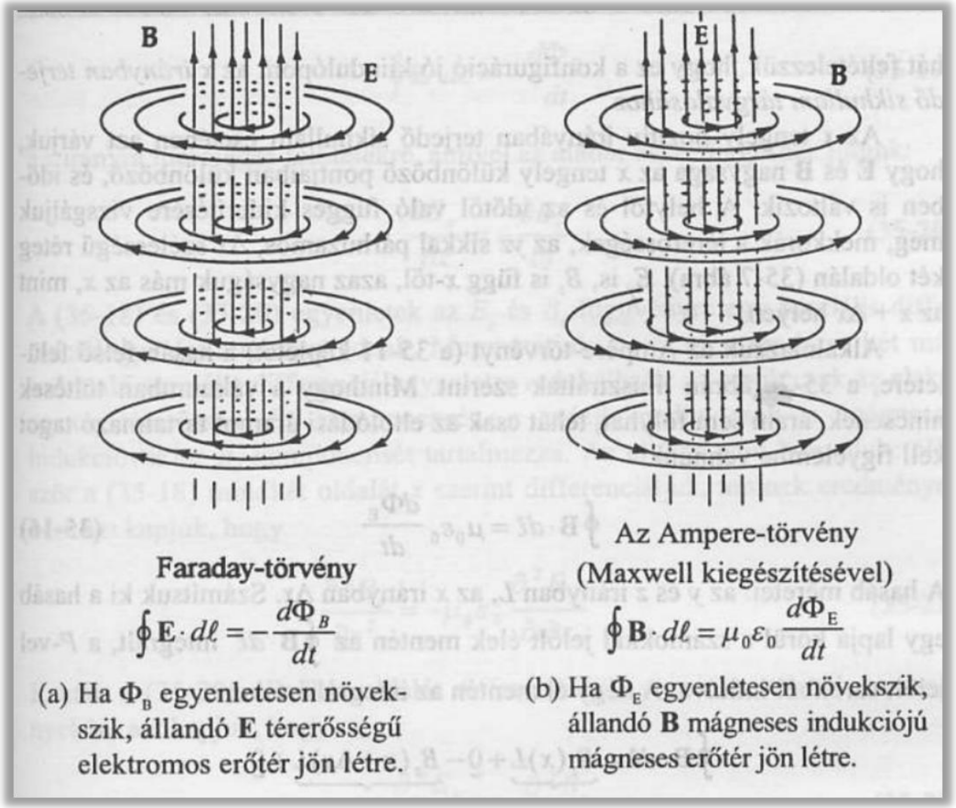
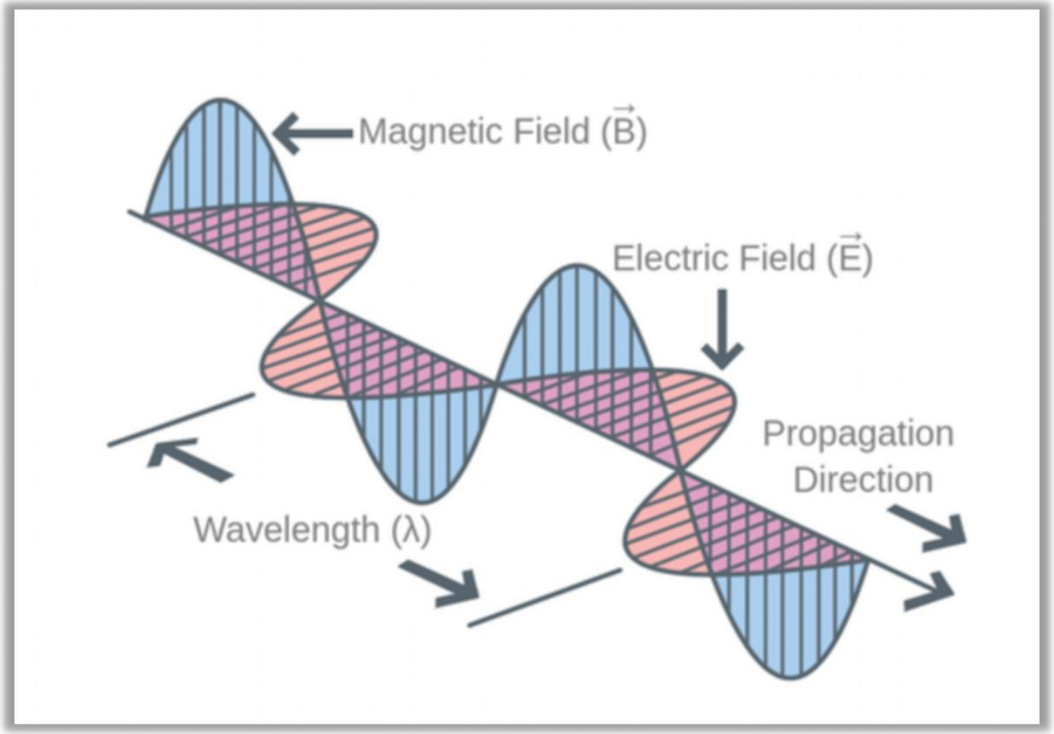
Ismétlés





	Integrális alak (makroszkopikus)	Differenciális alak (makroszkopikus)
I. Elektromos Gauss-törvény	$\oiint \mathbf{E}\, d\mathbf{A} = \frac{q}{\varepsilon_0}$	$\nabla\cdot\mathbf{E} = \frac{\rho}{\varepsilon_0}$
II. Mágneses Gauss-törvény	$\oiint \mathbf{B}\, d\mathbf{A} = 0$	$\nabla\cdot\mathbf{B} = 0$
III. Faraday-törvény	$\oint \mathbf{E}\, d\mathbf{l} = -\frac{d\phi_B}{dt}$	$\nabla\times\mathbf{E} = -\frac{d\mathbf{B}}{dt}$
IV. Ampere-Maxwell-törvény	$\oint \mathbf{B}\, d\mathbf{l} = \mu_0\left(I + \varepsilon_0\frac{d\phi_E}{dt}\right)$	$\nabla\times\mathbf{B} = \mu_0\left(\mathbf{j} + \varepsilon_0\frac{d\mathbf{E}}{dt}\right)$

$$\frac{\partial^2\mathbf{E}}{\partial t^2} = \frac{1}{\mu_0\varepsilon_0}\nabla^2\mathbf{E}$$

$$\frac{\partial^2\mathbf{B}}{\partial t^2} = \frac{1}{\mu_0\varepsilon_0}\nabla^2\mathbf{B}$$

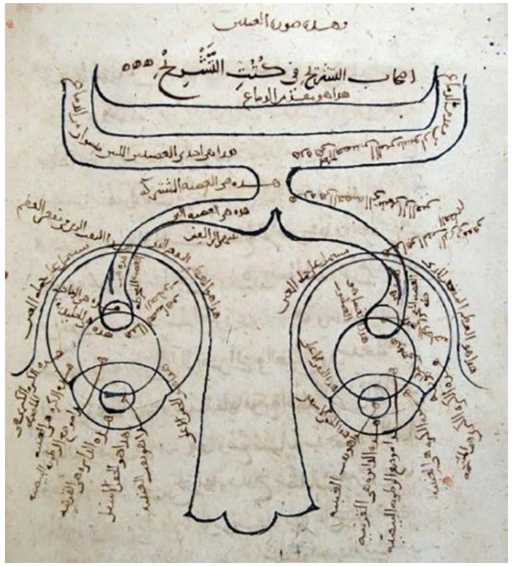
Optika

A fénytan rövid története

Eukleidész és Ptolemaiosz

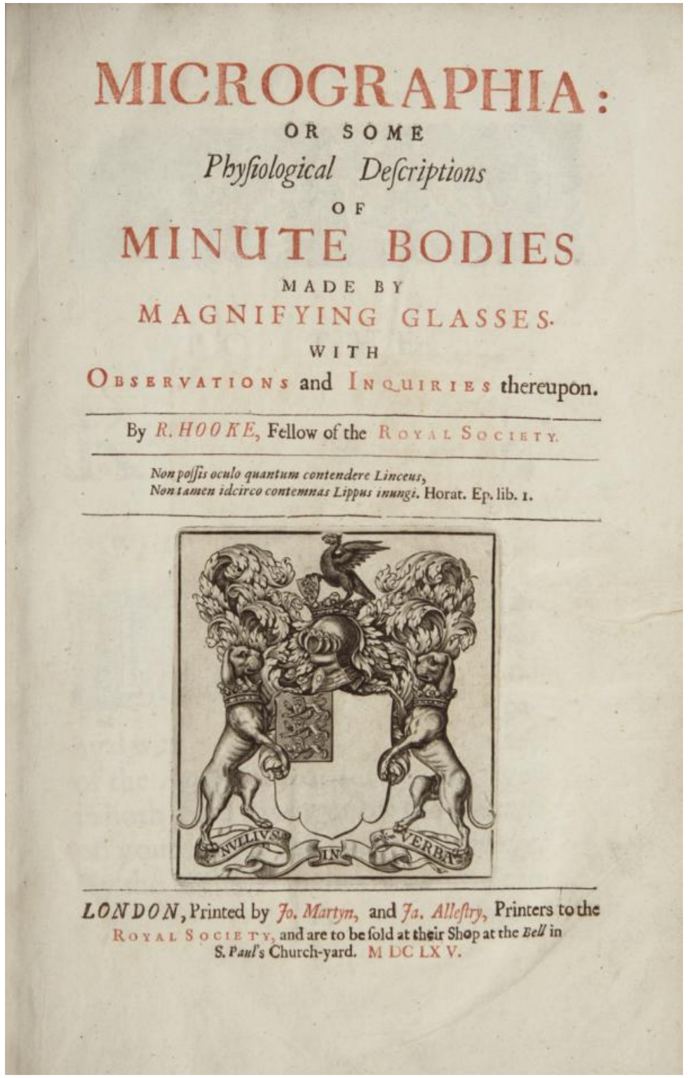
Geommetriai optika alapja: a fény egyenes úton terjed

Ibn al-Haytham ~1000



Az optika könyve: reflexió, refrakció, a látás

Robert Hooke 1665


MICROGRAPHIA:
OR SOME
Physiological Descriptions
OF
MINUTE BODIES
MADE BY
MAGNIFYING GLASSES.
WITH
OBSERVATIONS and INQUIRIES thereupon.

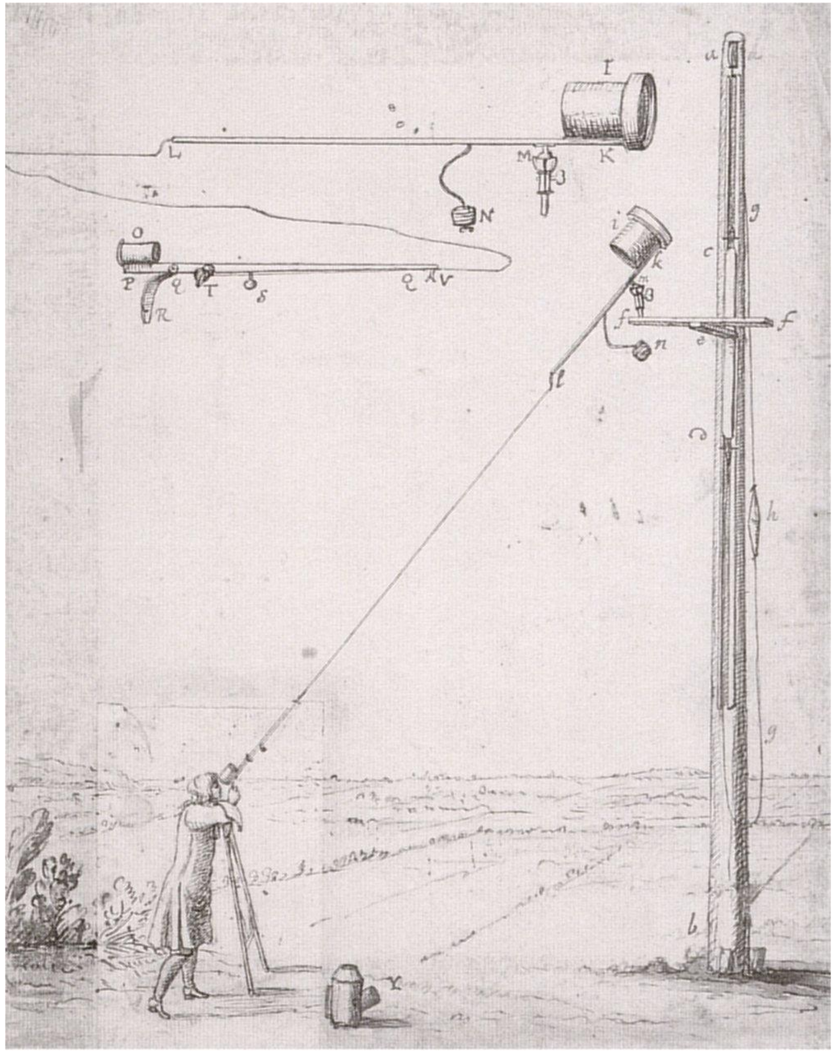
By *R. HOOKE*, Fellow of the ROYAL SOCIETY.

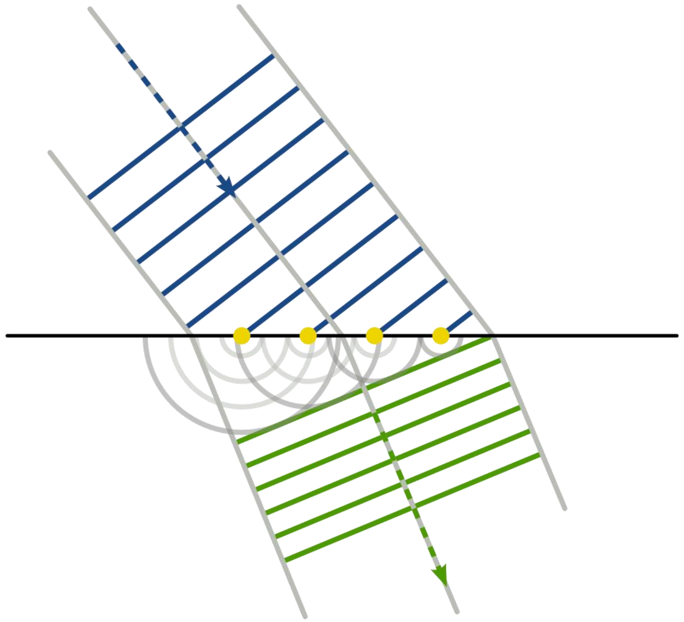
Non possis oculo quantum contendere Linceus,
Non tamen idcirco contemnas Lippus inungi. Horat. Ep. lib. 1.

LONDON, Printed by *Jo. Martyn*, and *Ja. Allestry*, Printers to the ROYAL SOCIETY, and are to be sold at their Shop at the *Bell* in S. *Paul's* Church-yard. M DC LX V.

Refrakció → a fény hullám

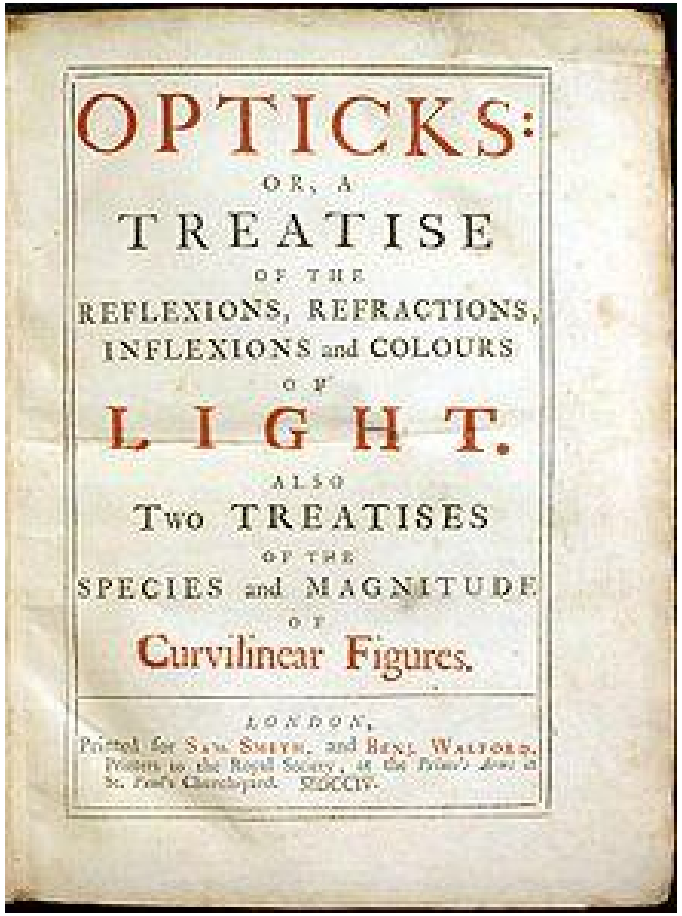
Christiaan Huygens 1678





A fény terjedése: hullámfront minden pontja elemi gömbhullámok kiindulópontja.

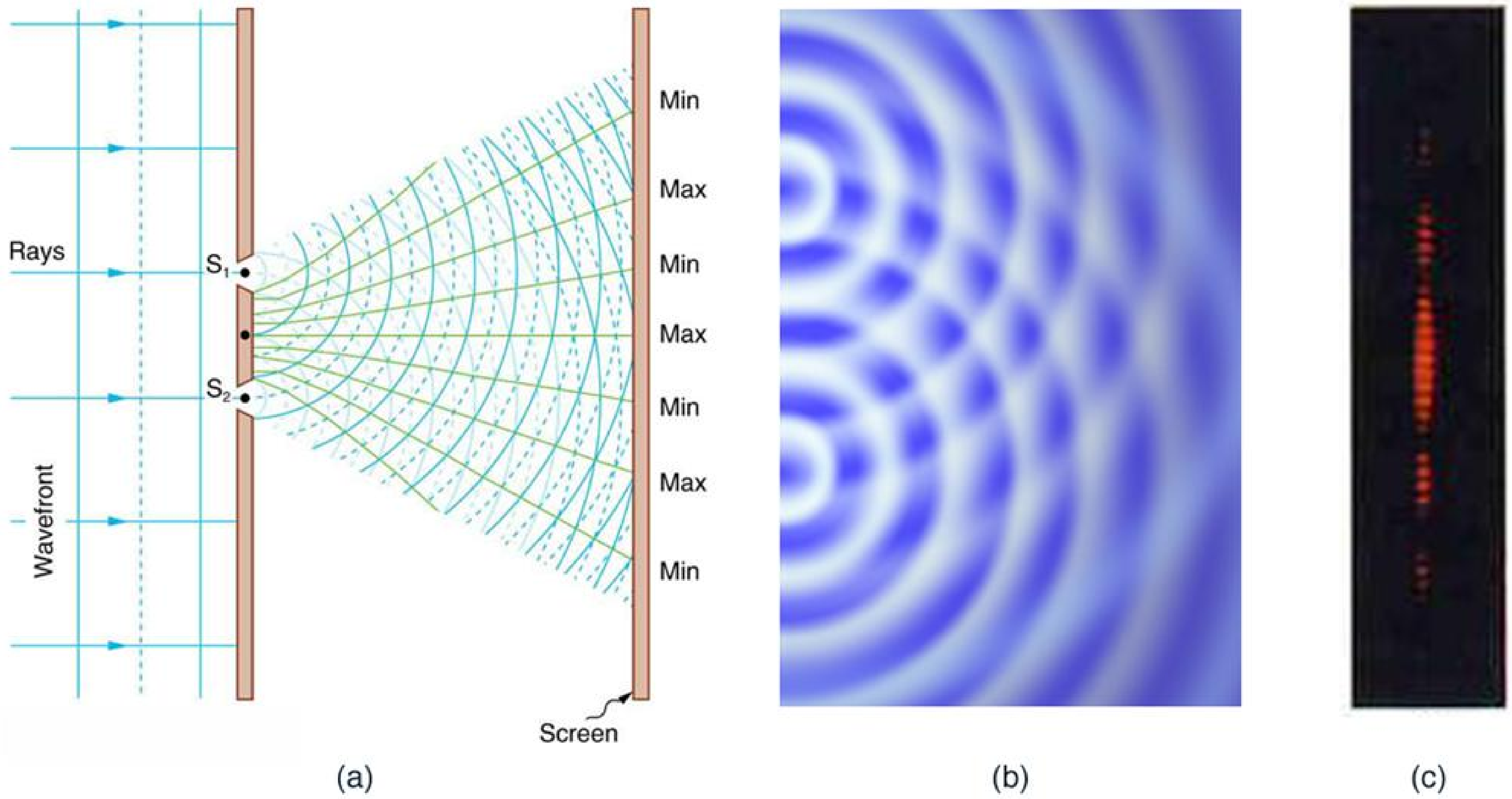
Isaac Newton 1704


OPTICKS:
OR, A
TREATISE
OF THE
REFLEXIONS, REFRACTIONS,
INFLEXIONS and COLOURS
OF
LIGHT.
ALSO
Two TREATISES
OF THE
SPECIES and MAGNITUDE
OF
Curvilinear Figures.

LONDON,
Printed for SAM. SMITH, and BENJ. WALFORD,
Printers to the Royal Society, at the Prince's Arms in
St. Paul's Church-yard. MDCCIV.

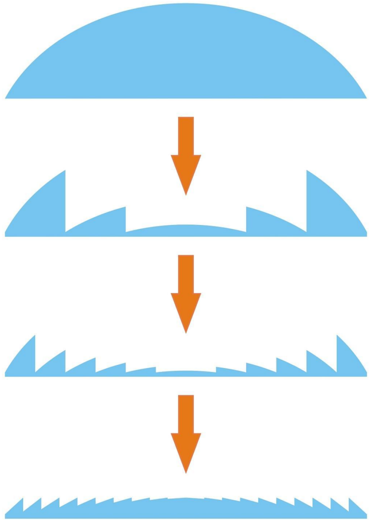
Korpuszkula elmélet

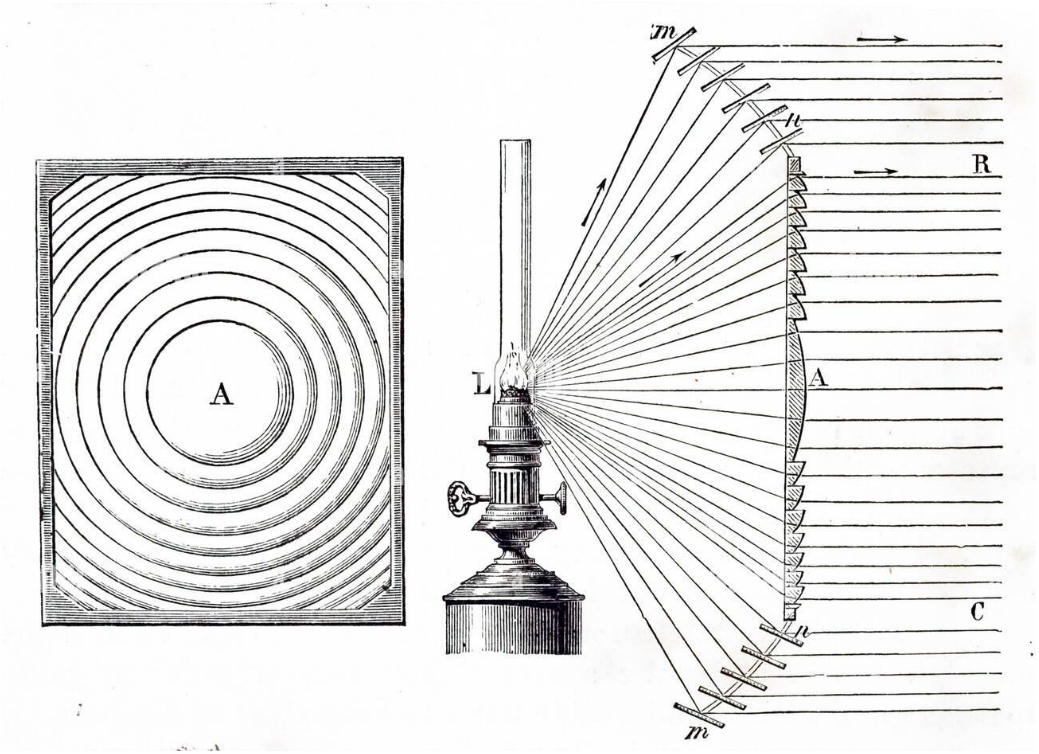
Thomas Young 1801



Kétrés-kísérlet

Augustin-Jean Fresnel 1817

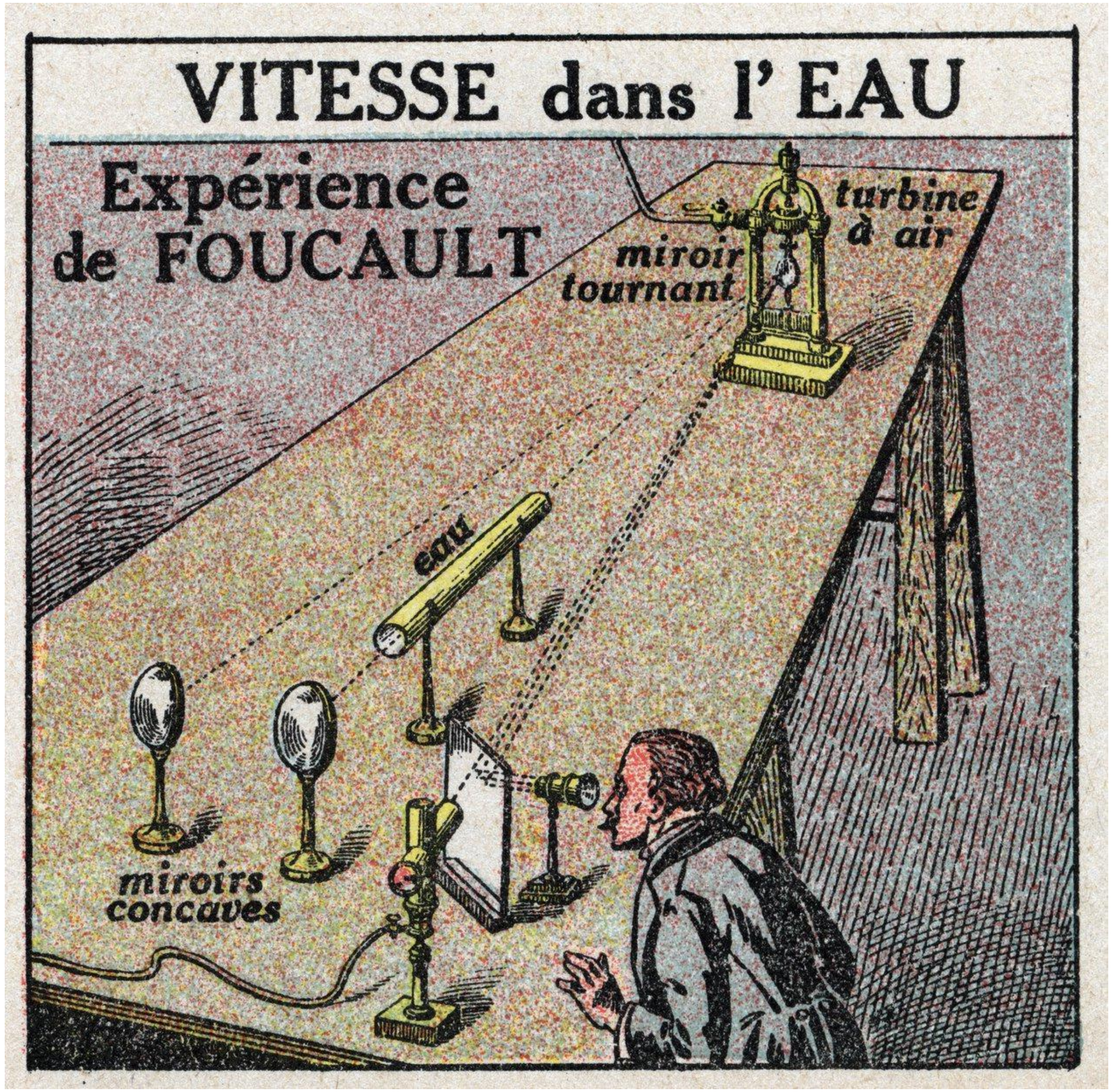




Huygens-Fresnel-elv: Másodlagos hullámok

Diffrakció, polarizáció

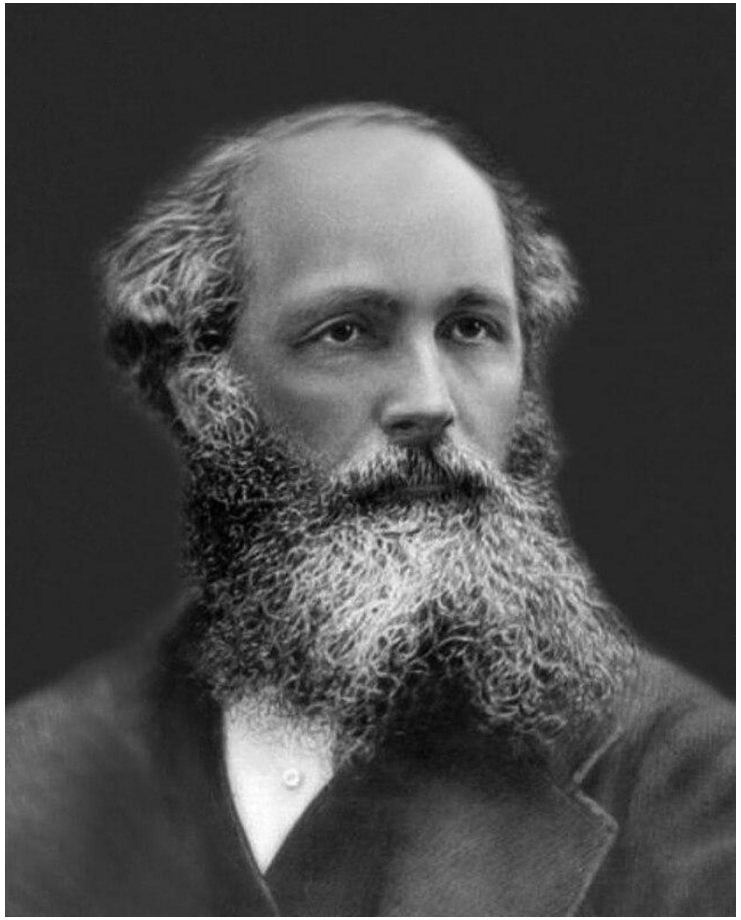
Léon Foucault 1850



Fény terjedési sebességének mérése

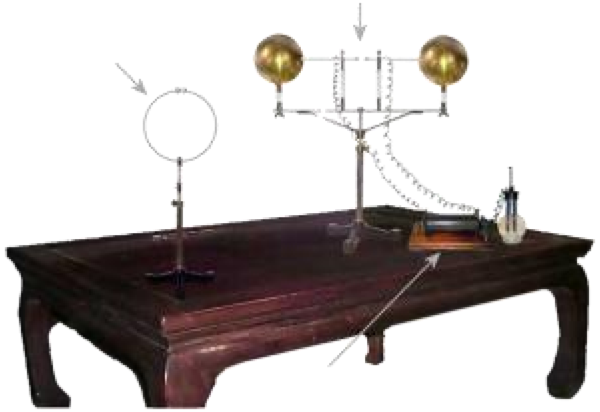
James Clerk Maxwell 1864

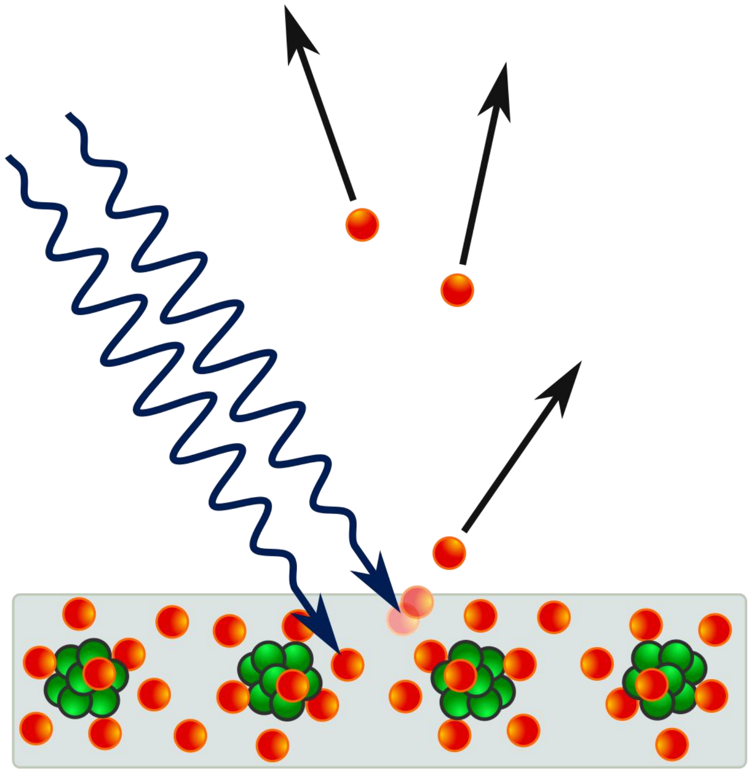
	Integrális alak (makroszkopikus)	Differenciális alak (makroszkopikus)
I. Elektromos Gauss-törvény	$\oiint \mathbf{E}\, d\mathbf{A} = \frac{q}{\varepsilon_0}$	$\nabla \cdot \mathbf{E} = \frac{\rho}{\varepsilon_0}$
II. Mágneses Gauss-törvény	$\oiint \mathbf{B}\, d\mathbf{A} = 0$	$\nabla \cdot \mathbf{B} = 0$
III. Faraday-törvény	$\oint \mathbf{E}\, d\mathbf{l} = -\frac{d\phi_B}{dt}$	$\nabla \times \mathbf{E} = -\frac{d\mathbf{B}}{dt}$
IV. Ampere-Maxwell-törvény	$\oint \mathbf{B}\, d\mathbf{l} = \mu_0 \left(I + \varepsilon_0 \frac{d\phi_E}{dt} \right)$	$\nabla \times \mathbf{B} = \mu_0 \left(\mathbf{j} + \varepsilon_0 \frac{d\mathbf{E}}{dt} \right)$



$$\frac{\partial^2 \mathbf{E}}{\partial t^2} = \frac{1}{\mu_0 \varepsilon_0} \nabla^2 \mathbf{E} \qquad \frac{\partial^2 \mathbf{B}}{\partial t^2} = \frac{1}{\mu_0 \varepsilon_0} \nabla^2 \mathbf{B}$$

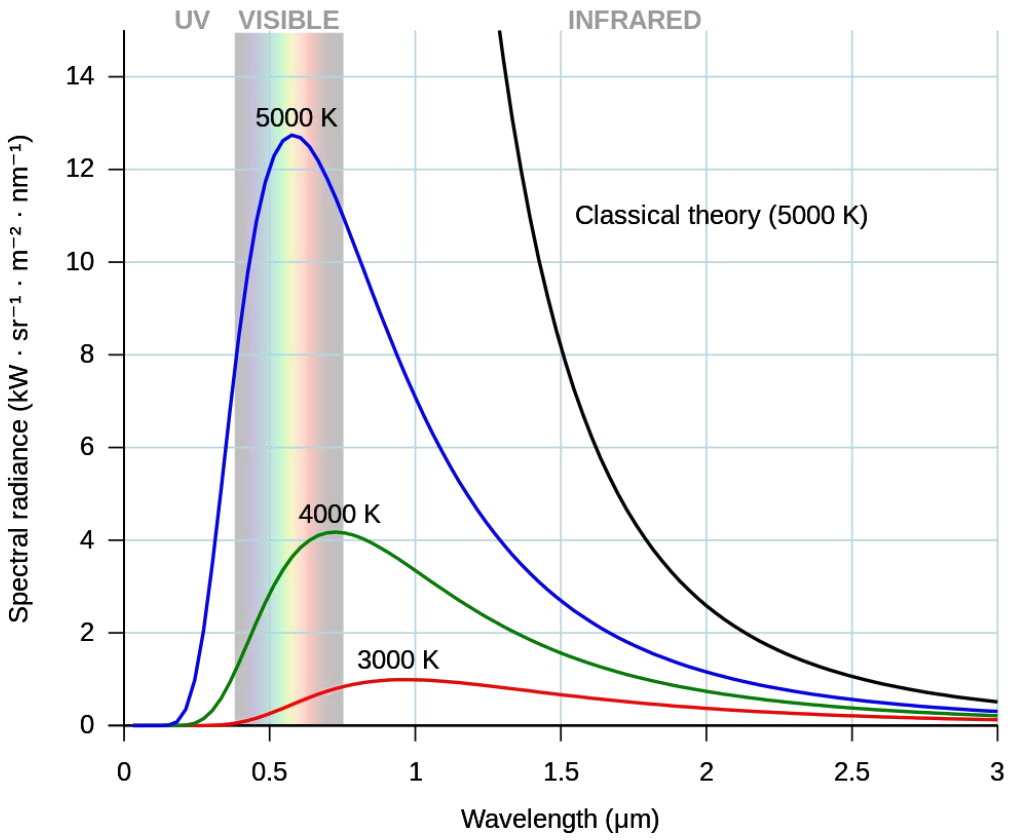
Heinrich Hertz 1887



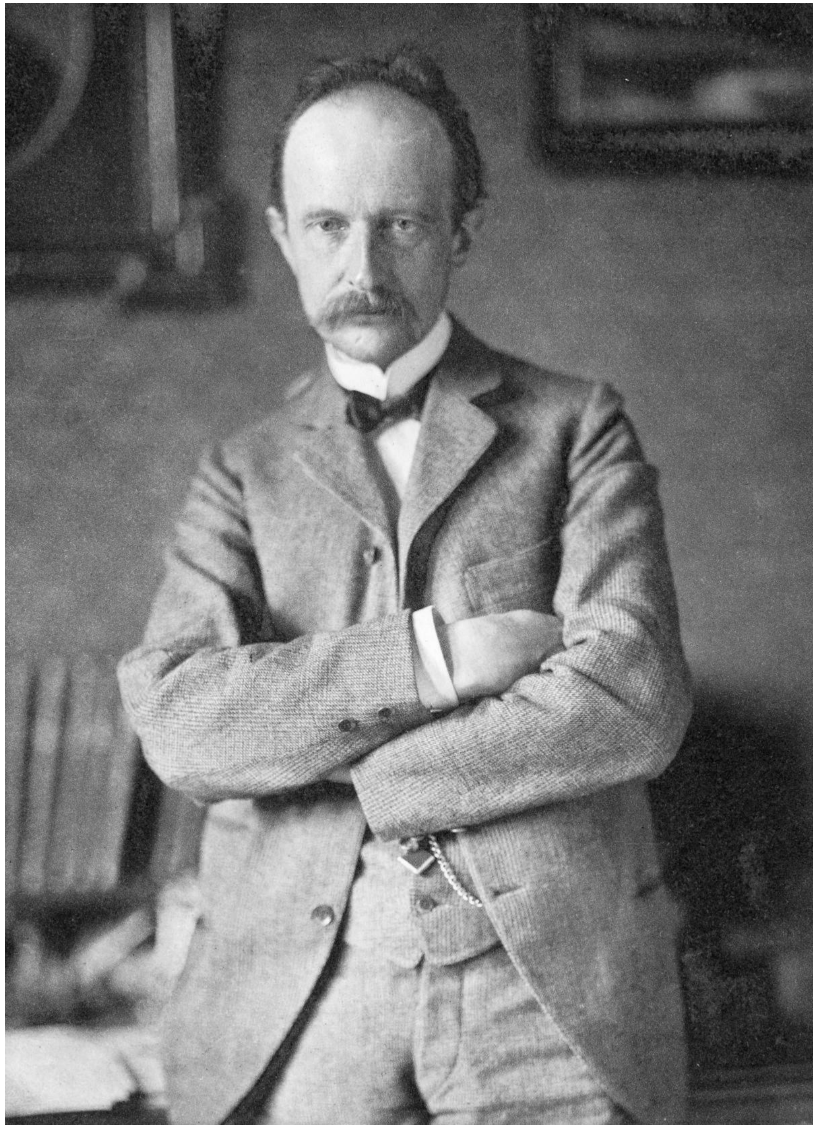


Fotoeffektus (Fotoelektromos hatás)

Max Planck 1900

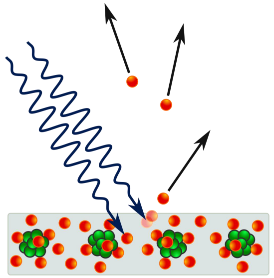


$$B_\nu(T) = \frac{2h\nu^3}{c^2}\frac{1}{e^{h\nu/kT}-1}, \qquad E = h\nu$$

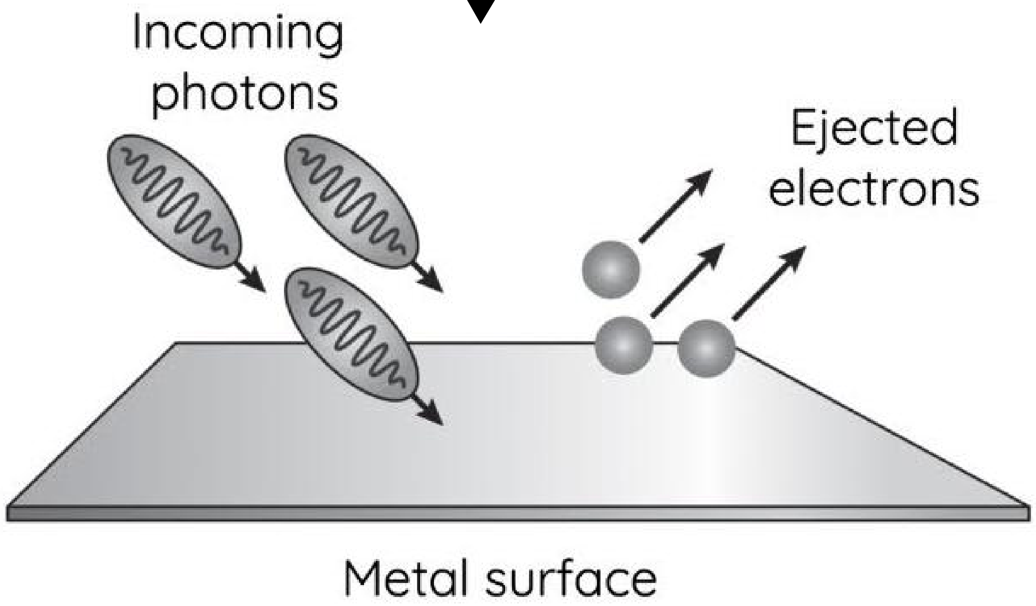


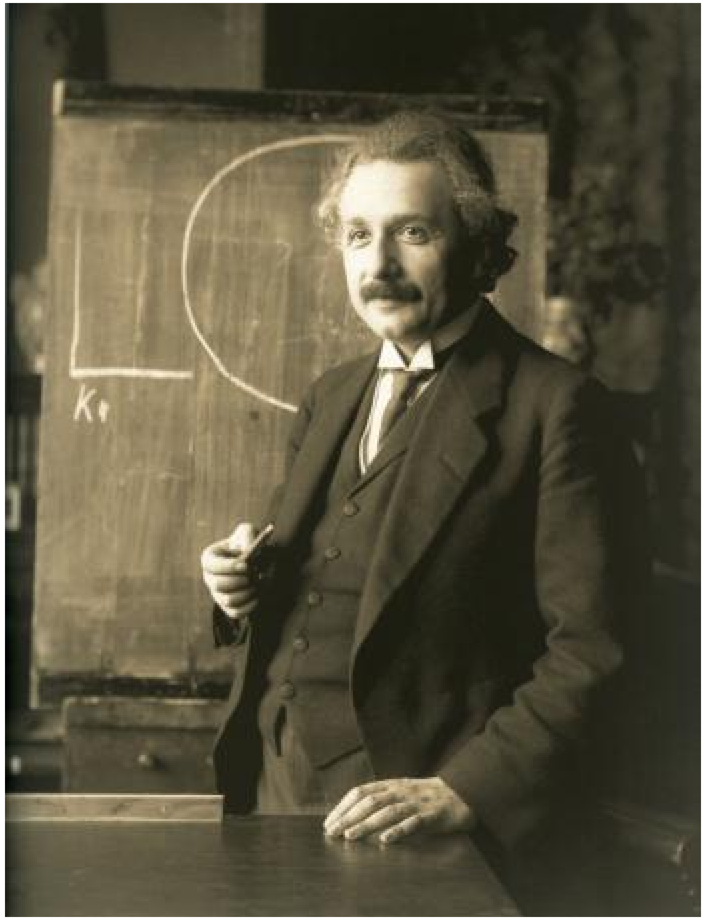
Kvantált energia, feketetest sugárzás

Albert Einstein 1905

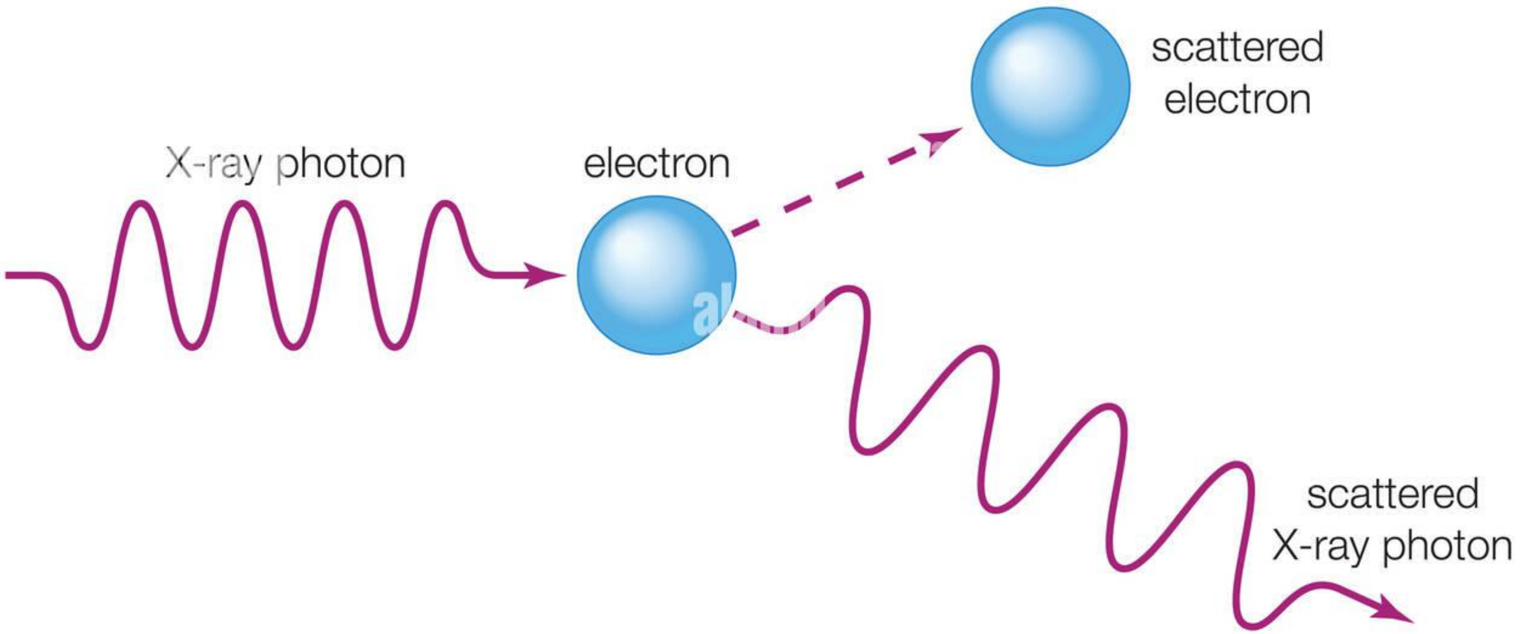


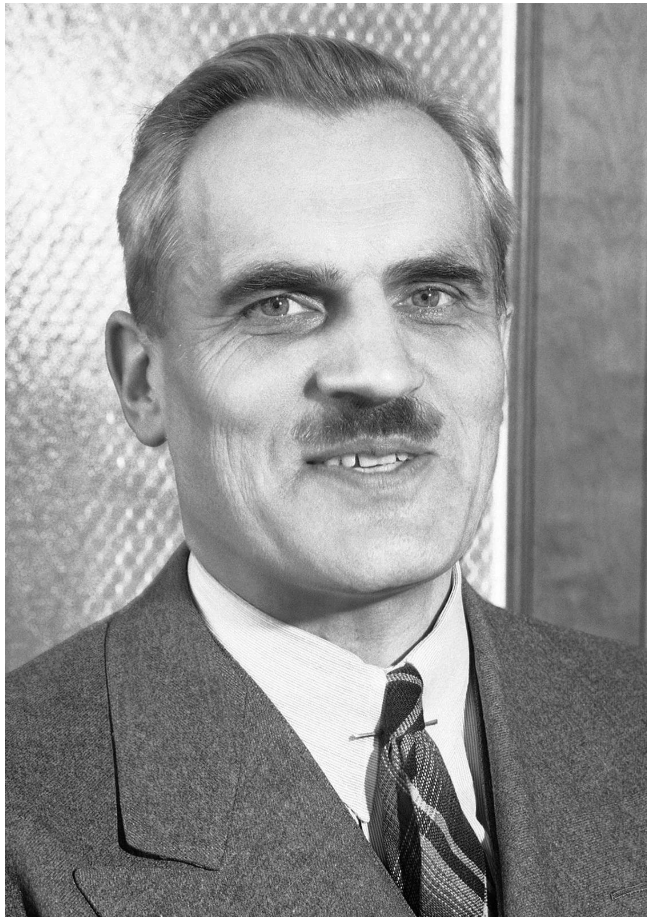
$$E = h\nu$$





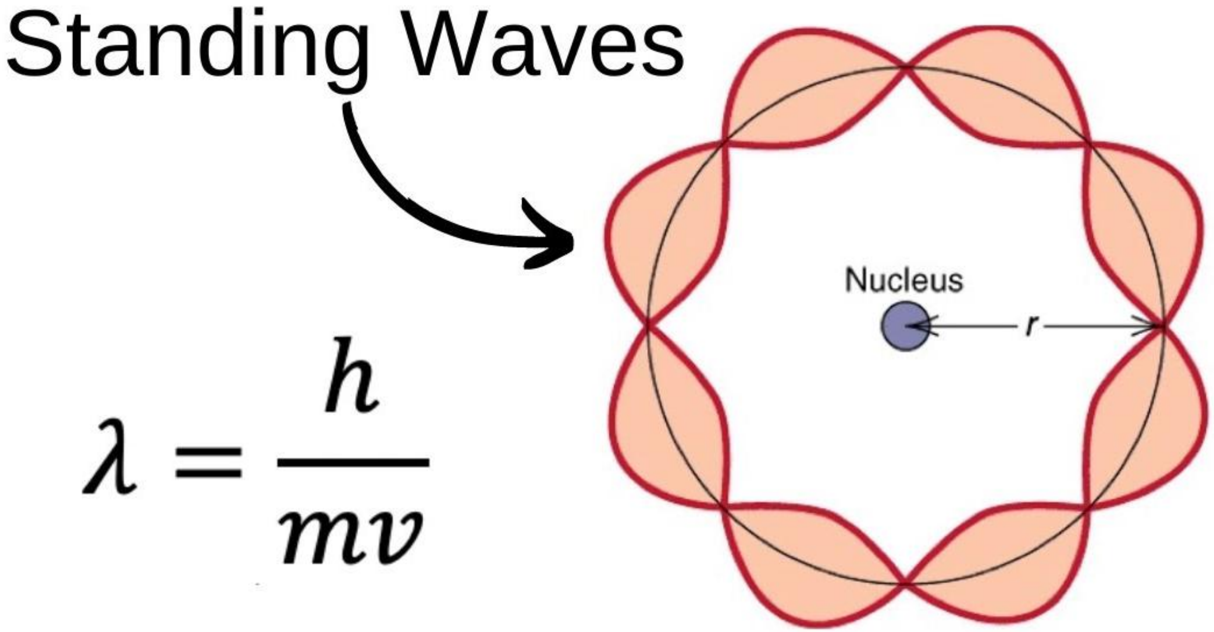
Arthur Compton 1923





Compton-szórás

Louis de Broglie 1924



$$\lambda = \frac{h}{mv}$$

Hullámok és kvantumok: Anyaghullám és de Broglie hullámhossz

→ Davisson-Germer kísérlet igazolja az elektron hullámtermészetét

→ Kvantum elektrodinamika (QED)