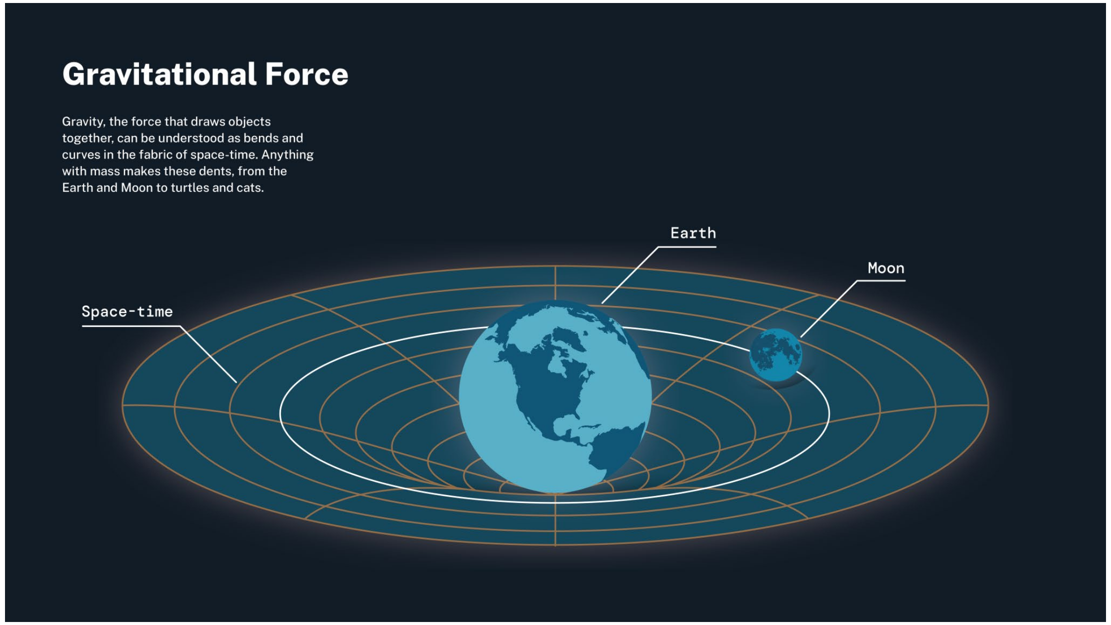
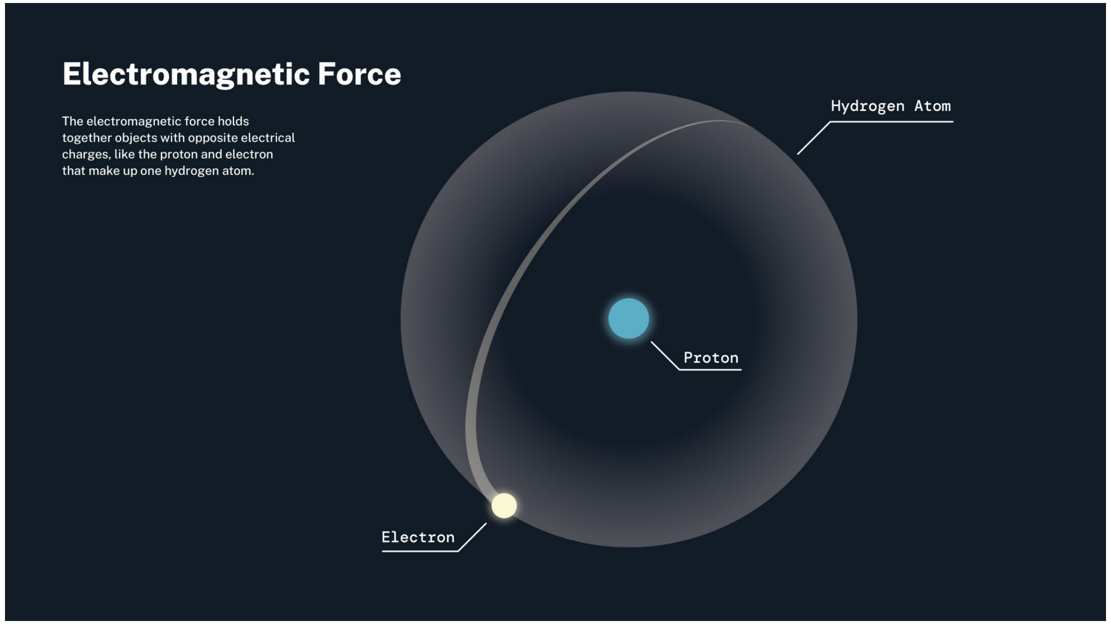
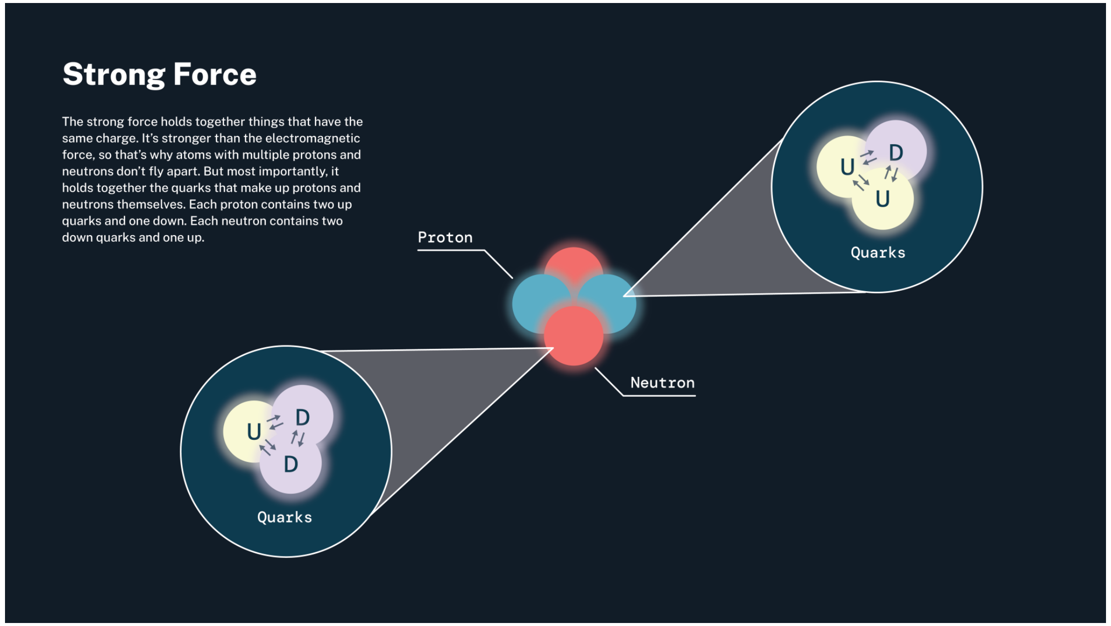
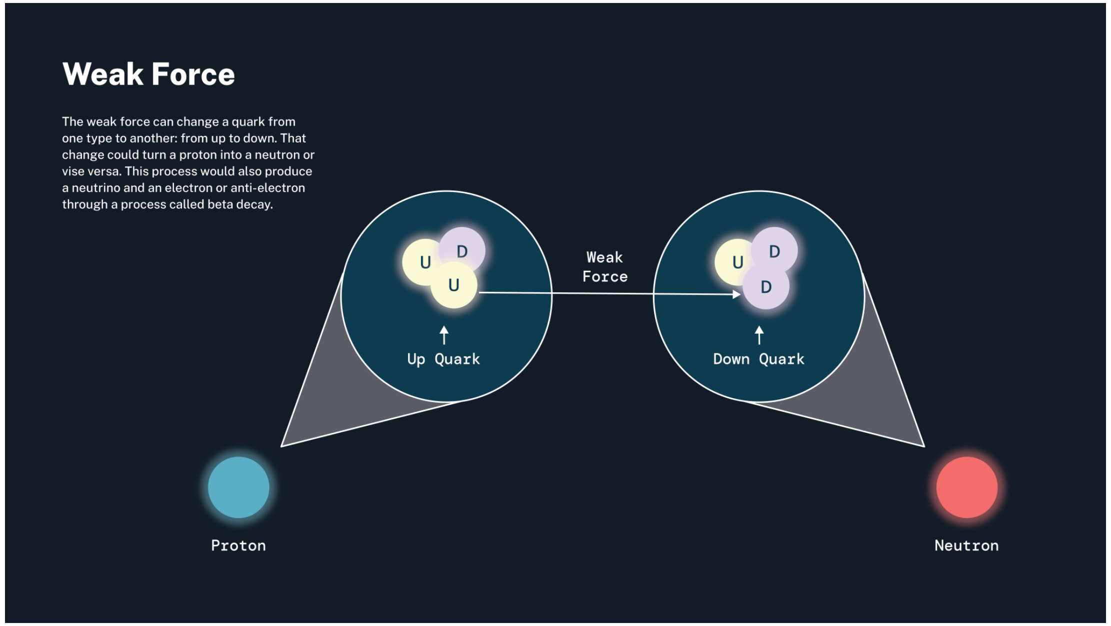
# Fizika 2: Elektrodnamika

Bevezetés

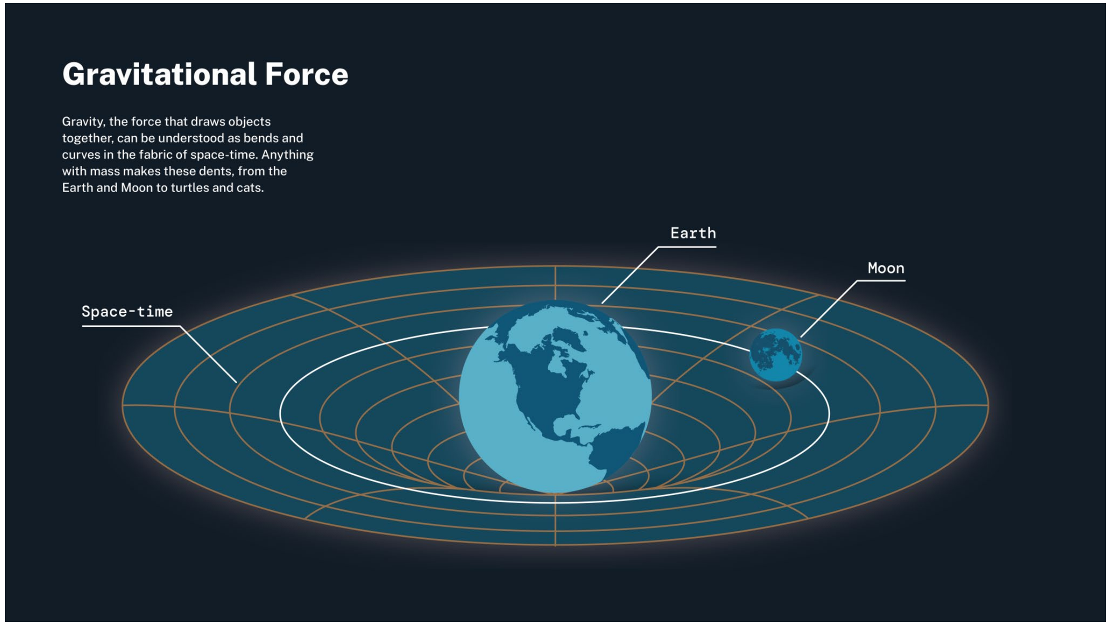


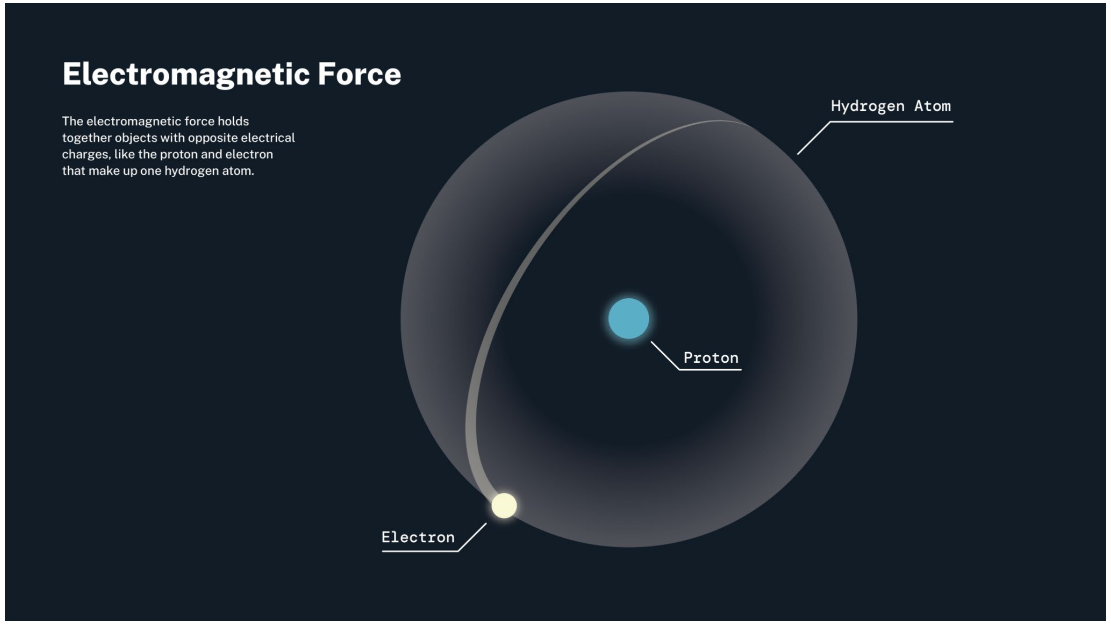



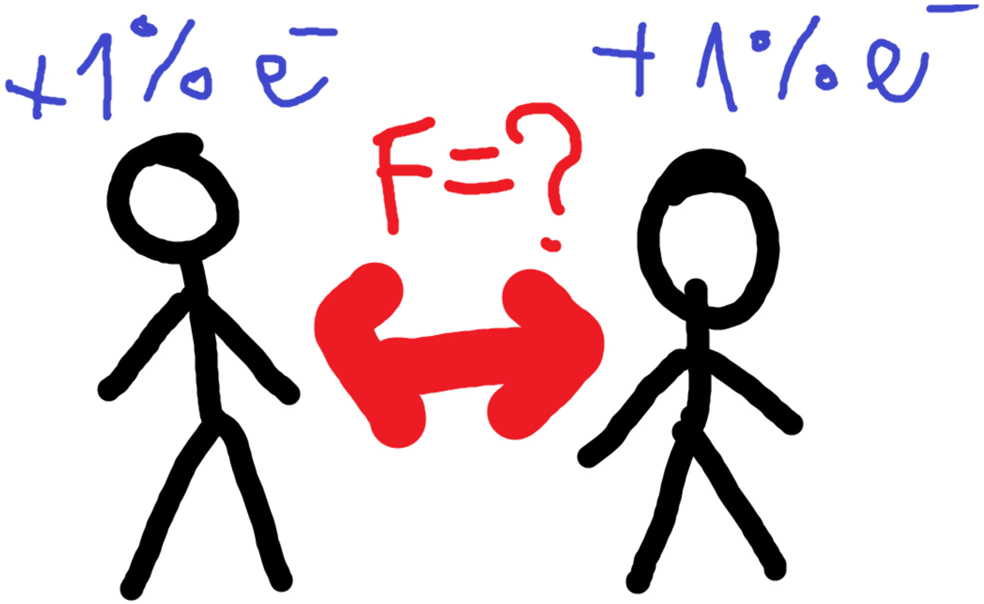



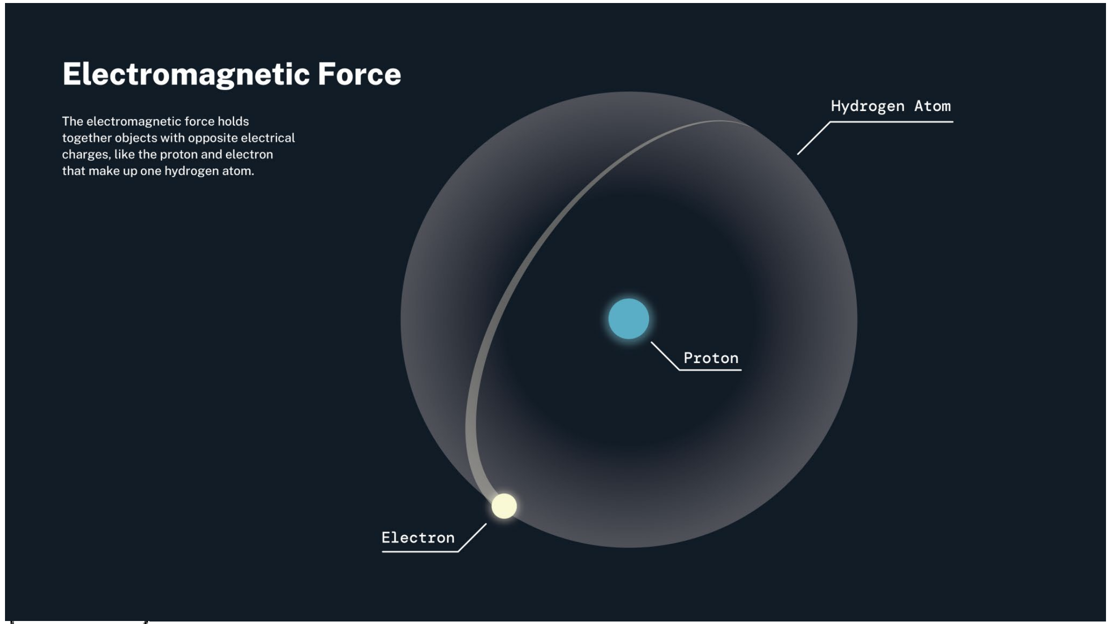

https://science.nasa.gov/universe/overview/forces/

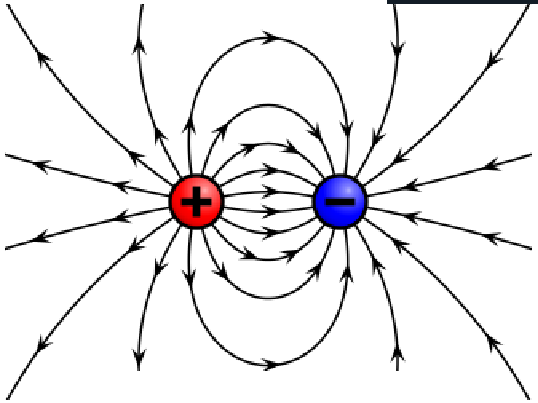

Gravitational Force
Gravity, the force that draws objects together, can be understood as bends and curves in the fabric of space-time. Anything with mass makes these dents, from the Earth and Moon to turtles and cats.
Earth
Moon
Space-time

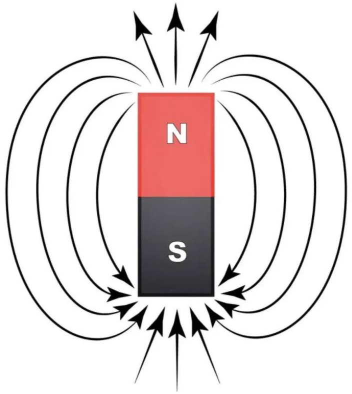

Electromagnetic Force
The electromagnetic force holds together objects with opposite electrical charges, like the proton and electron that make up one hydrogen atom.
Hydrogen Atom
Proton
Electron

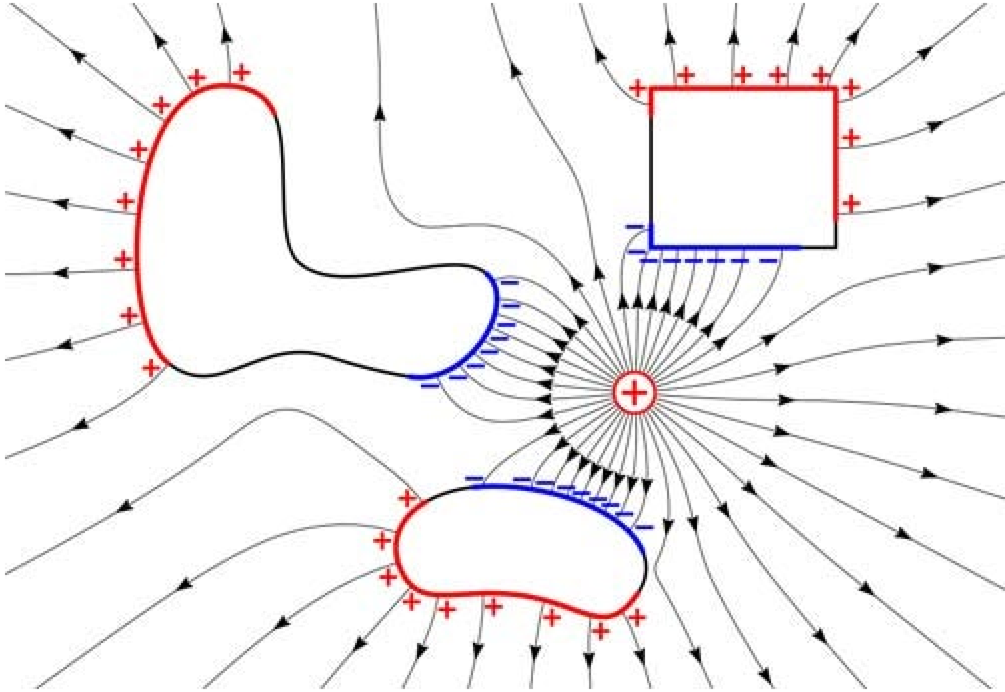

+1% e⁻
F=?
+1% e⁻

Foam peanuts clinging to a cat's fur due to static electricity. The electric field of the charged fur causes polarization of the molecules of the foam due to electrostatic induction, resulting in a slight attraction of the light plastic pieces to the fur.[1][2][3][4] This effect is also the cause of static cling in clothes.

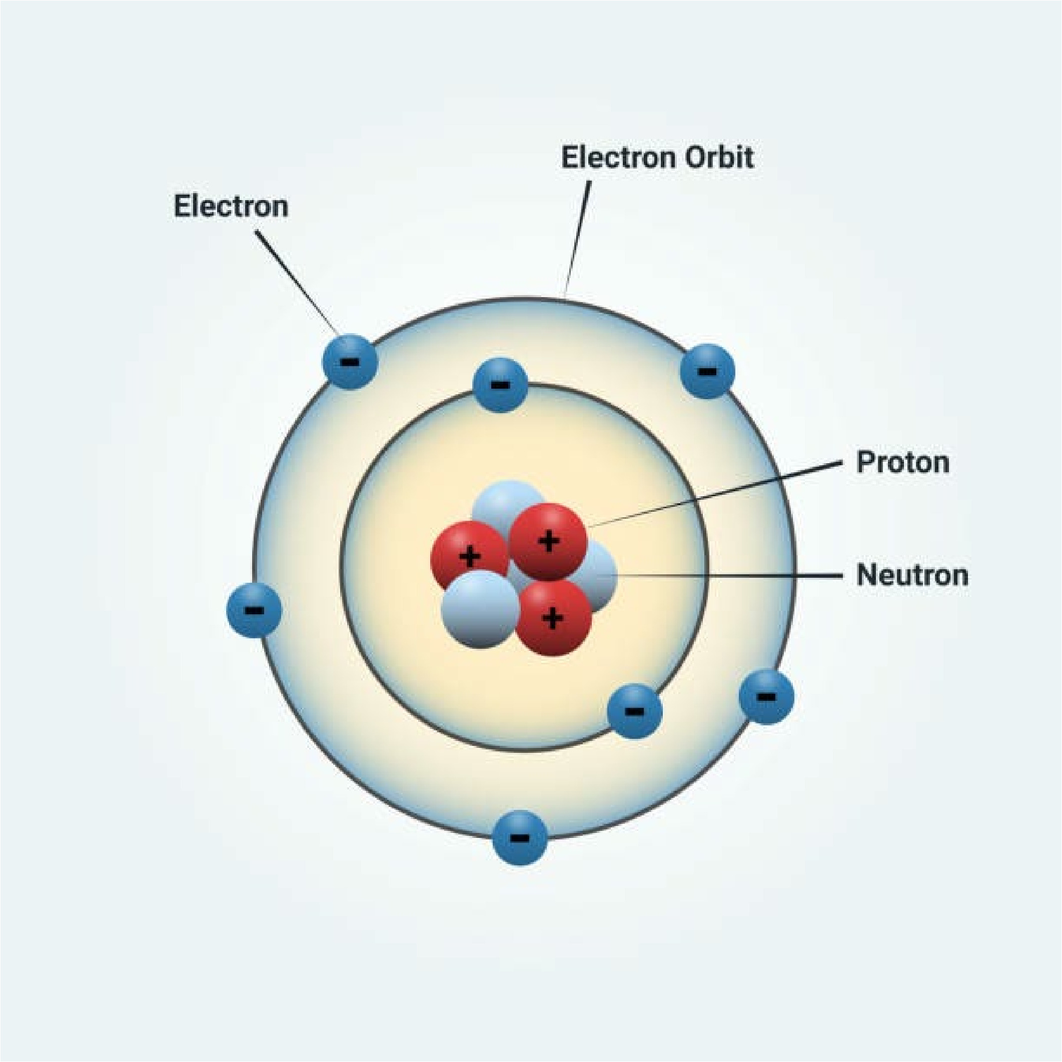




# Miért nem esnek be az elektronok az atommagba?



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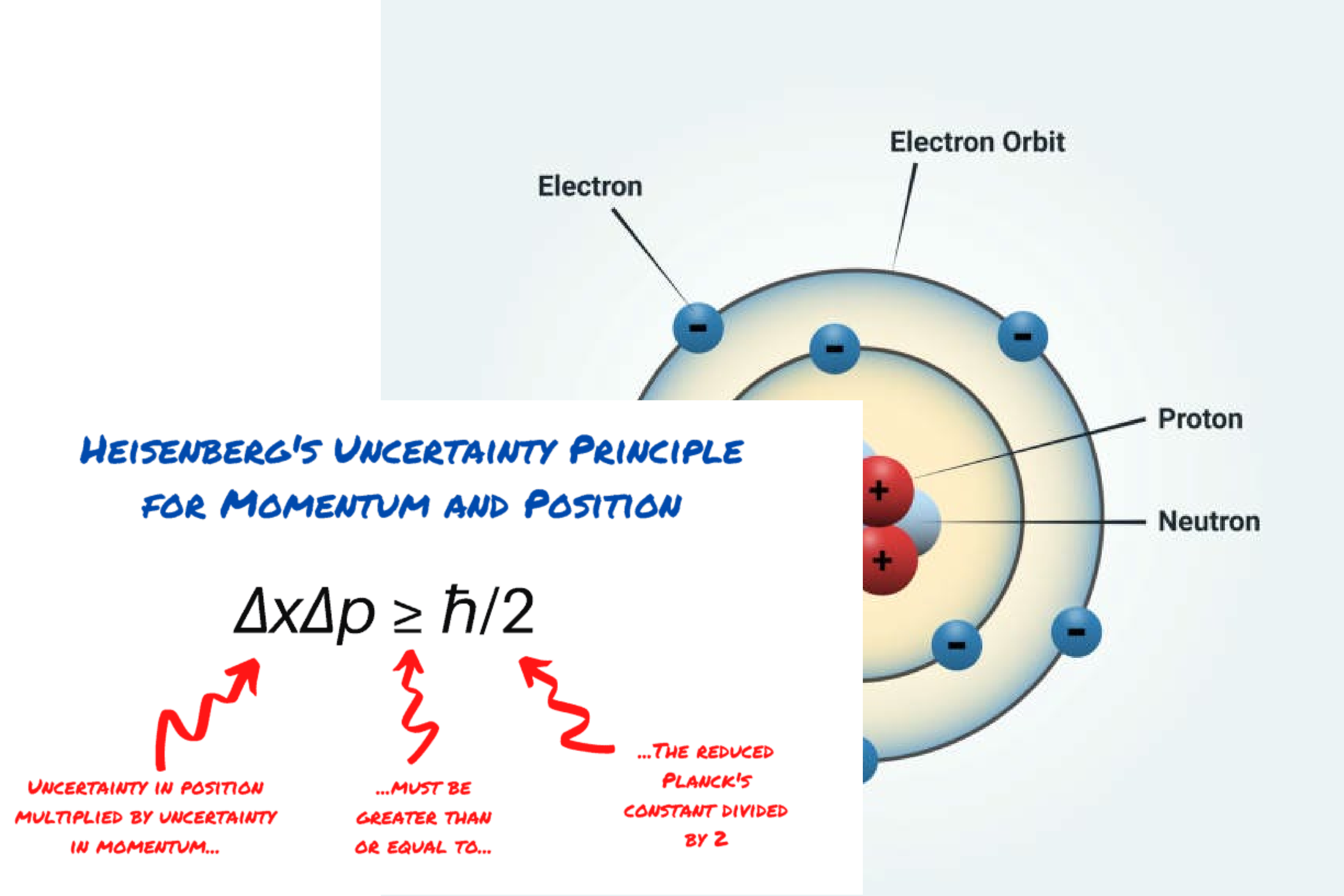
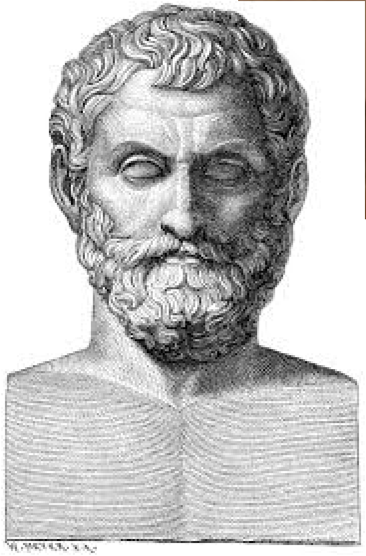
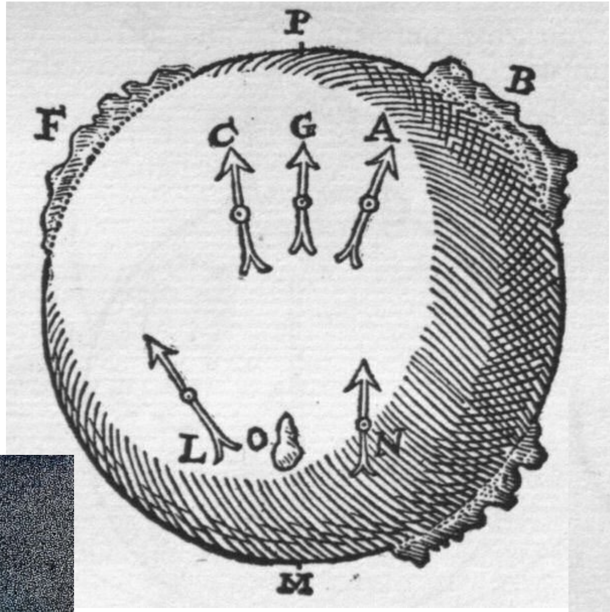
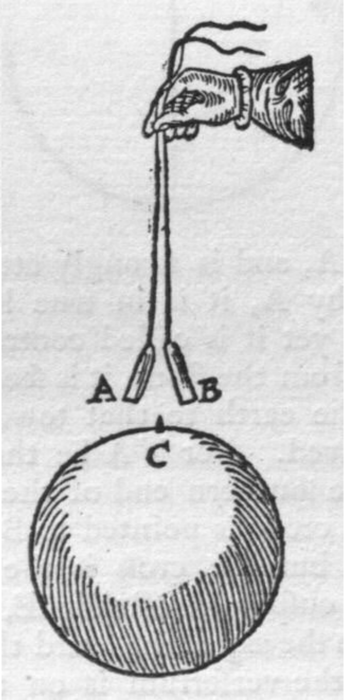



Elektron: hullámfüggvény (kvantummechanikai állapot)

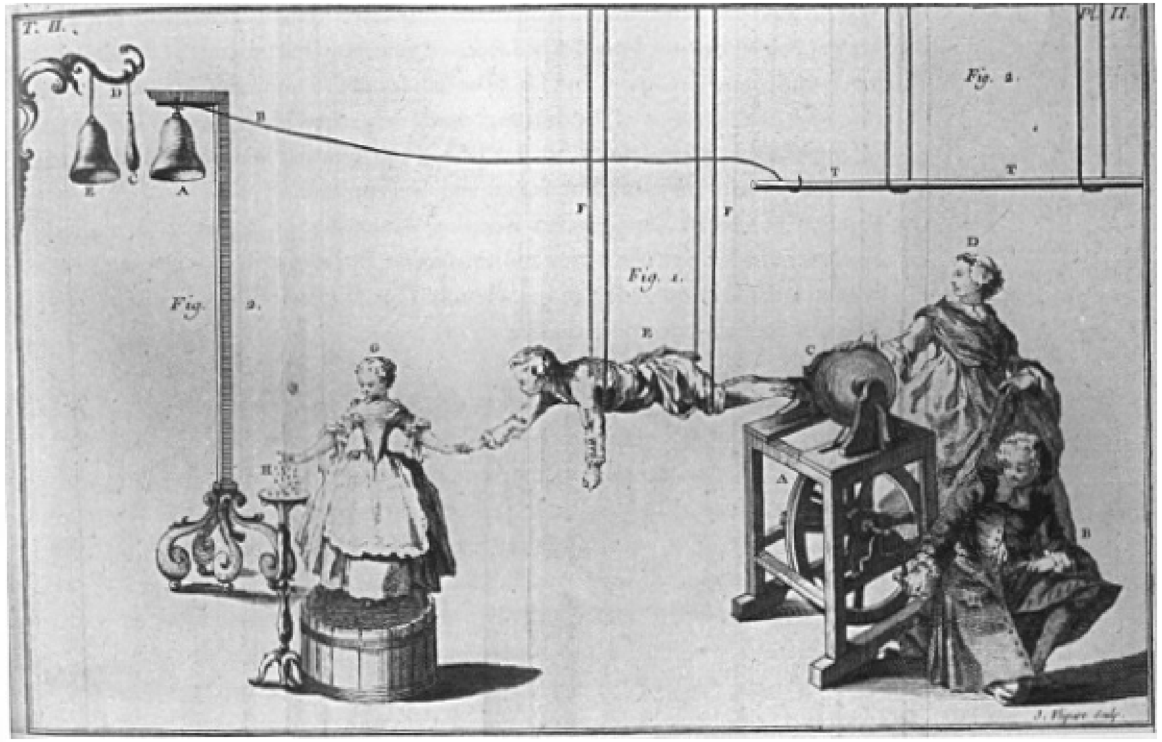


Milétoszi Thalész (i.e. 600 körül)




William Gilbert: elektromosság megnevezés + Föld mágneses mezeje (1600)

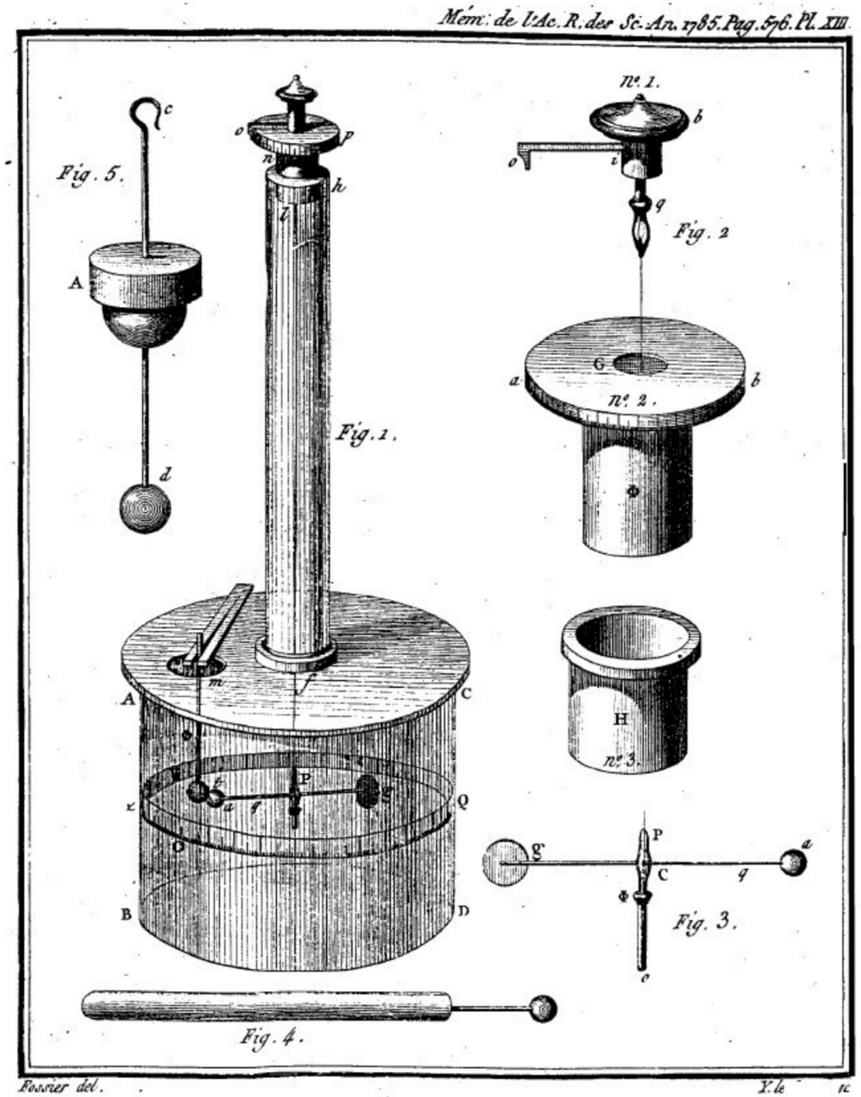


Stephen Gray: vezetők és szigetelők megkülönböztetése (1729)

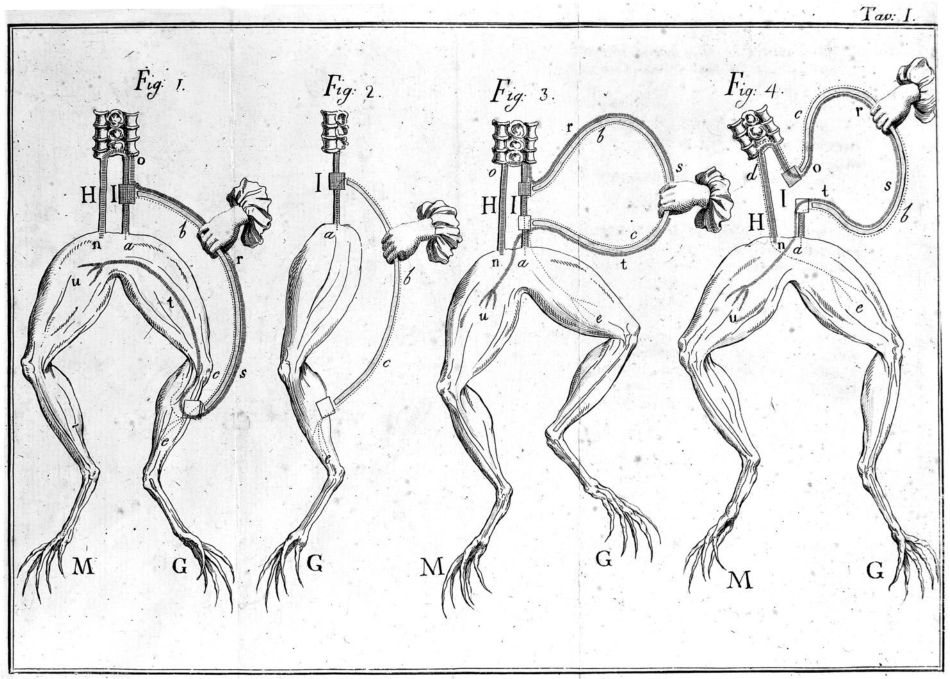
Charles du Fay: étféle elektromos töltés (1733)

Benjamin Franklin: villámlás elektromos jellege (1753)

Johan Wilcke: elektrosztatikus indukció (1763)

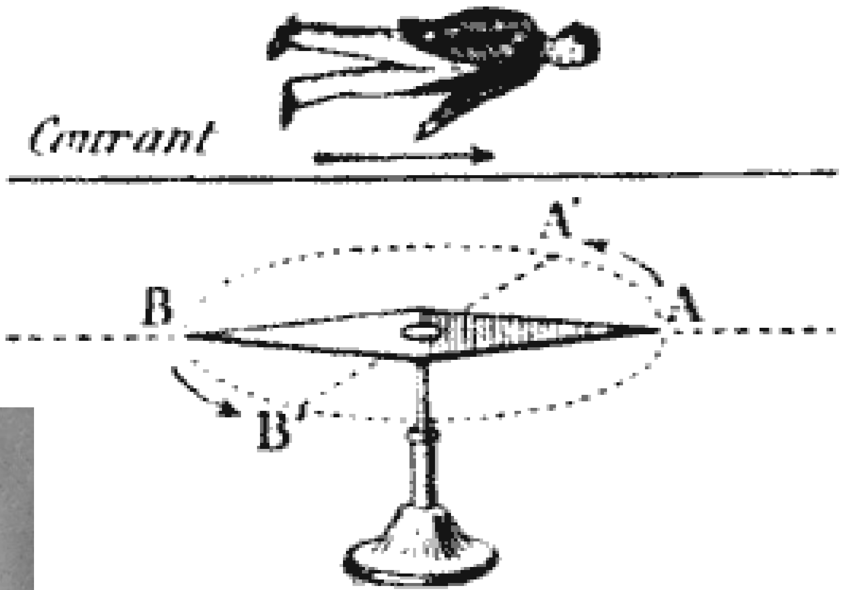


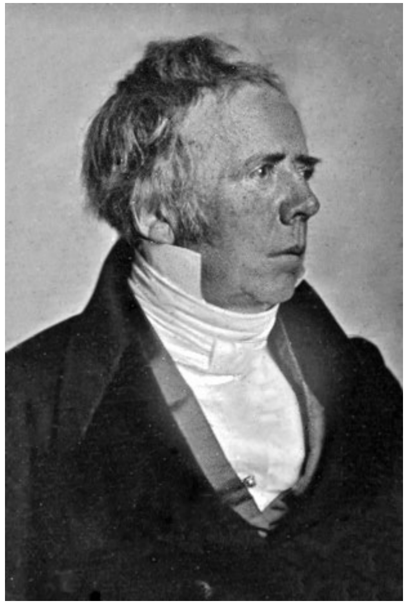

Charles-Augustin de Coulomb: pontszerű töltések között ható elektromos erő (1785)

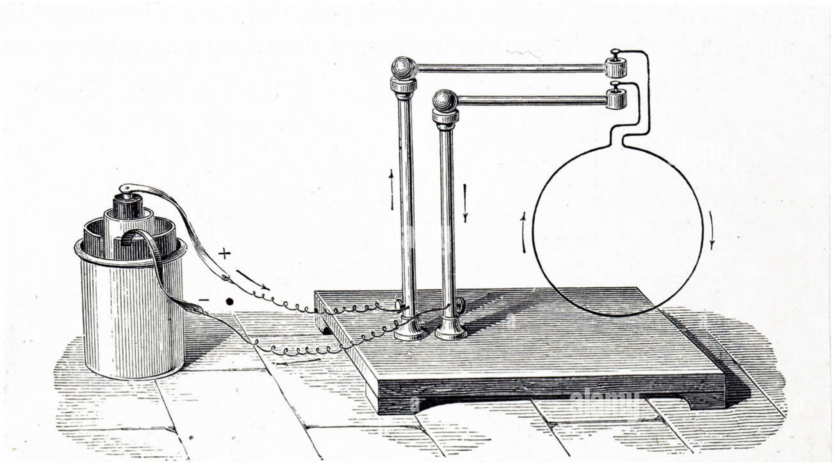



Luigi Galvani:
Békacomb (1780)


Alessandro Volta:
Volta-oszlop (1799)

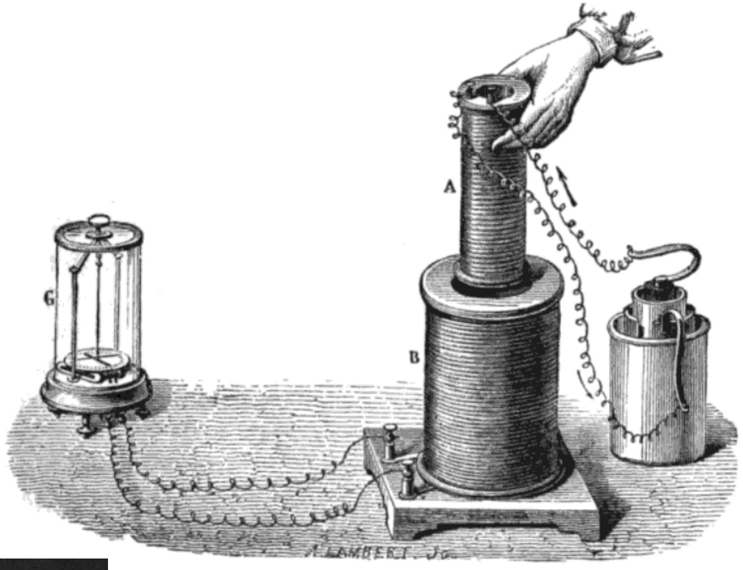




Hans Christian Ørsted: mágnes tűk elfordulnak elektromos áramok hatására (1820)

André-Marie Ampère: molekuláris áramok a mágnesesség okai (1822)




AND GOD SAID

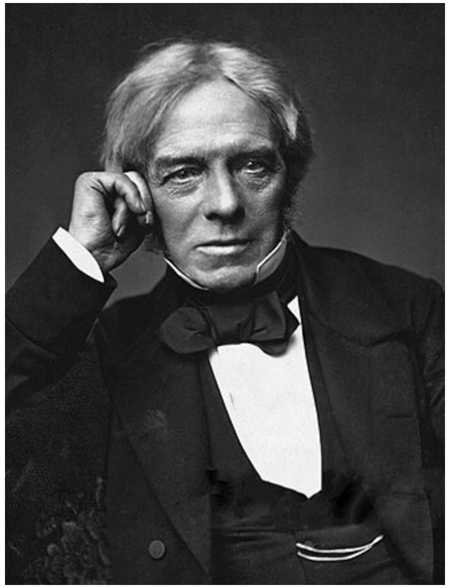
$$\nabla \cdot \vec{E} = \frac{\rho_e}{\epsilon_0}$$

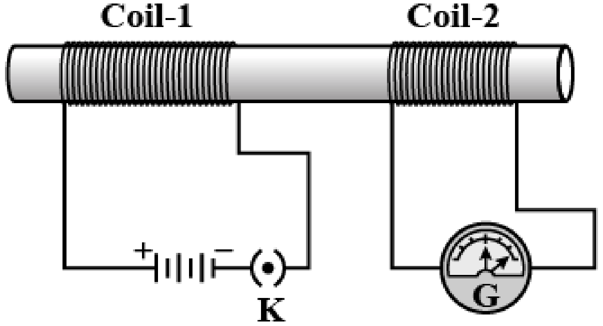
$$\nabla \cdot \vec{B} = 0$$

$$\nabla \times \vec{E} = -\frac{\partial \vec{B}}{\partial t}$$

$$\nabla \times \vec{B} = \mu_0 \left( \vec{j} + \epsilon_0 \frac{\partial \vec{E}}{\partial t} \right)$$

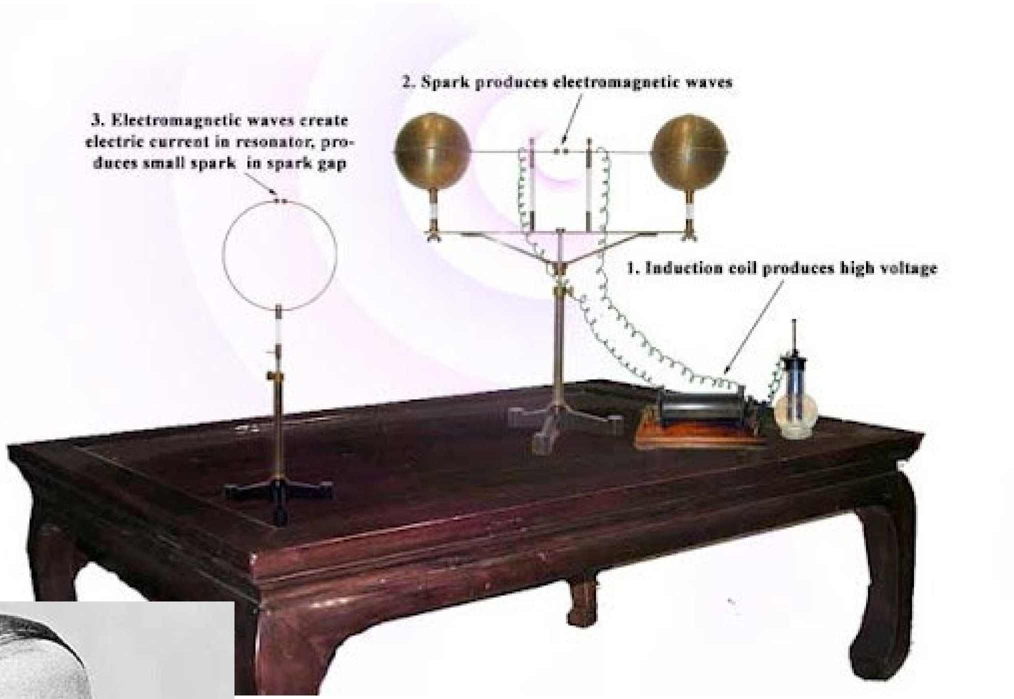
AND THERE WAS LIGHT

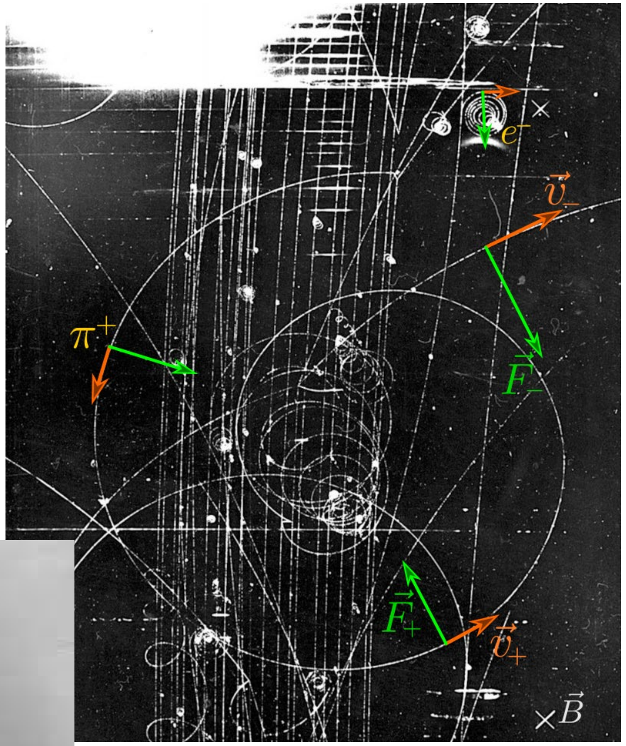





Michael Faraday: időben változó mágneses mező elektromos áramot indukál (1831)

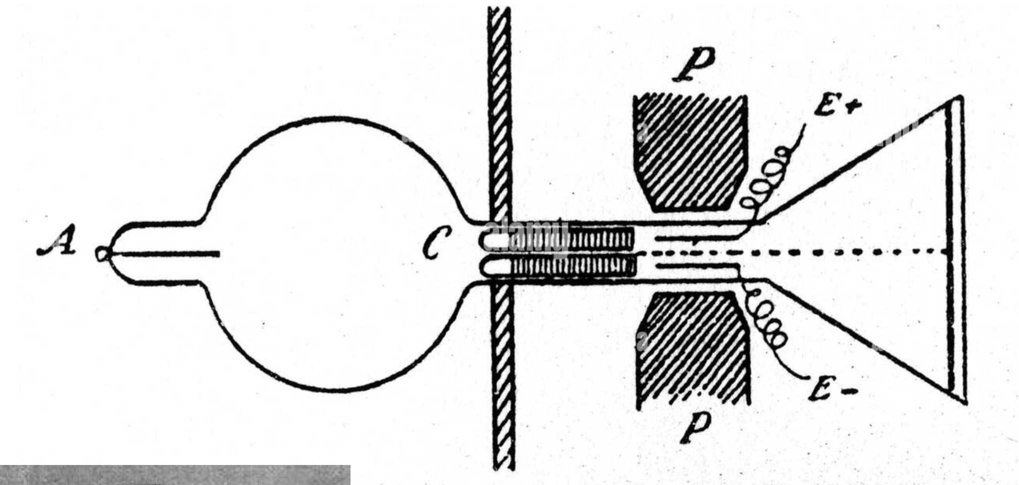
James Clerk Maxwell: elektromágnesesség egyenletei (1861, 1873), elektromágneses fényelmélet (1864).



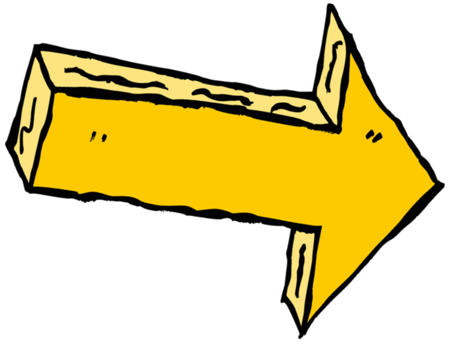



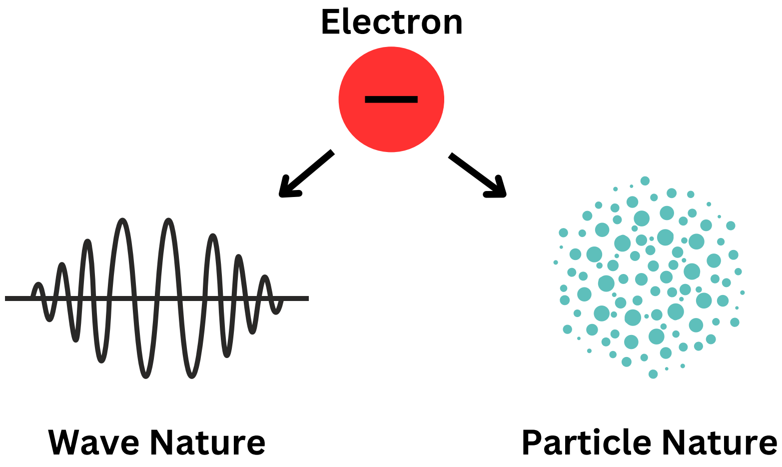

Heinrich Hertz: elektromágneses hullámok kísérleti kimutatása (1887)

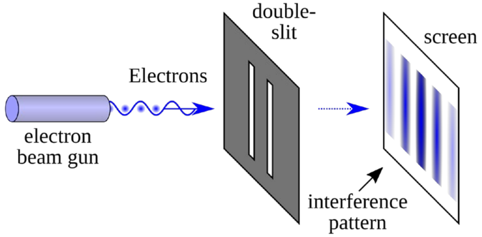
Hendrik Lorentz: Lorentz-erő (1895)

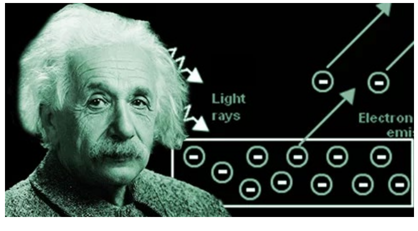



J. J. Thomson: Az elektron felfedezése (1897)



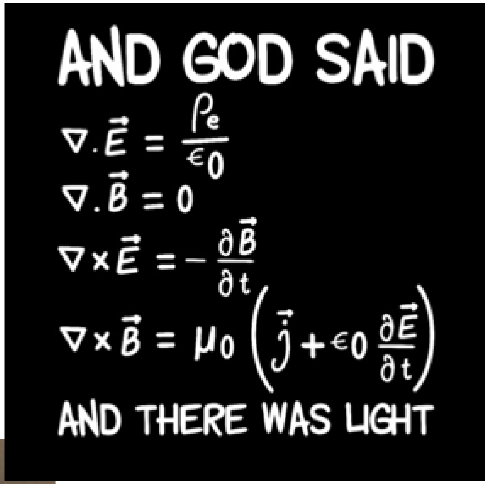



Cél: Maxwell-elmélet – Elektromágneses tér és hullámok

Jellemzői:

- Makroszkopikus
- Fenomenologikus
- Klasszikus térelmélet → Vektoranalízis
- Relativisztikus

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