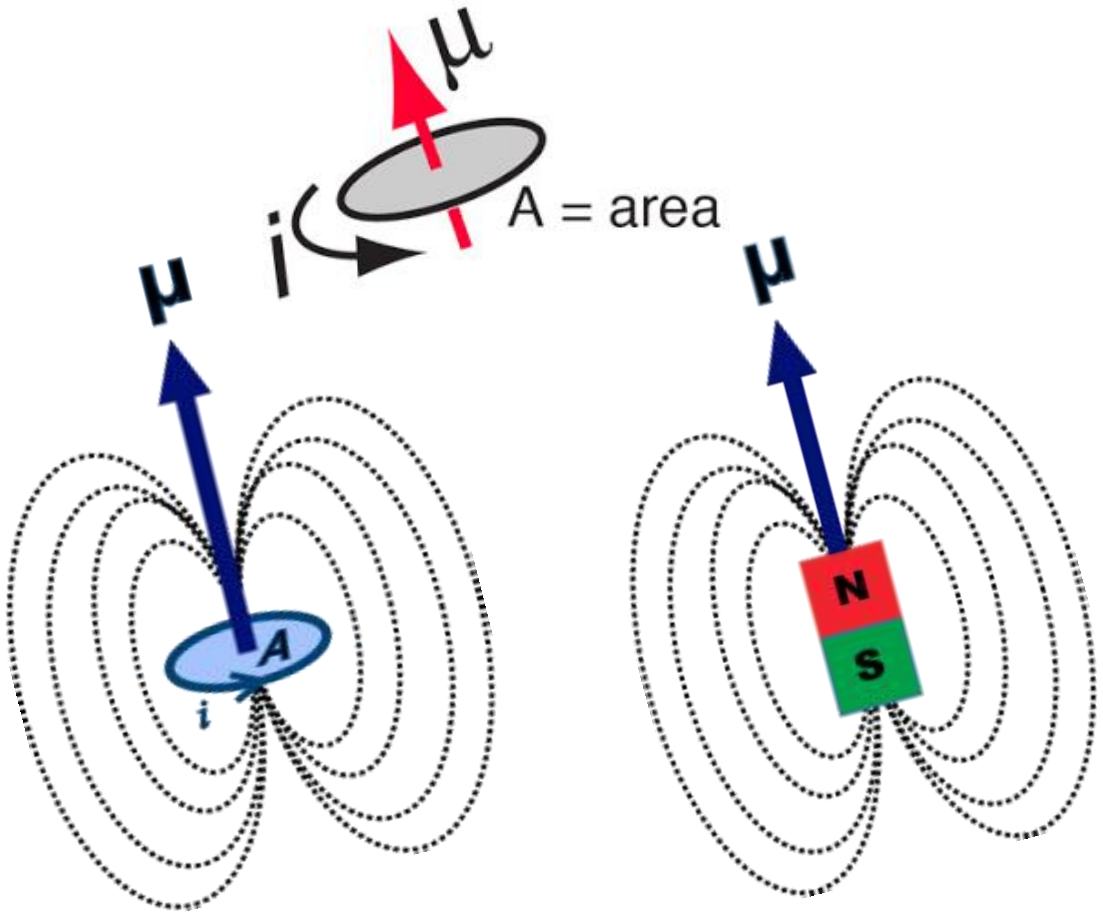
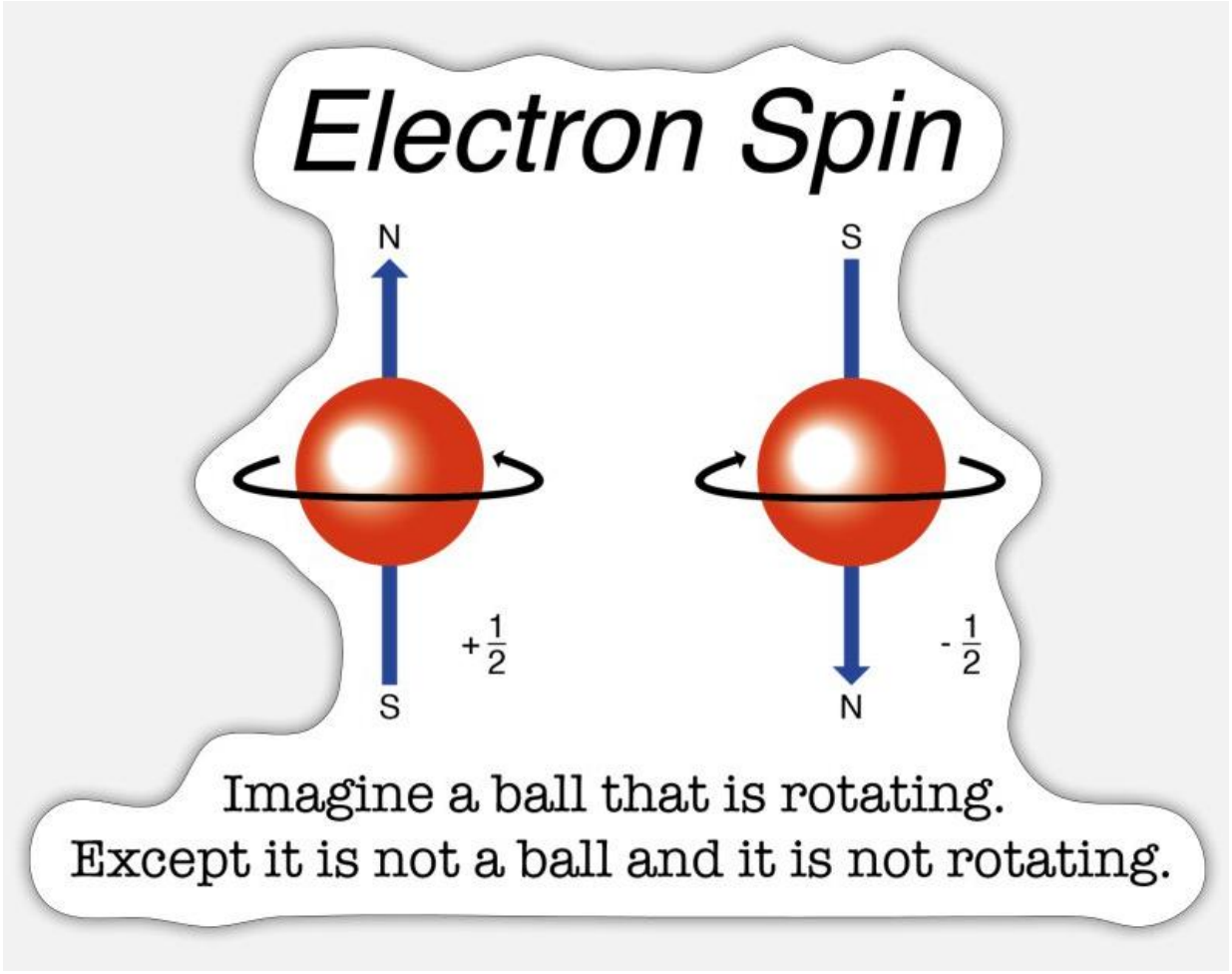
Mágneses erőtér

Köráram mágneses tere, mágneses dipólus és monopólus, Maxwell II. egyenlete, Ampère-törvény, Stokes-tétel

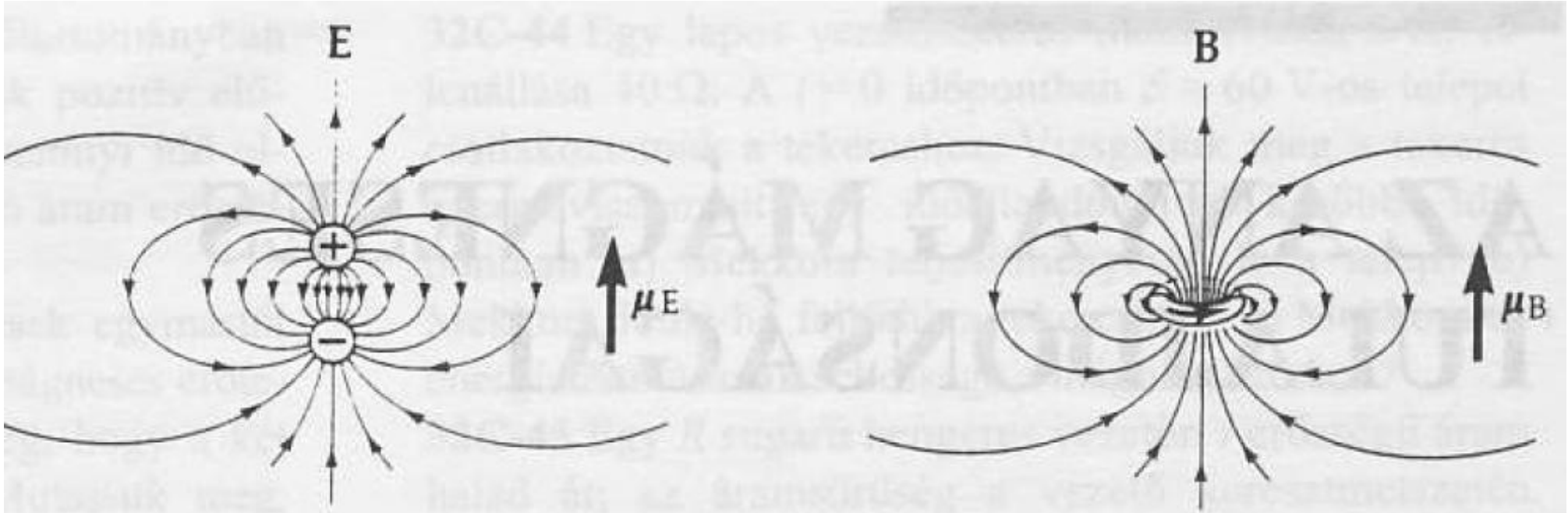
Mágneses dipólus

$$\mu = I \cdot \mathbf{A} \quad [Am^2]$$





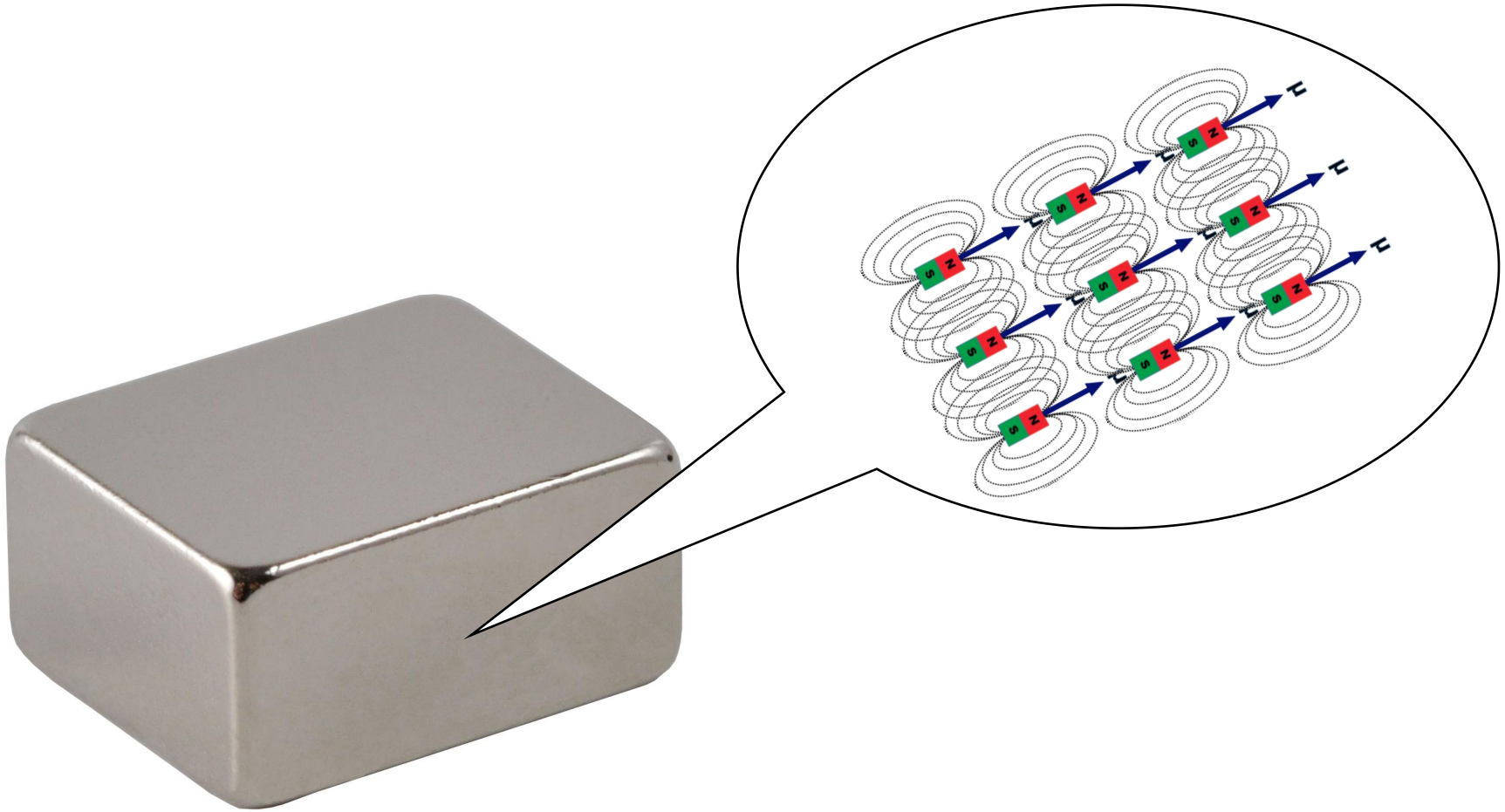
Mágneses dipólus



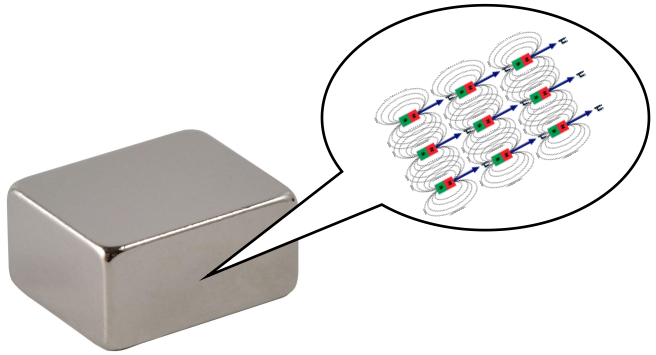
(a) Elektromos dipólus. A középpontban az elektromos erővonal az elektromos dipólus-vektorral ellentétes irányú.

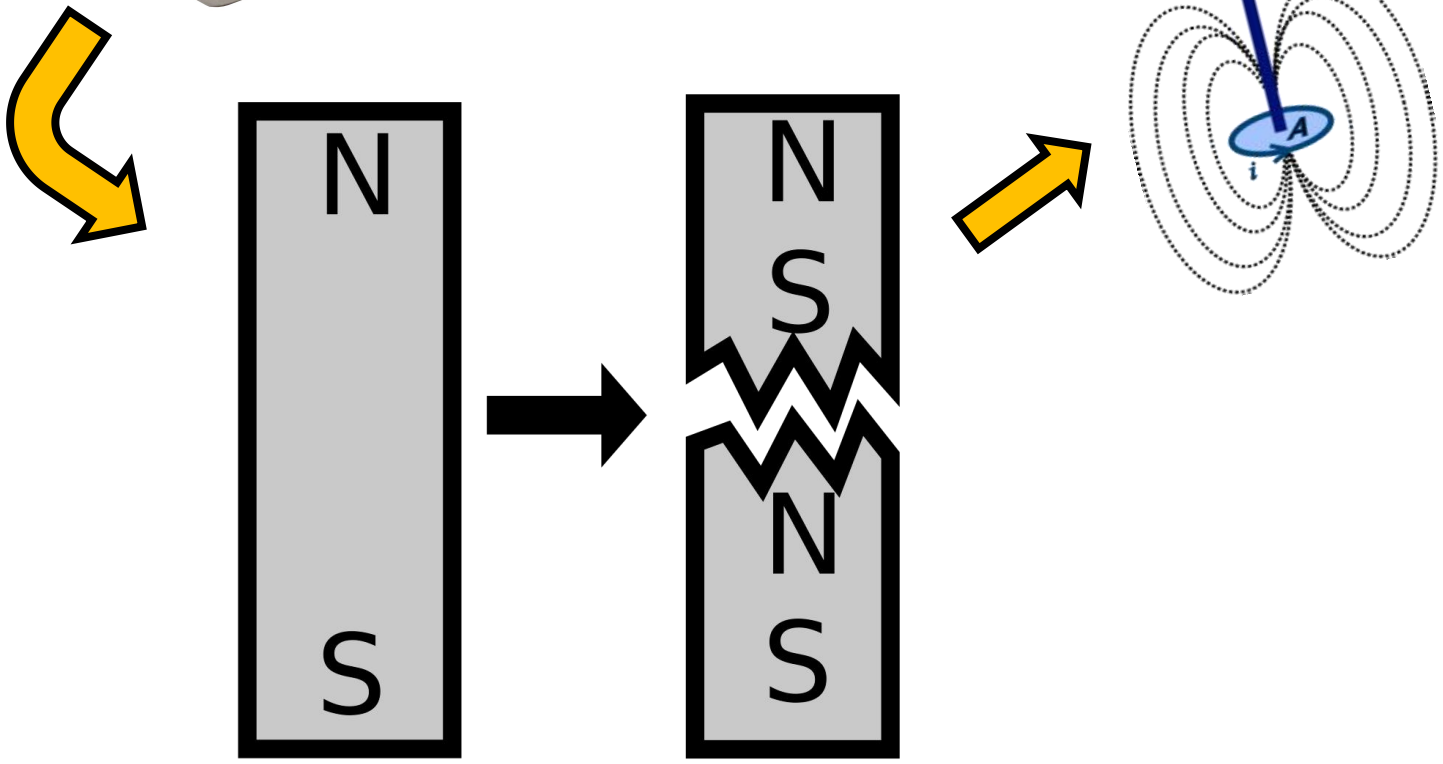
(b) Köráram, mint mágneses dipólus. A középpontban a mágneses erővonal a mágneses dipólus-vektorral azonos irányú.

Mágneses dipólus



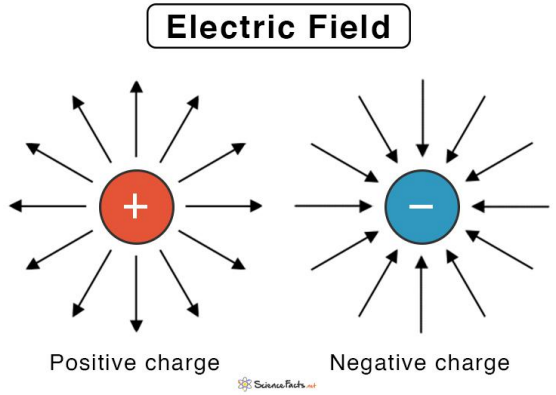
Mágneses monopólus



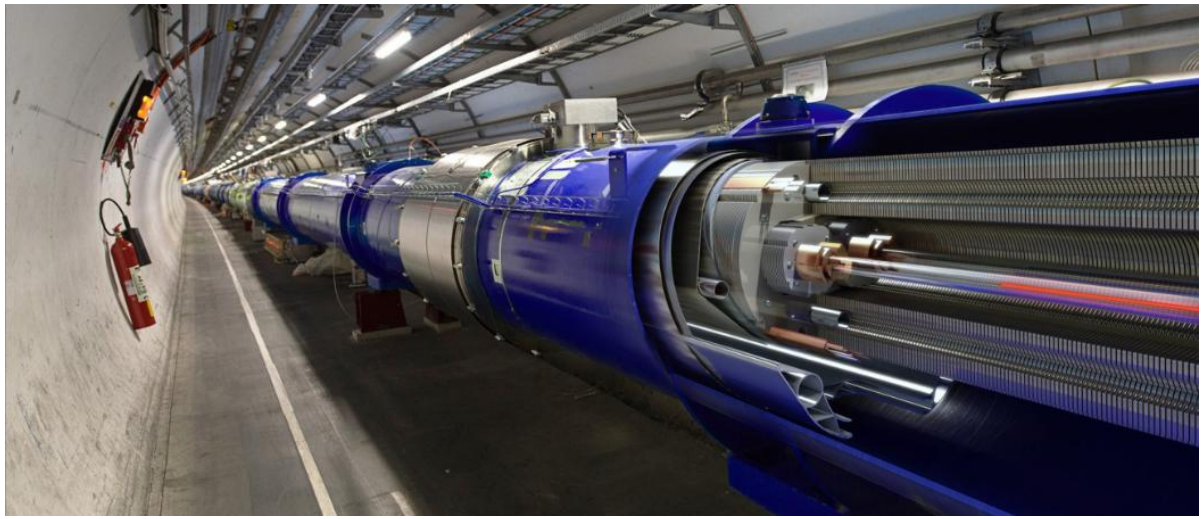


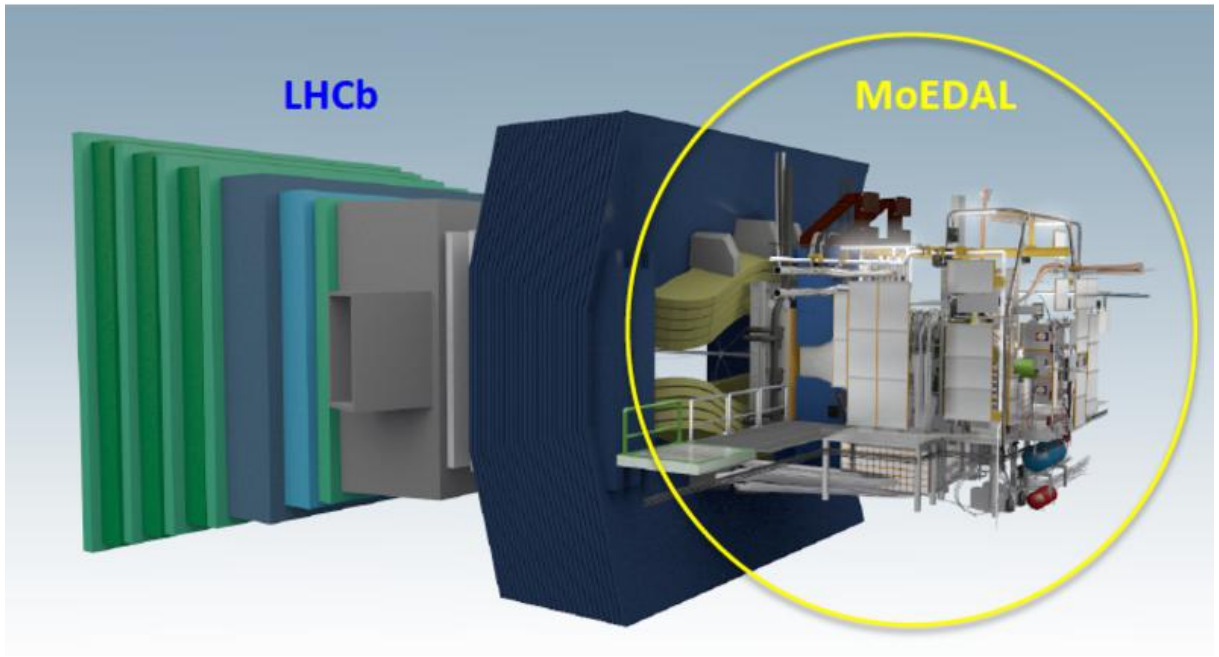
A mágneses erővonalak mindig zárt hurkot alkotnak!

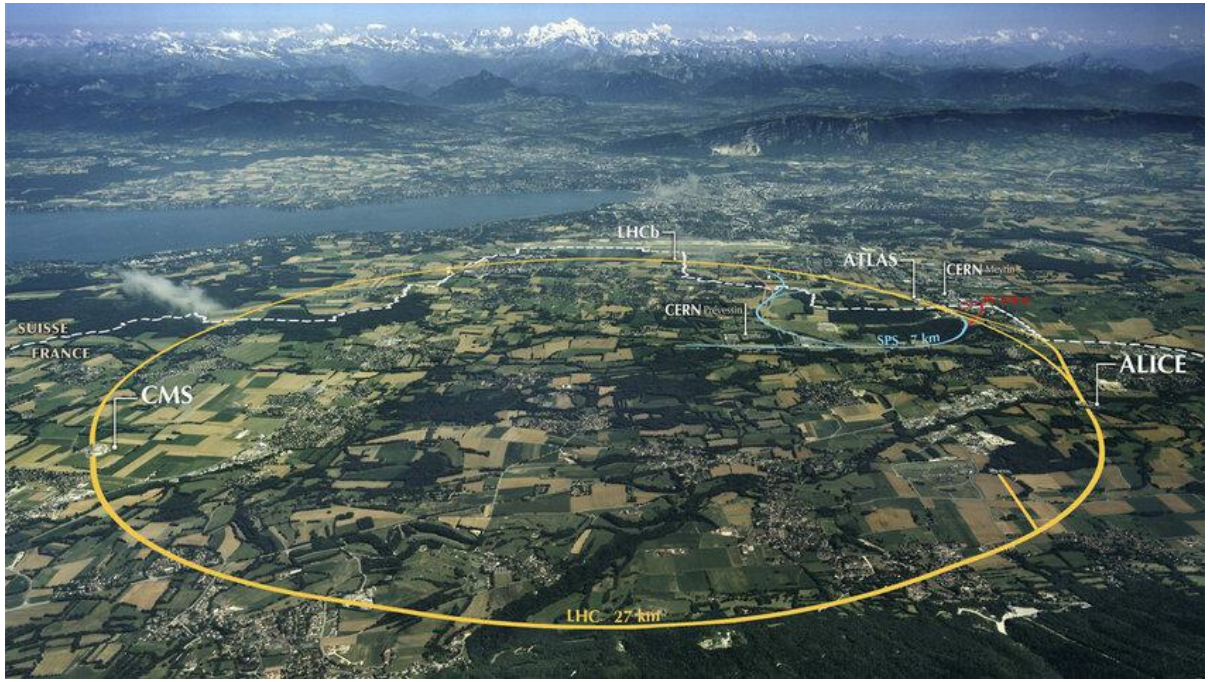
Elektromos monopóuls
= töltés



MoEDAL (Monopole and Exotics Detector at the LHC)







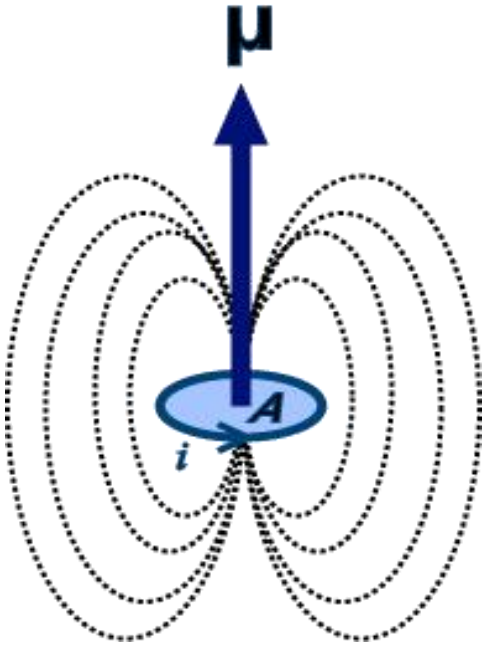
~~Mágneses monopólus~~

A mágneses erővonalak mindig zárt hurkot alkotnak

$$\oiint \mathbf{B}\, d\mathbf{A} = 0$$

Divergencia tétel

$$\nabla \cdot \mathbf{B} = 0 \quad \text{vagy} \quad \mathrm{div}\mathbf{B} = 0$$

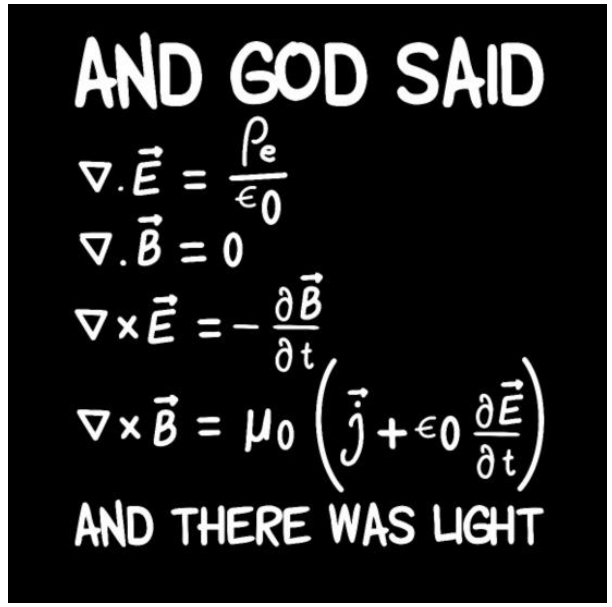


Maxwell II. egyenlete

$$\oiint \mathbf{B}\, d\mathbf{A} = 0 \qquad \nabla \cdot \mathbf{B} = 0$$

Integrális alak

Differenciális alak



Maxwell I. egyenlete:

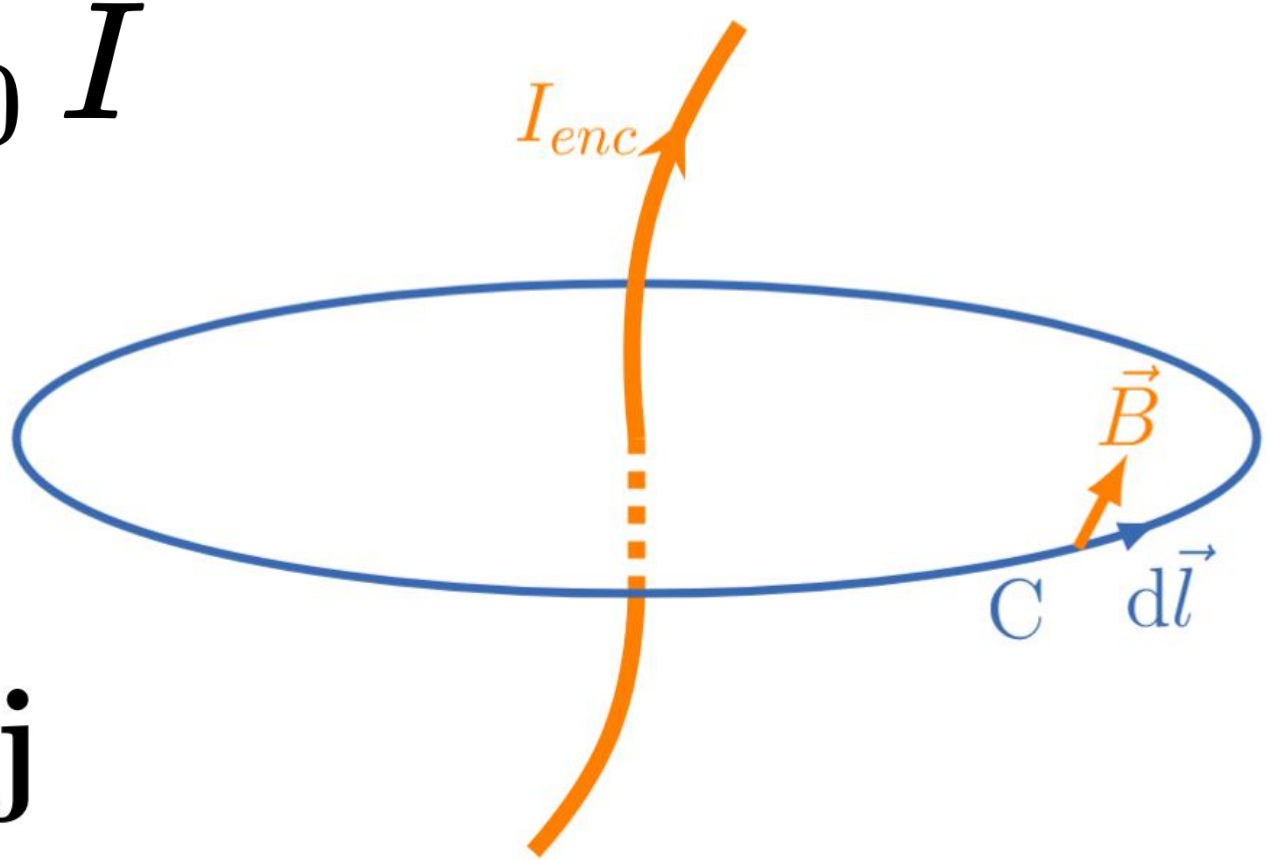
$$\oiint \mathbf{E} \cdot d\mathbf{A} = \frac{q}{\varepsilon_0} \qquad \nabla \cdot \mathbf{E} = \frac{\rho}{\varepsilon_0}$$

Ampère törvény

$$\oint \mathbf{B}\, dl = \mu_0\, I$$

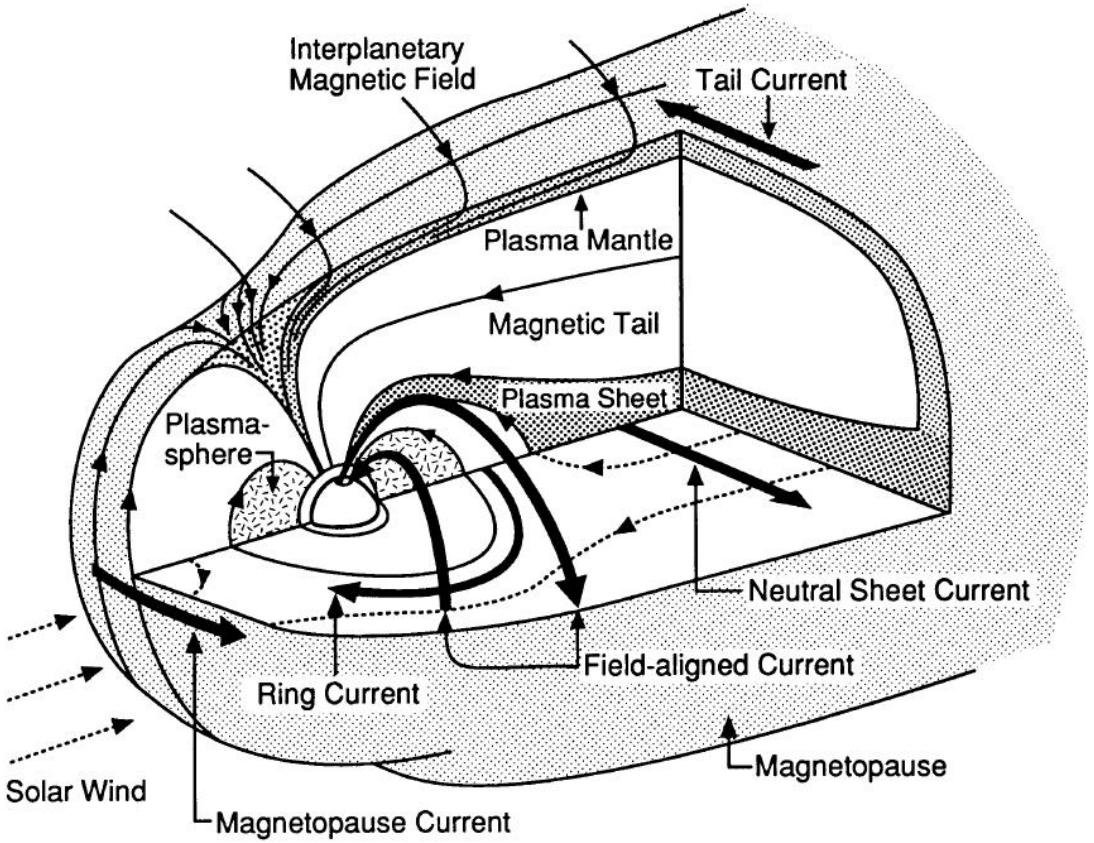
Stokes tétel

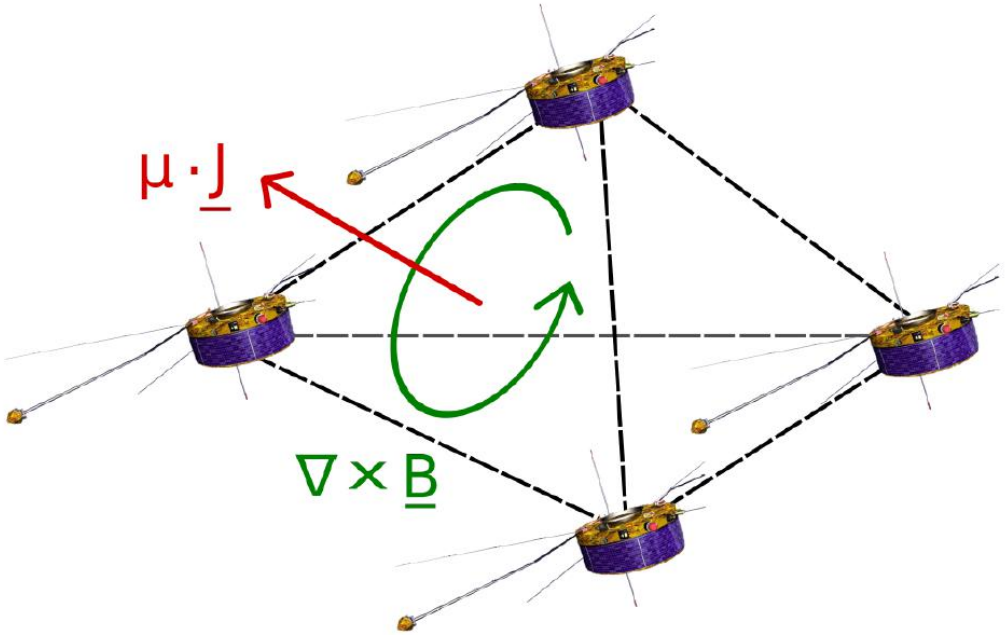
$$\nabla \times \mathbf{B} = \mu_0 \mathbf{j}$$



	Integrális alak	Differenciális alak
Maxwell I.	$\oiint \mathbf{E} \cdot d\mathbf{A} = \frac{q}{\varepsilon_0}$	$\nabla \cdot \mathbf{E} = \frac{\rho}{\varepsilon_0}$
Maxwell II.	$\oiint \mathbf{B}\, d\mathbf{A} = 0$	$\nabla \cdot \mathbf{B} = 0$
Ampere-tv.	$\oint \mathbf{B}\, dl = \mu_0\, I$	$\nabla \times \mathbf{B} = \mu_0\, \mathbf{j}$

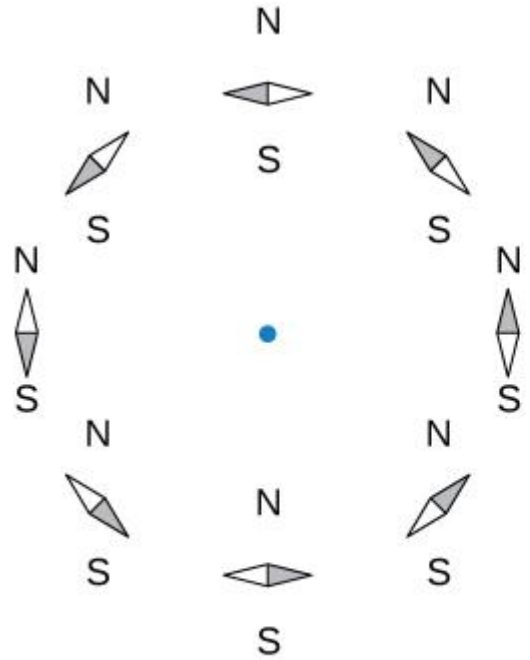
Elektromos áram mérése az űrplazmában 4 műhold mágneses mérései alapján

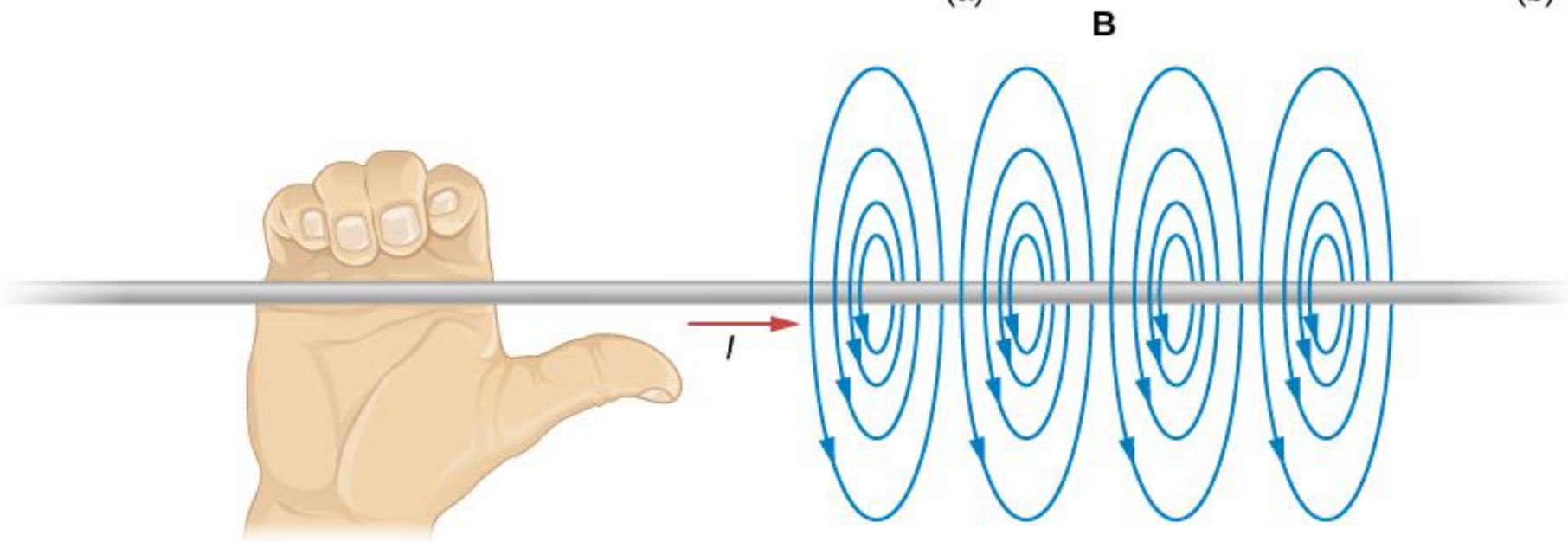




$$\mu_0 \cdot \mathbf{j_{avg}} = rot(\mathbf{B})$$

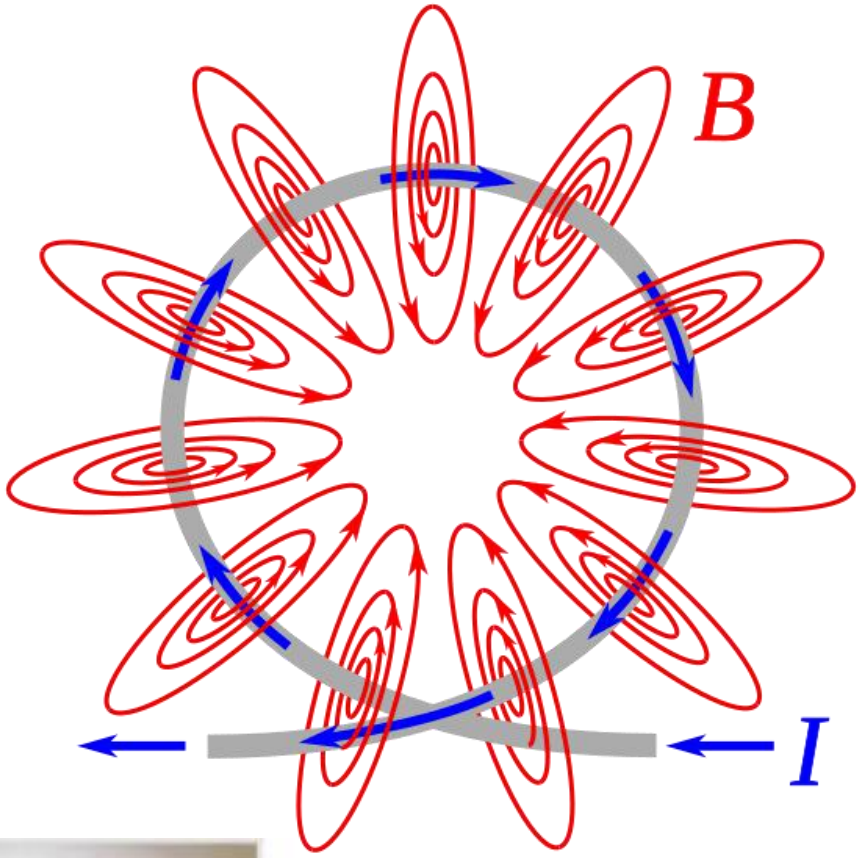
Egyenes vezető mágneses tere

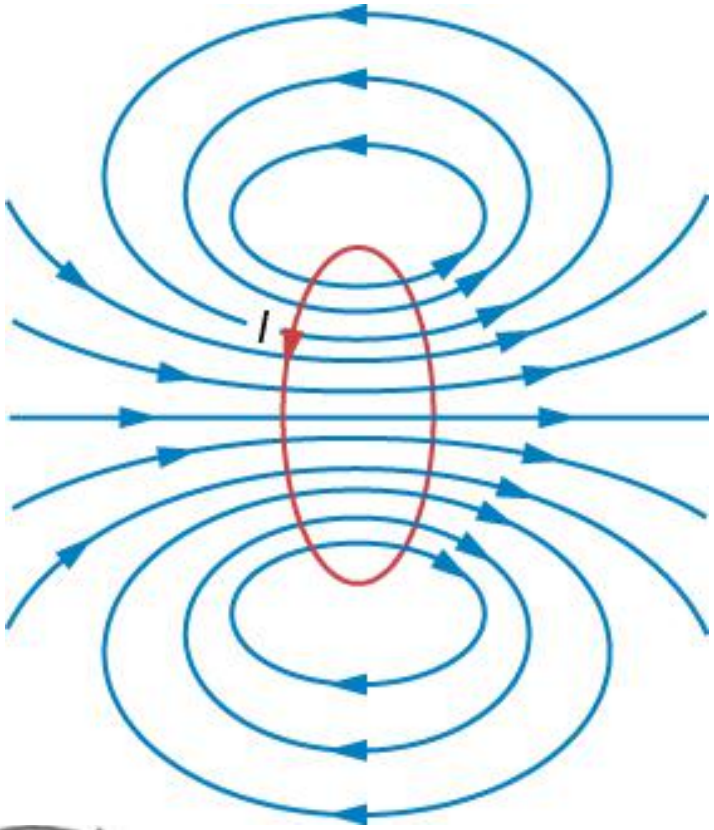


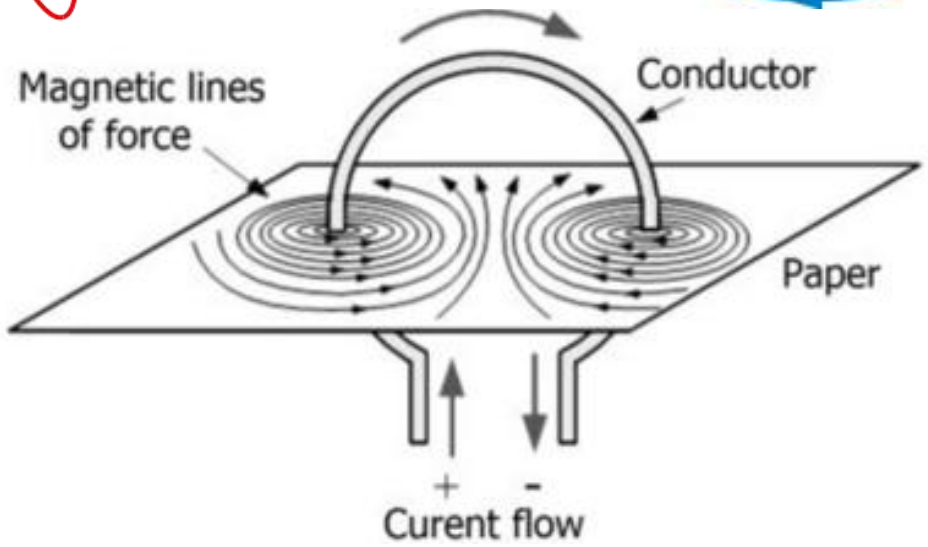


Áramhurok mágneses tere

$$B = \frac{\mu_0 I}{2\pi R}$$

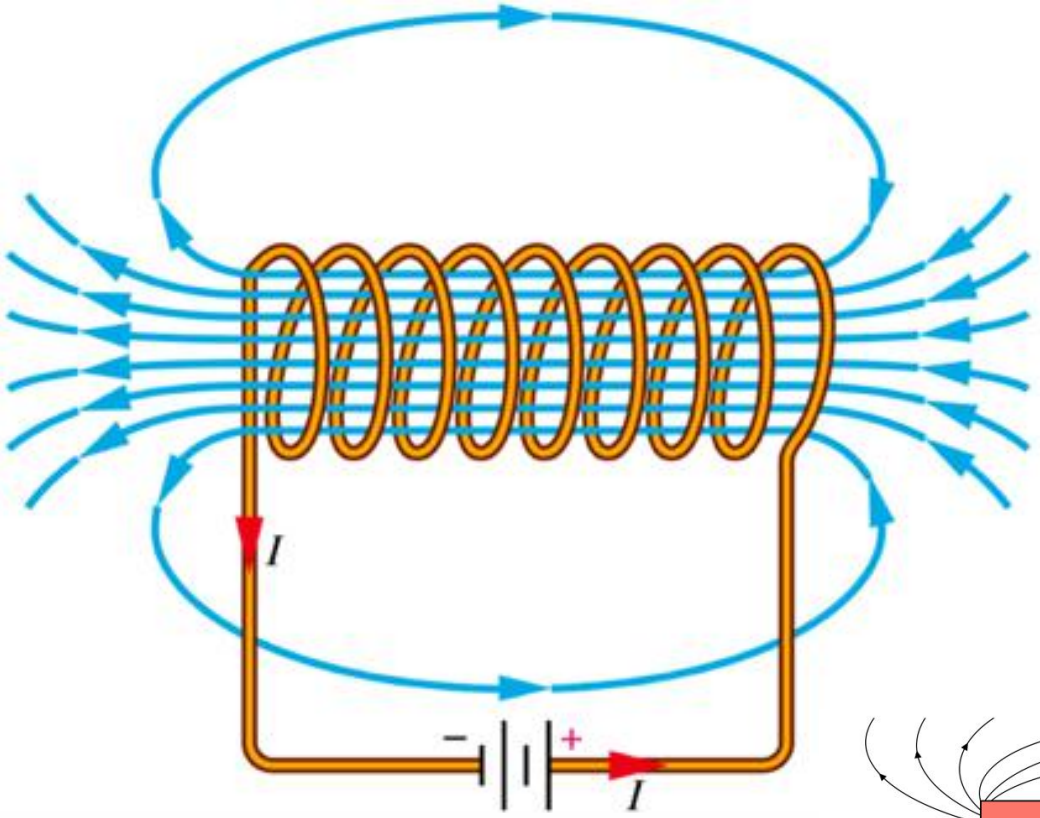


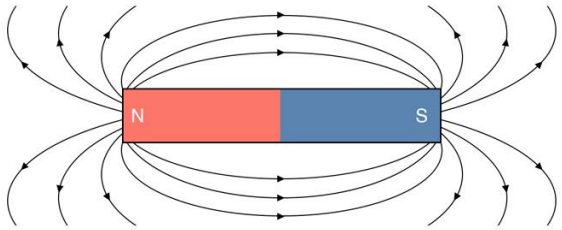


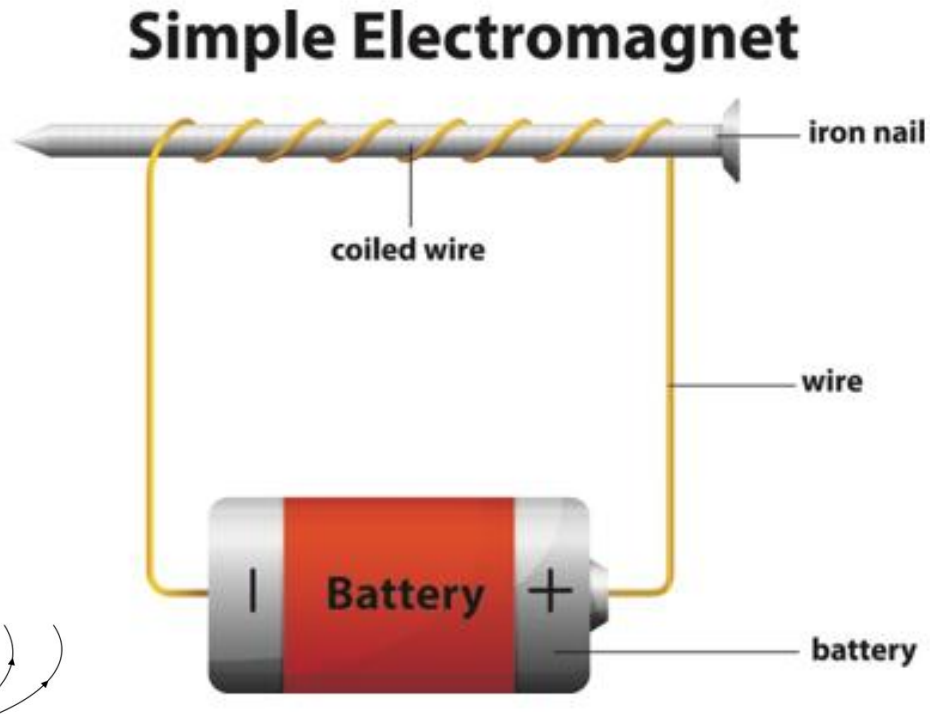


Szolenoid mágneses tere

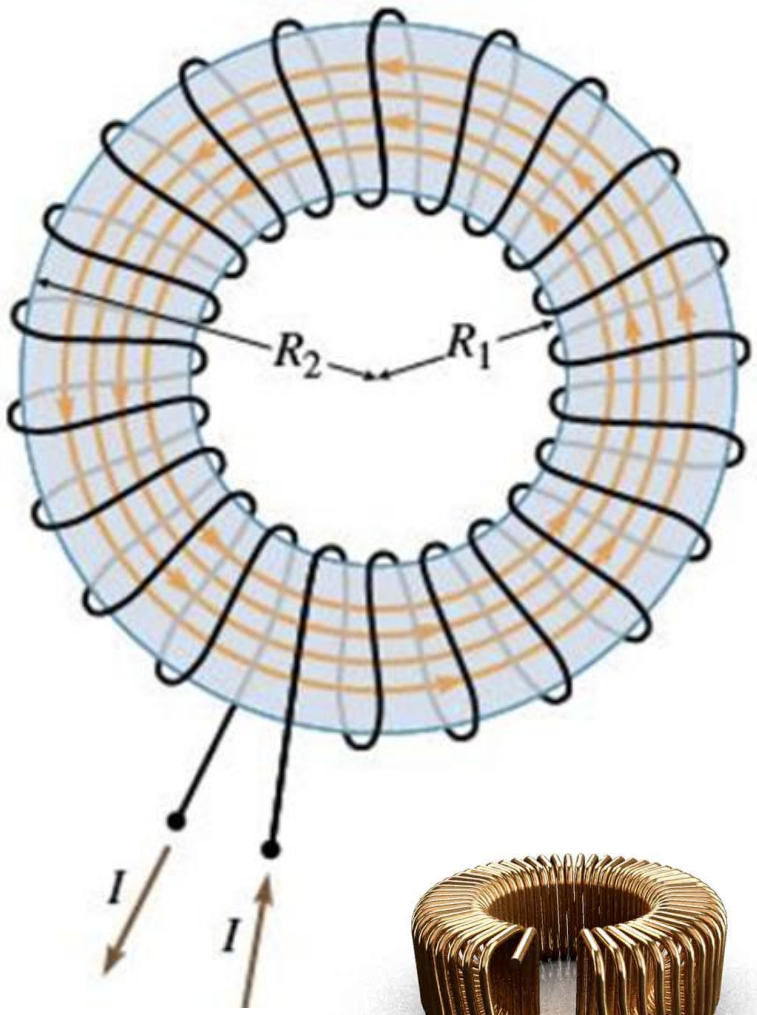
$$B = N\frac{\mu_0 I}{2\pi R}$$

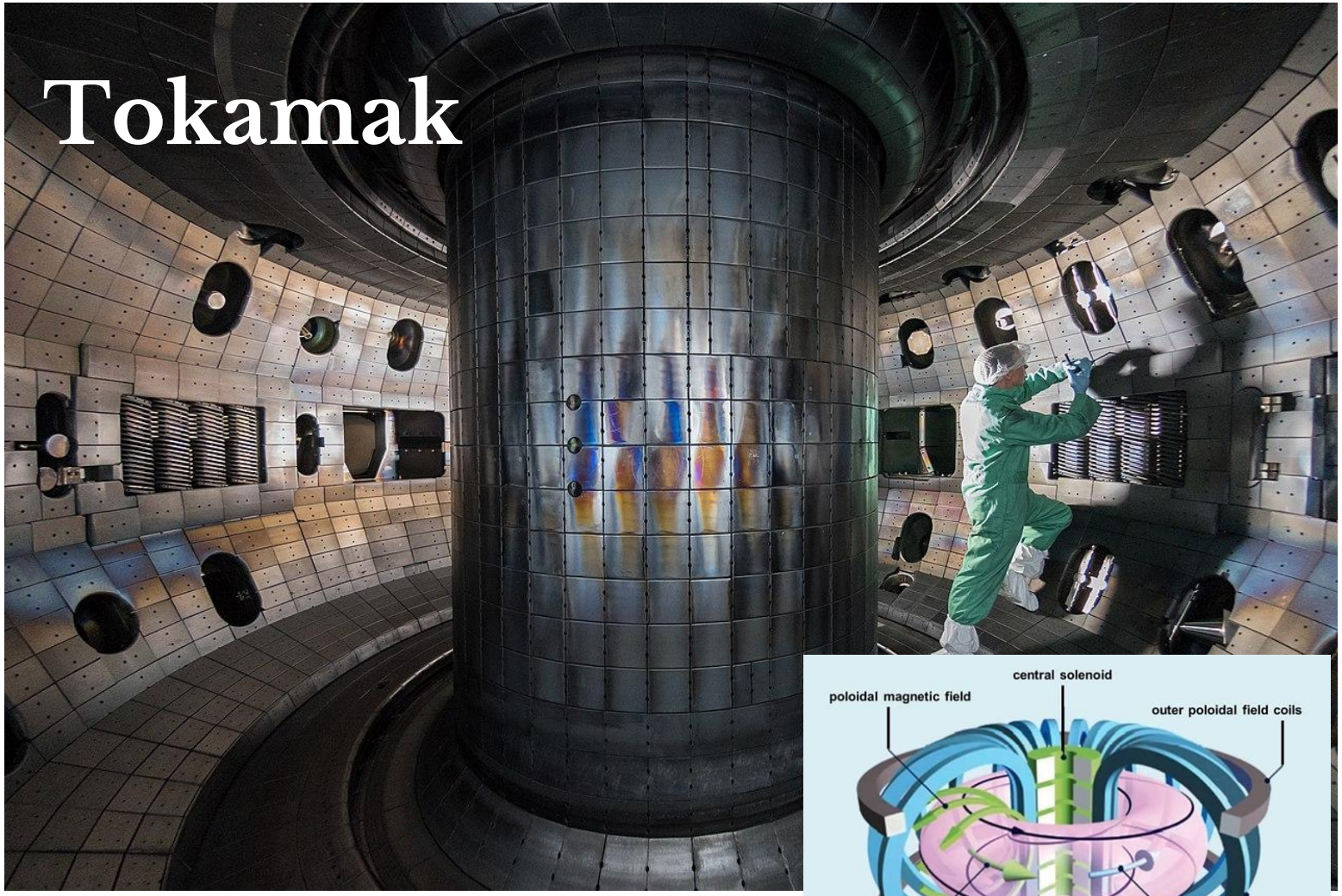




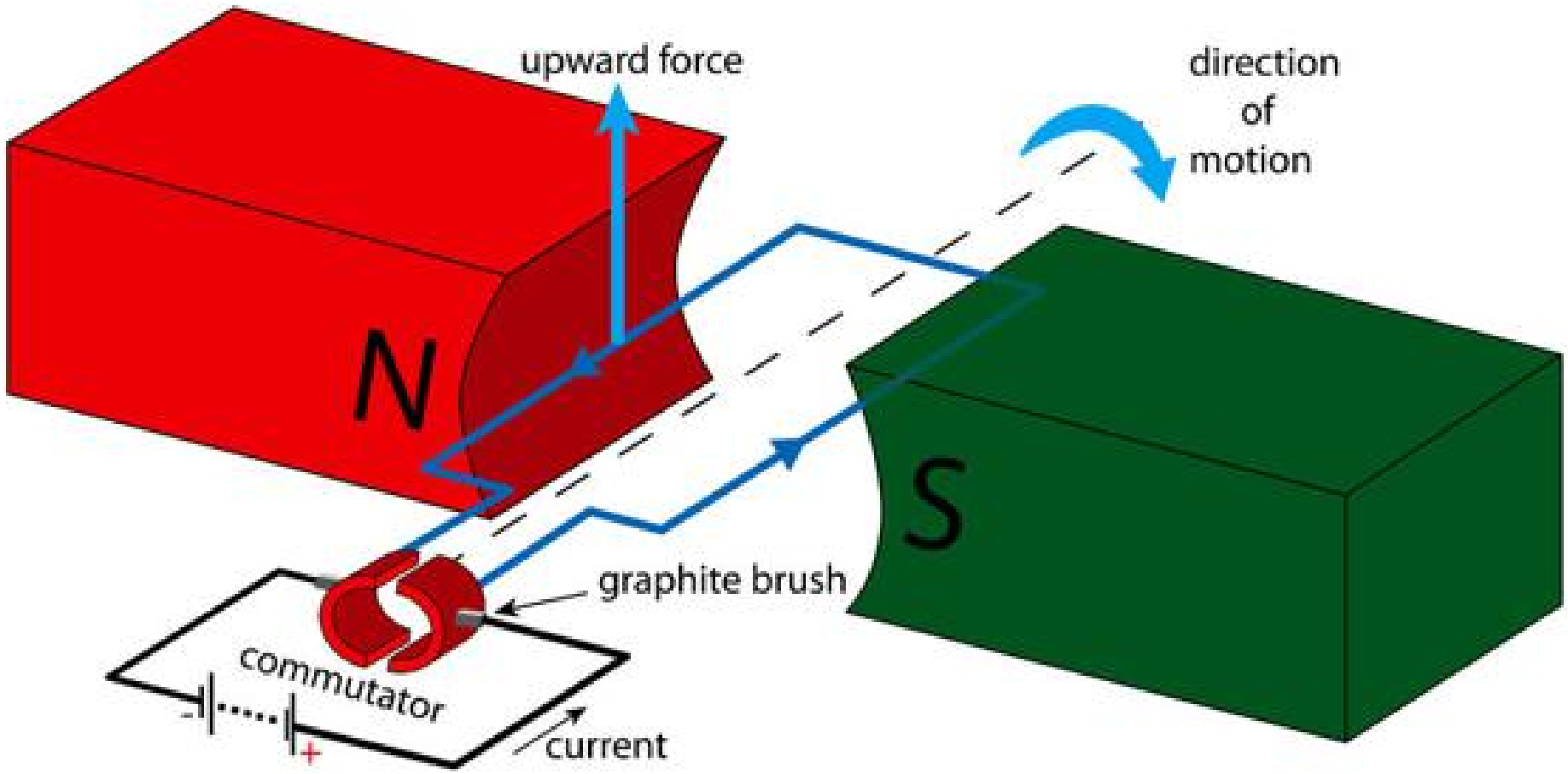


Toroid mágneses tere

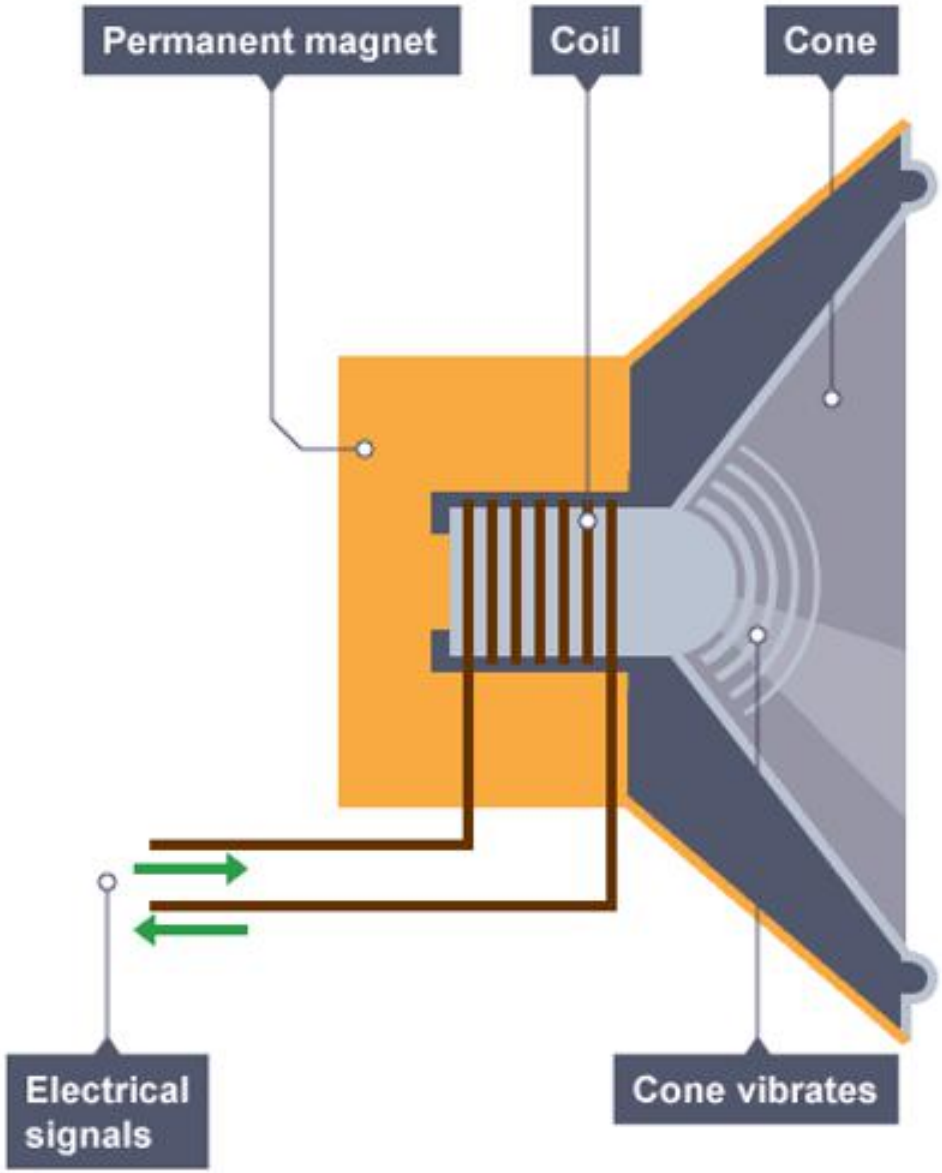




Egyszerű elektromotor



Hangszóró


Permanent magnet
Coil
Cone
Electrical signals
Cone vibrates

Mágeses erőtér  Elektromos erőtér