Hands-on experiments: electricity and magnetism

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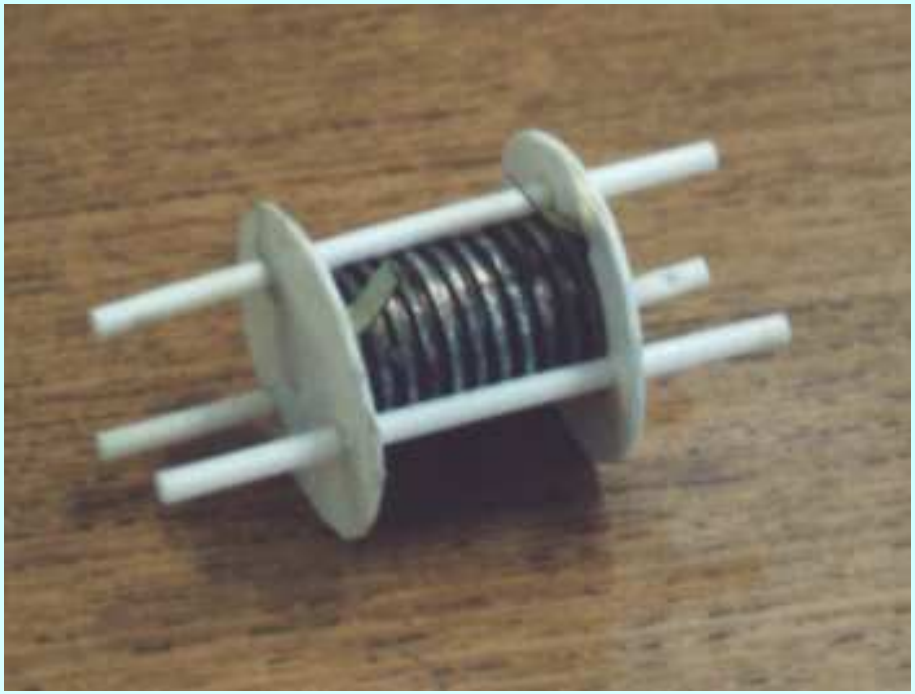
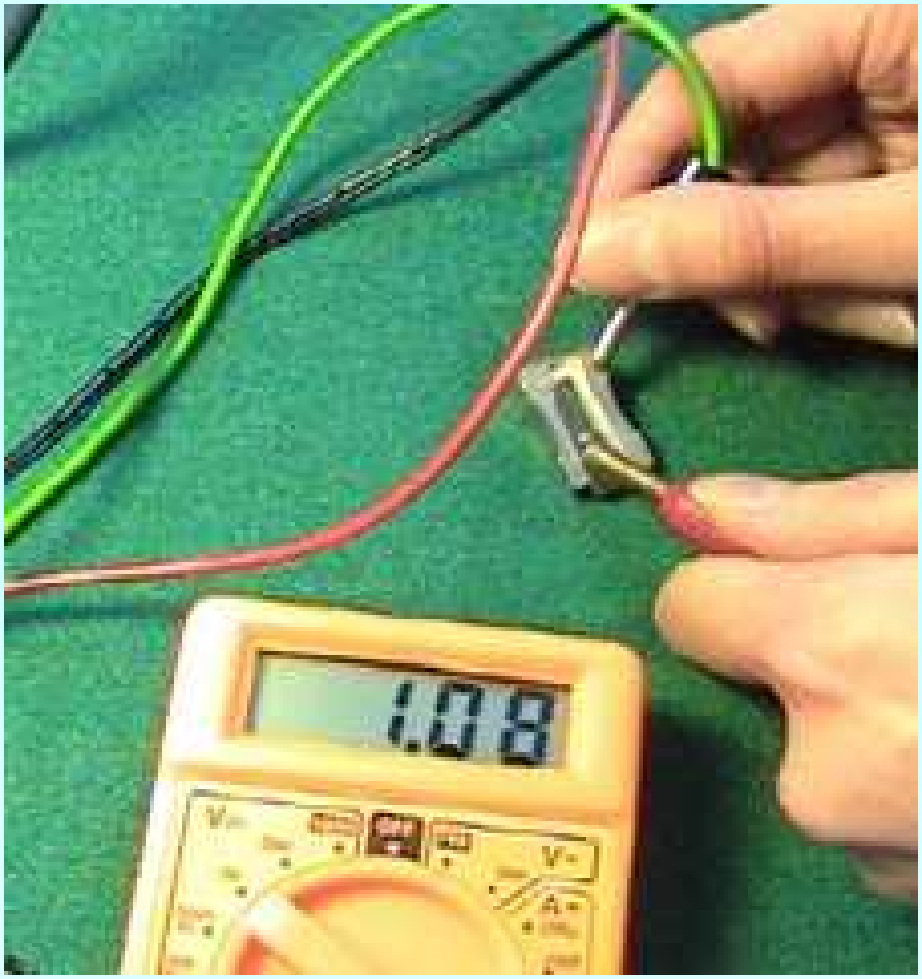
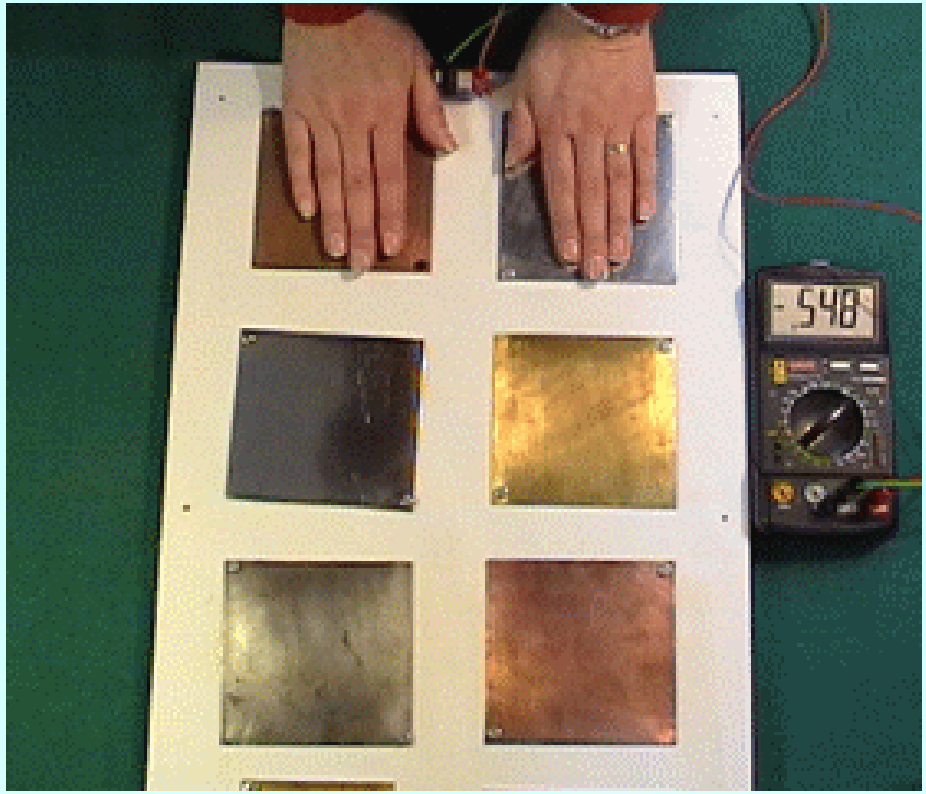
I. Electricity sources

Volta’s pile (electochemistry)

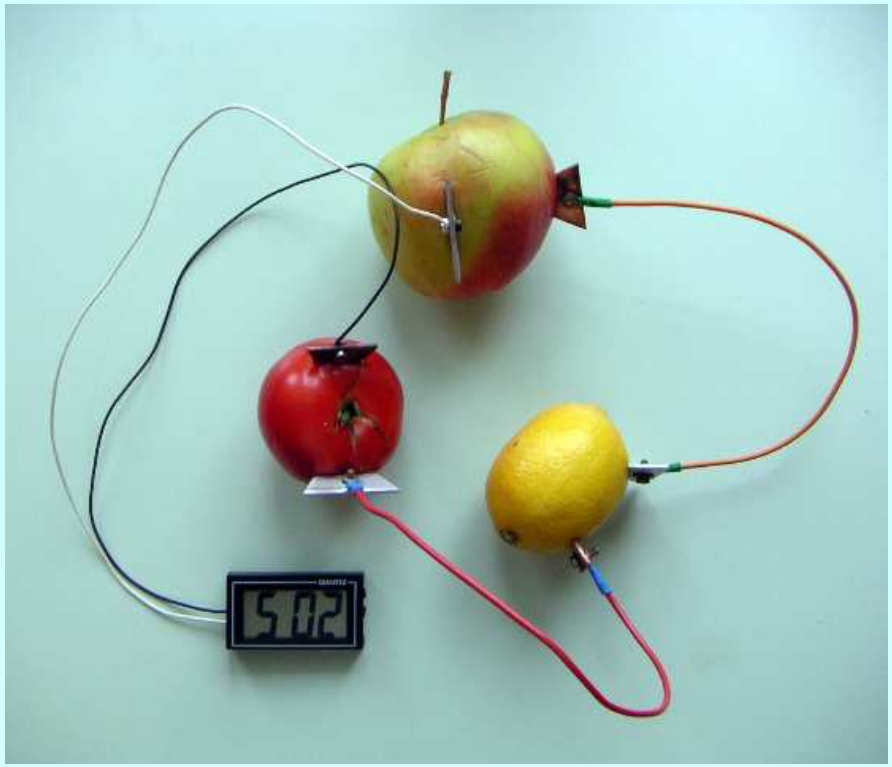




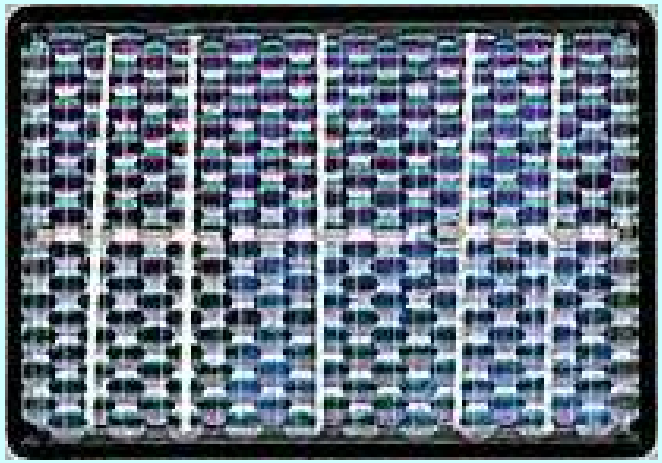
IQ-meter



Vegetable battery



Photoelectric pile



Tribology

Electroscope

Photoelectric pile (2)

$V = h\nu - 0.8eV$

Helmholtz coil

pradnica1.mpg

pradnica2.avi

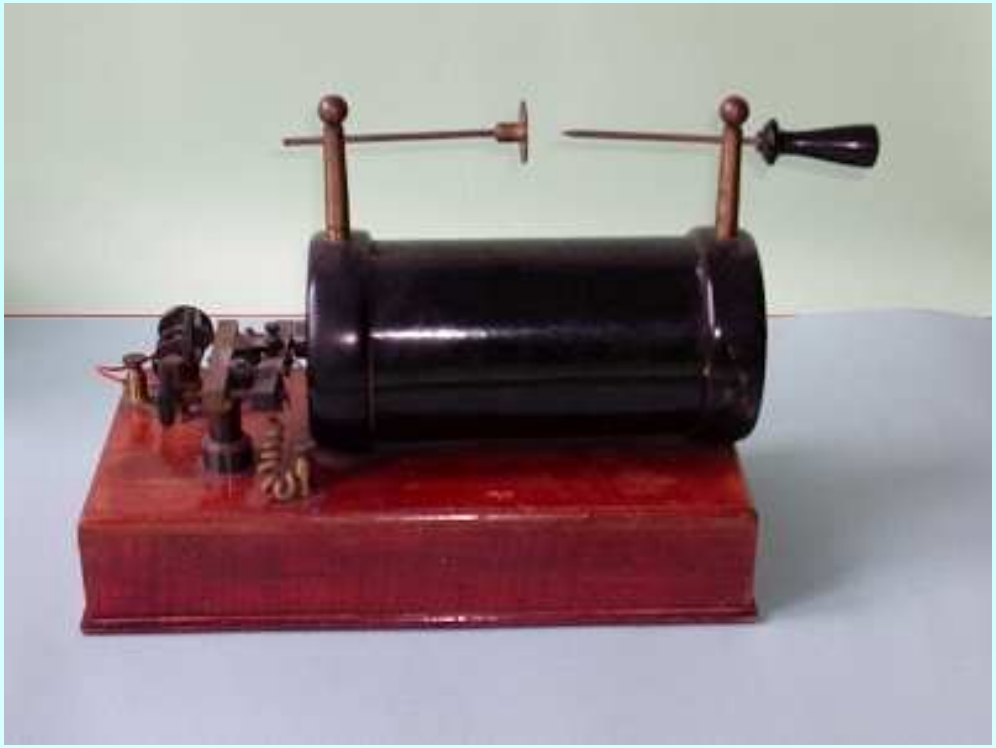
Induced currents (Faraday)

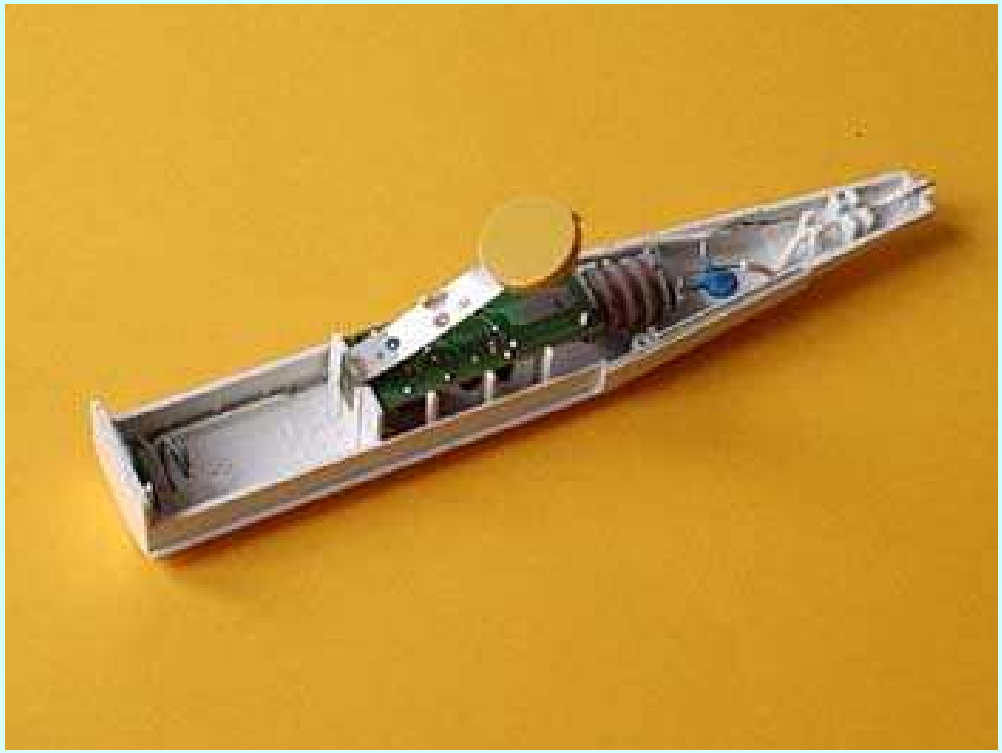
Helmholtz coil (2)

High Voltage sources

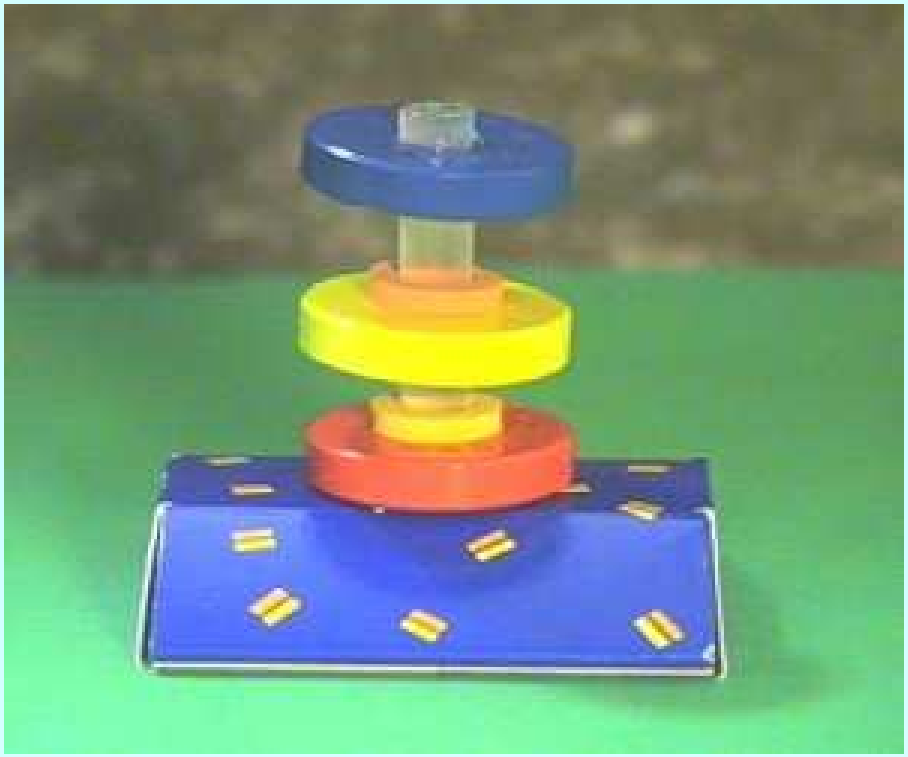
Piezoelectric effect

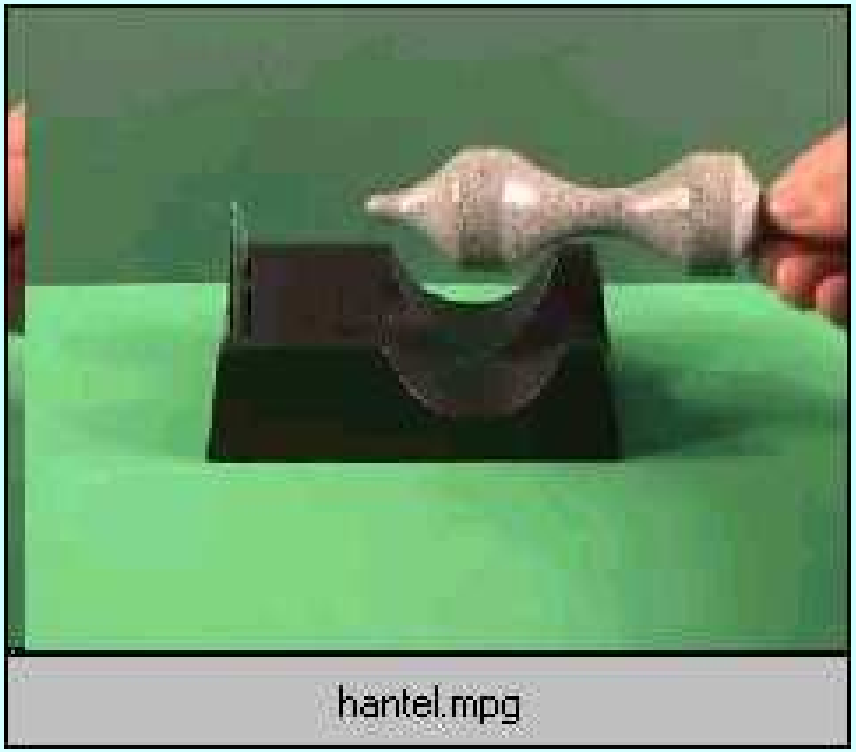
High Voltage sources (2)





Magnetic levitation (1)

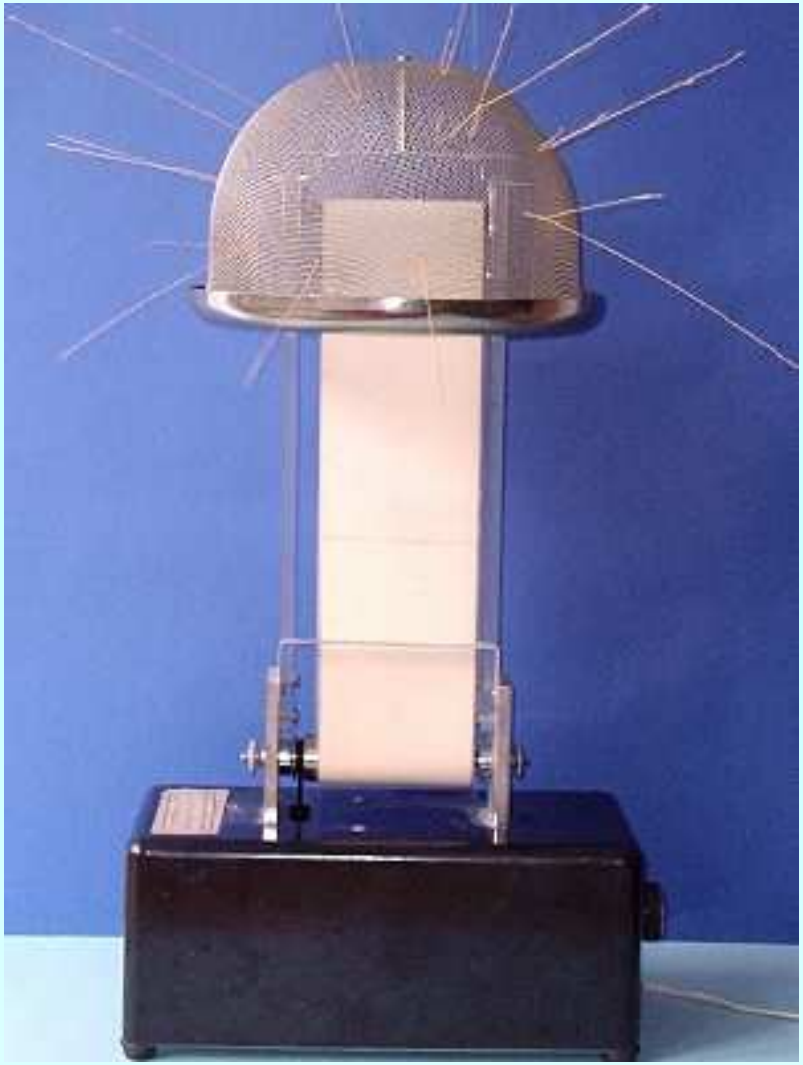




Magnetic levitation (2)

Magnetic levitation (3)

Gauss' law



"quasi- Gauss"

Maxwell's laws

$$\oint \mathbf{E} \circ d\mathbf{S} = Q_{\text{int}} / \varepsilon_0$$

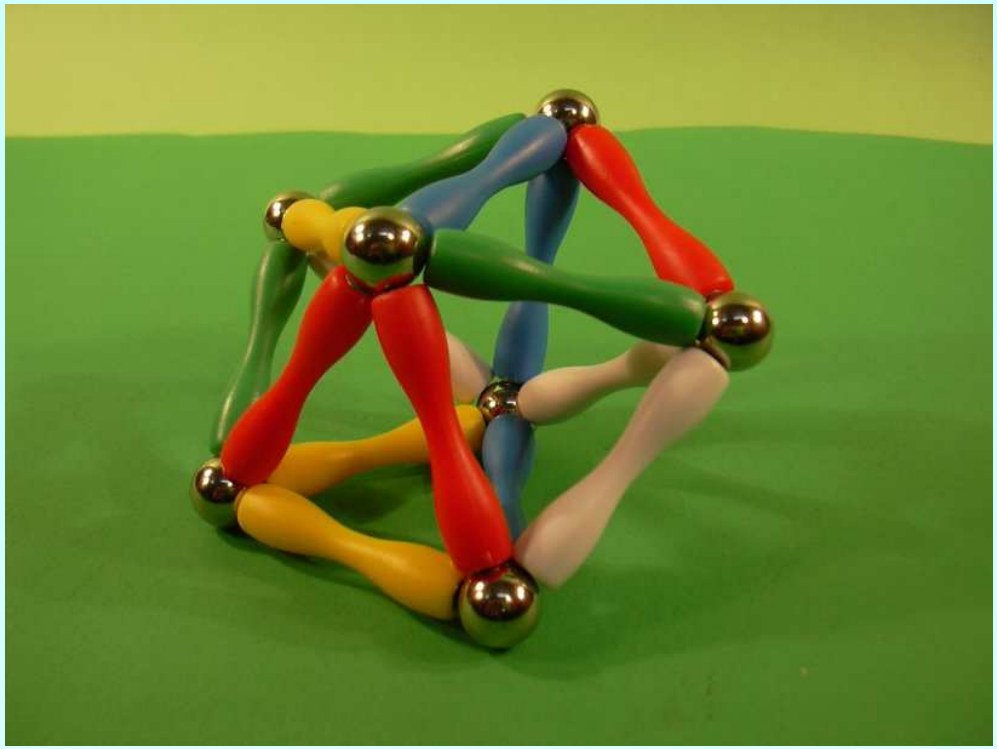
$$\oint \mathbf{B} \circ d\mathbf{S} = 0$$

$$\oint \mathbf{B} \circ d\mathbf{l} = \mu_0 \, \mathrm{I}$$

$$\oint \mathbf{E} \circ d\mathbf{l} = -\frac{d\Phi_B}{dt}$$

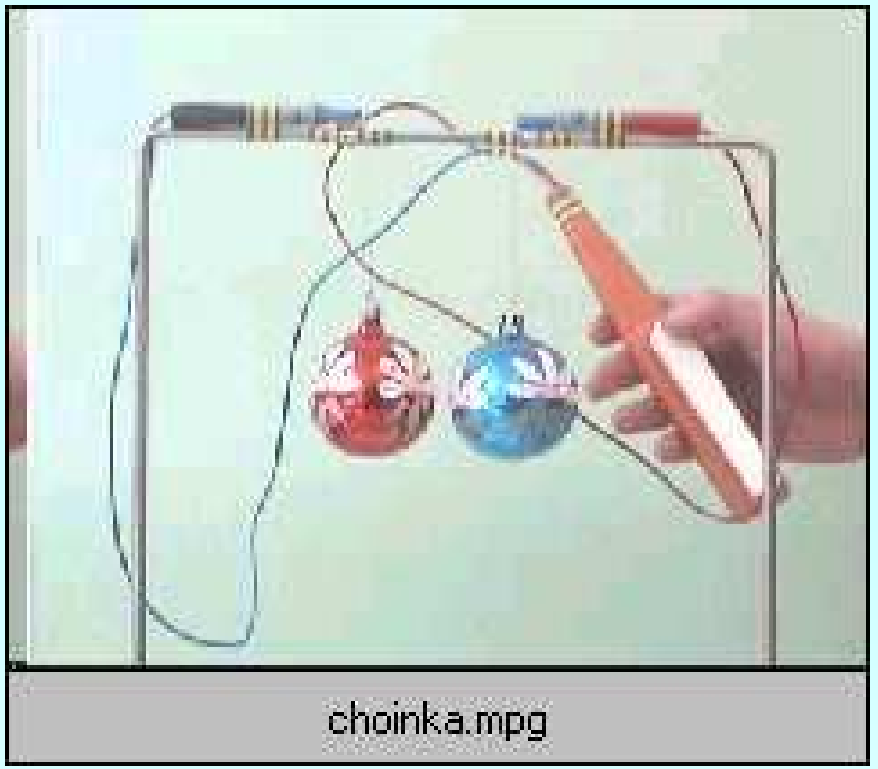
Gauss cage

Magnetic “Gauss law”



Magnetic “Gauss law” (2)

Coulomb's law



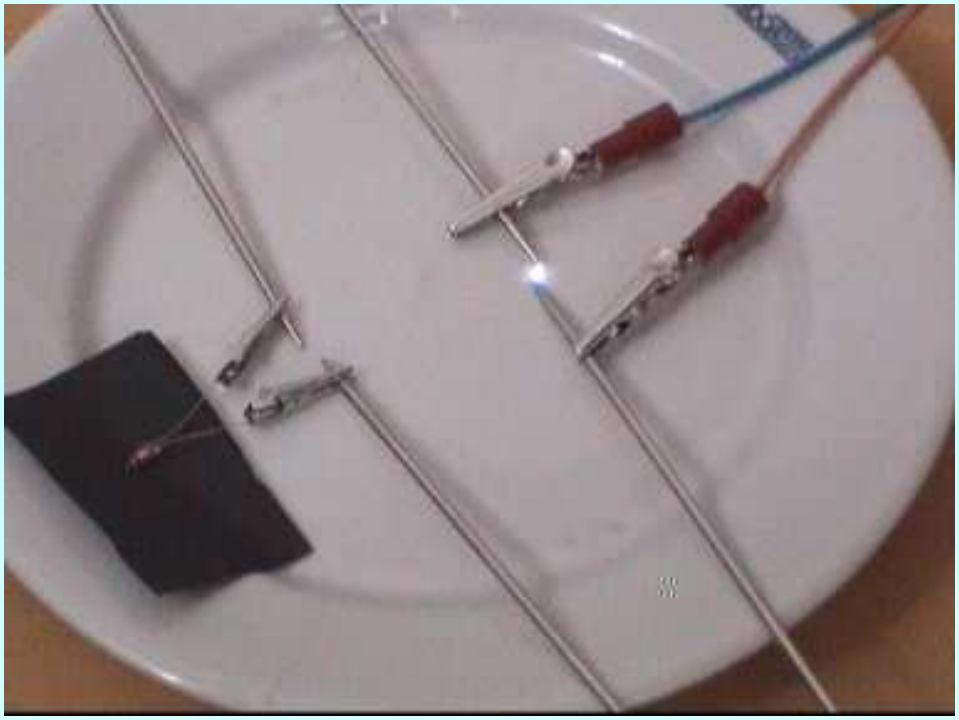
Zapalacz dostarcza napięcia rzędu 10 kV, ładunek na każdej z bombek jest mały (dla średnicy bombek 4 cm wynosi 2×10^{-8}C). Siła, z jaką przyciągają się bombki odległe o 5 cm jest bardzo mała (1,4 mN), podczas gdy wychylenie o $1{,}5^{o}$ od pionu (tj. o 0,5 cm bombki zawieszonej na 20 cm drucie) bombki o masie 5 g wymaga siły 1,2 mN.

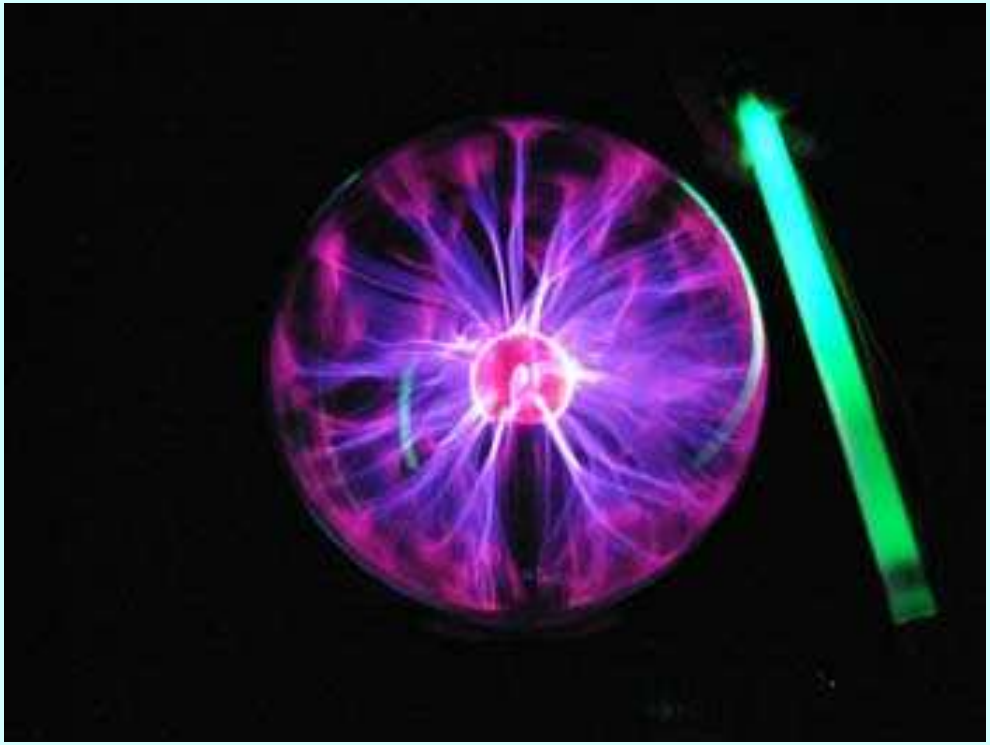
Faraday – Lenz law

Sorry, prof. Maxwell

$$\oint \mathbf{B} \circ d\mathbf{l} = \mu_0 \mathrm{I} + \mu_0 \varepsilon_0 \frac{\partial \Phi_E}{\partial t}$$

Electromagnetic waves





Hertz’ experiment

and light was...