

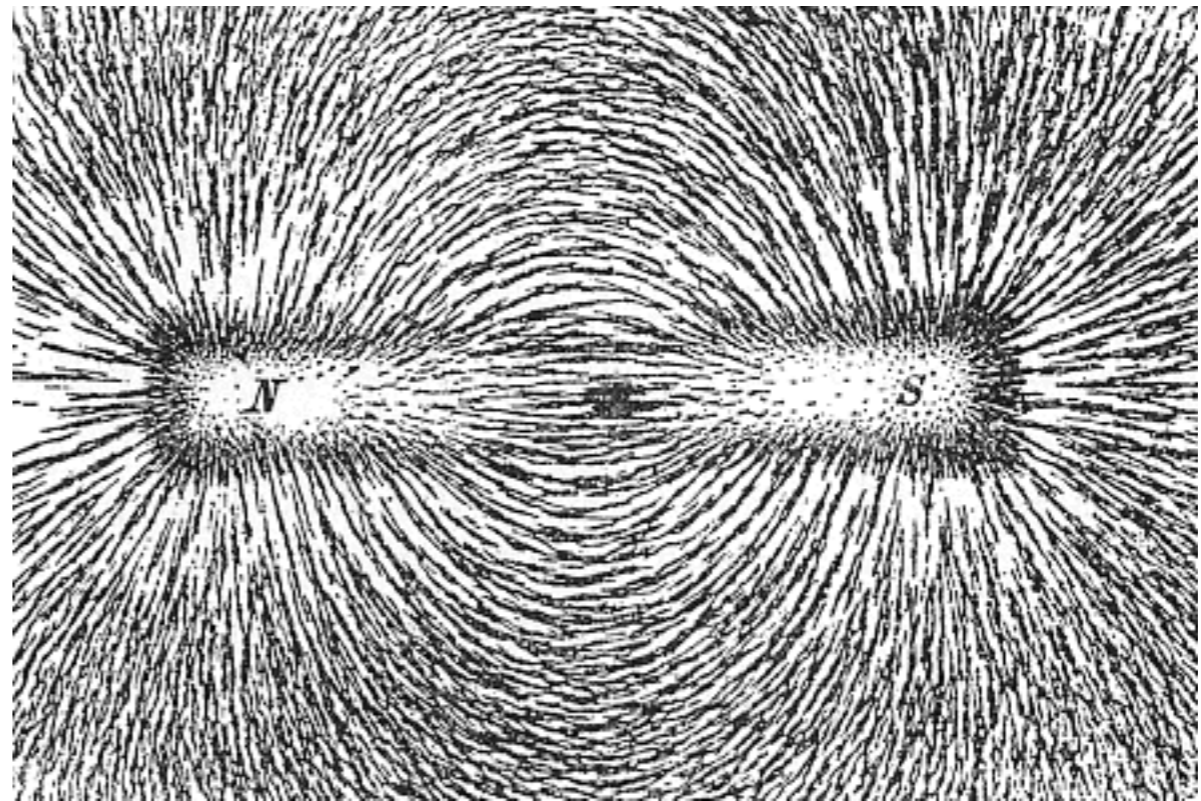
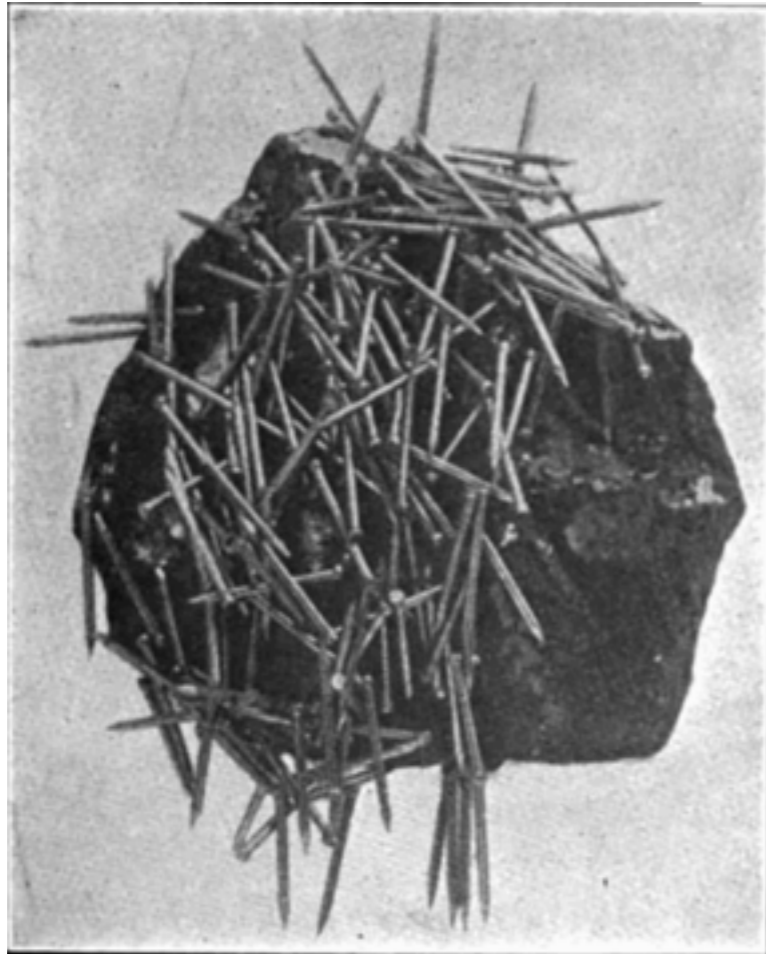
Magnetism

Lecture 17

Announcements

- Regrading due Monday!
 - Give to Susan Miller
 - See email for instructions

Magnetism through the ages.



- Known to the ancients: Lodestone/Magnetite

Unification

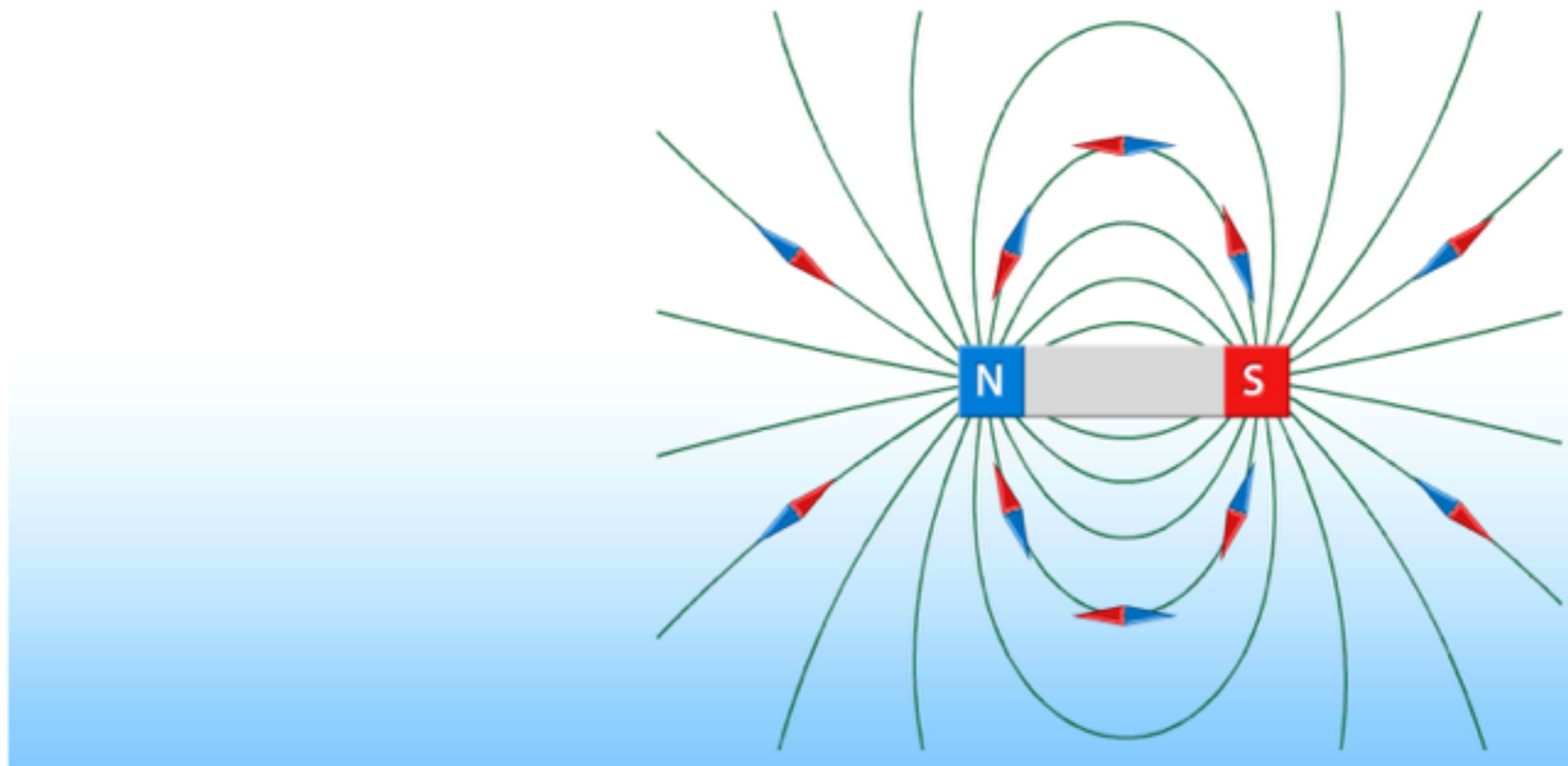
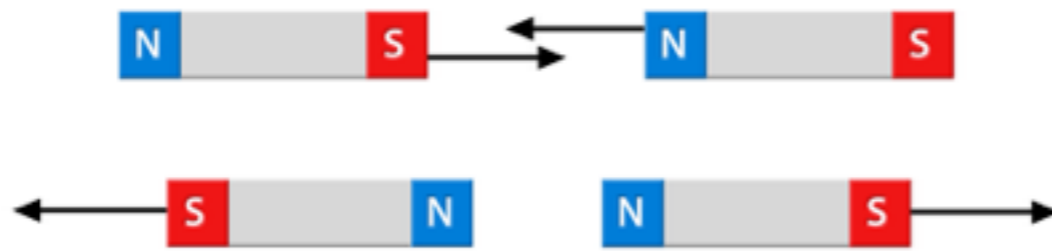
- **Electricity** and **Magnetism** were **unified** into a single theory!
- Current **generates** B and B **applies forces** on currents.
- Lorentz Force Law (J.J. Thomson ++):

$$\vec{F} = q(\vec{E} + \vec{v} \times \vec{B})$$

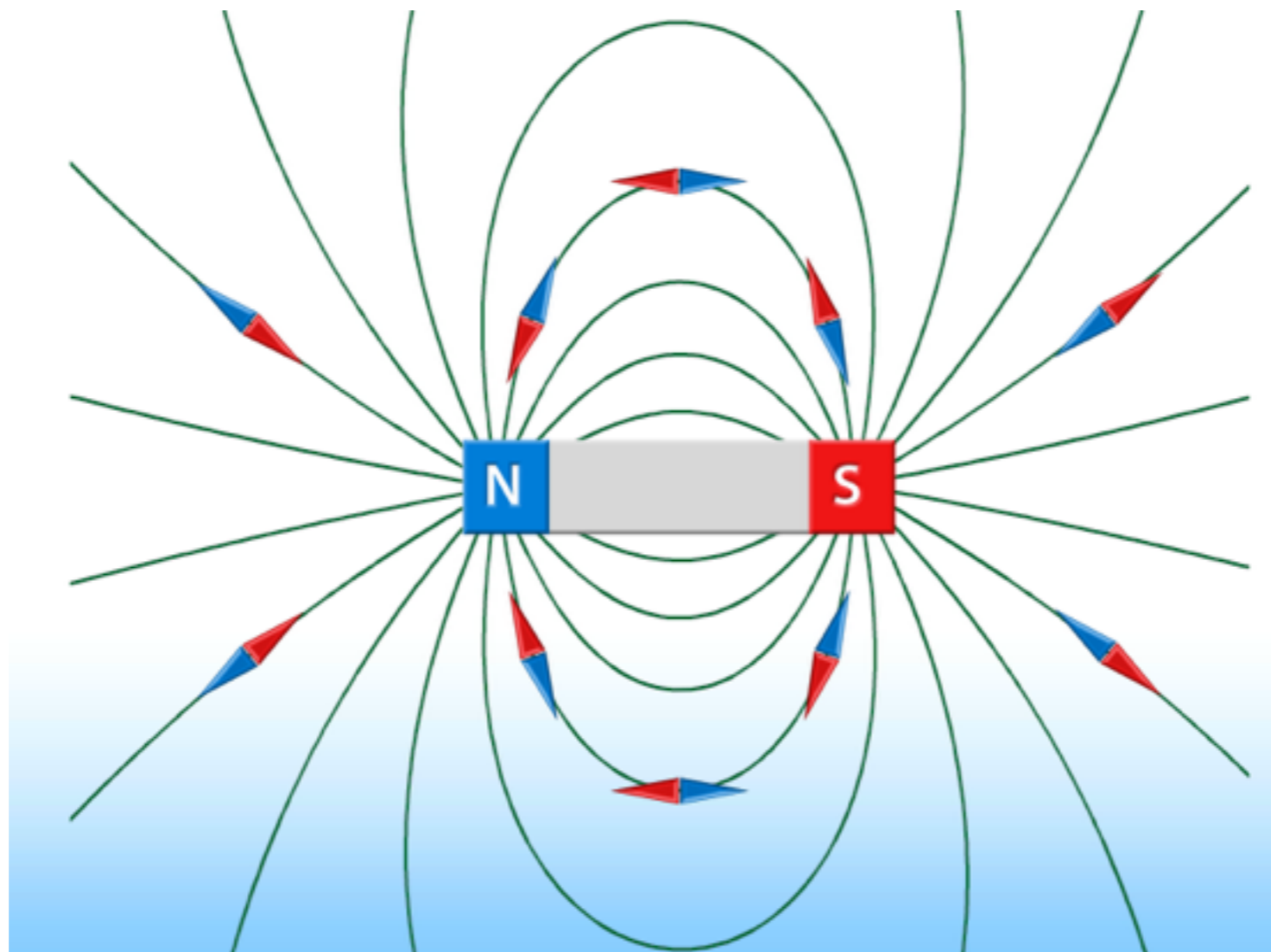
- Ampère Law (w/o Maxwell correction):

$$\vec{\nabla} \times \vec{B} = \mu_0 \vec{j} \qquad \oint \vec{d\ell} \cdot \vec{B} = \mu_0 I_{\text{inside}}$$

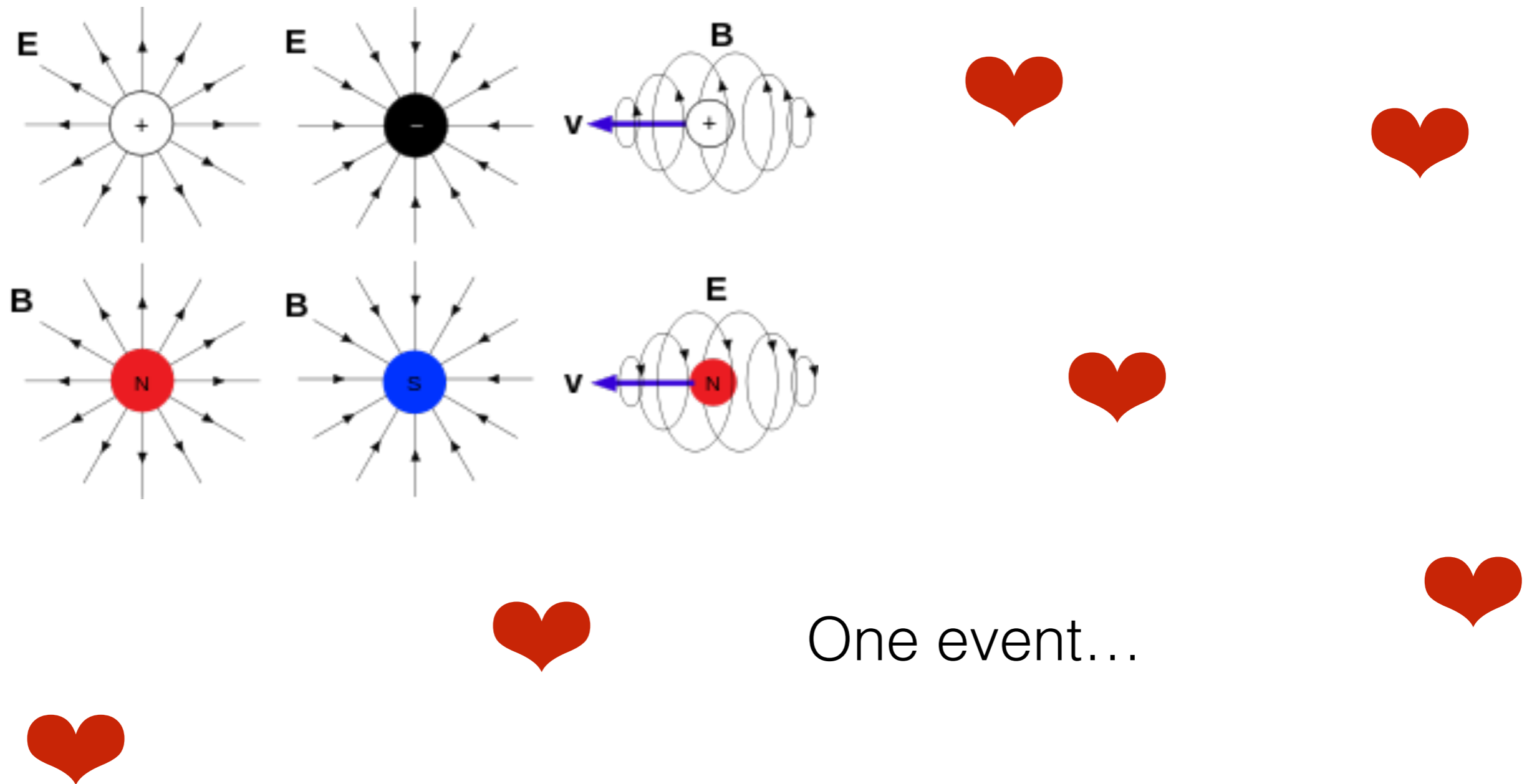
Properties of Bar Magnets (Demo)



Bar magnets produce a dipole field... but no M. monopoles!



Looking for love: Search for magnetic monopoles...

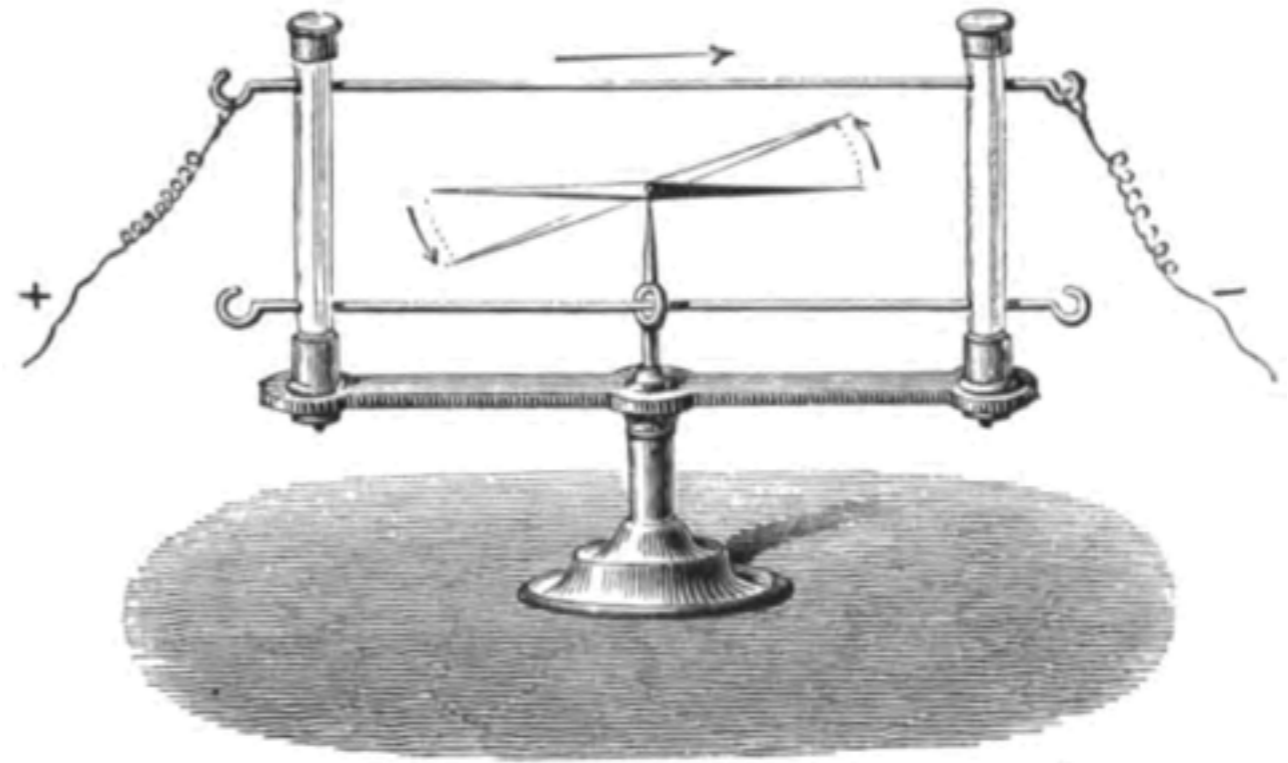
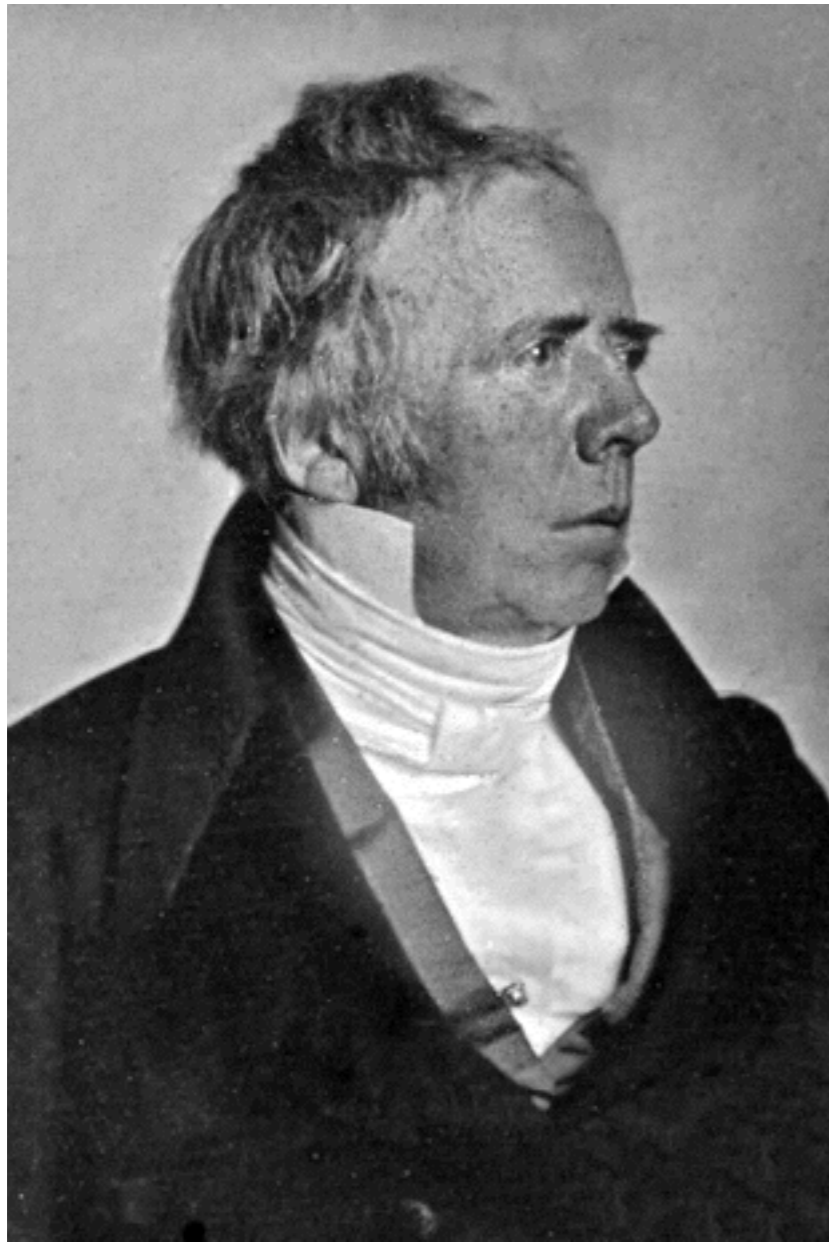


One event...

Blas Cabrera on the night of February 14, 1982

If there are no “charges”,
what generates B?

Ørsted and the demo.



- Electric currents generate magnetic field!
- Bar magnets?

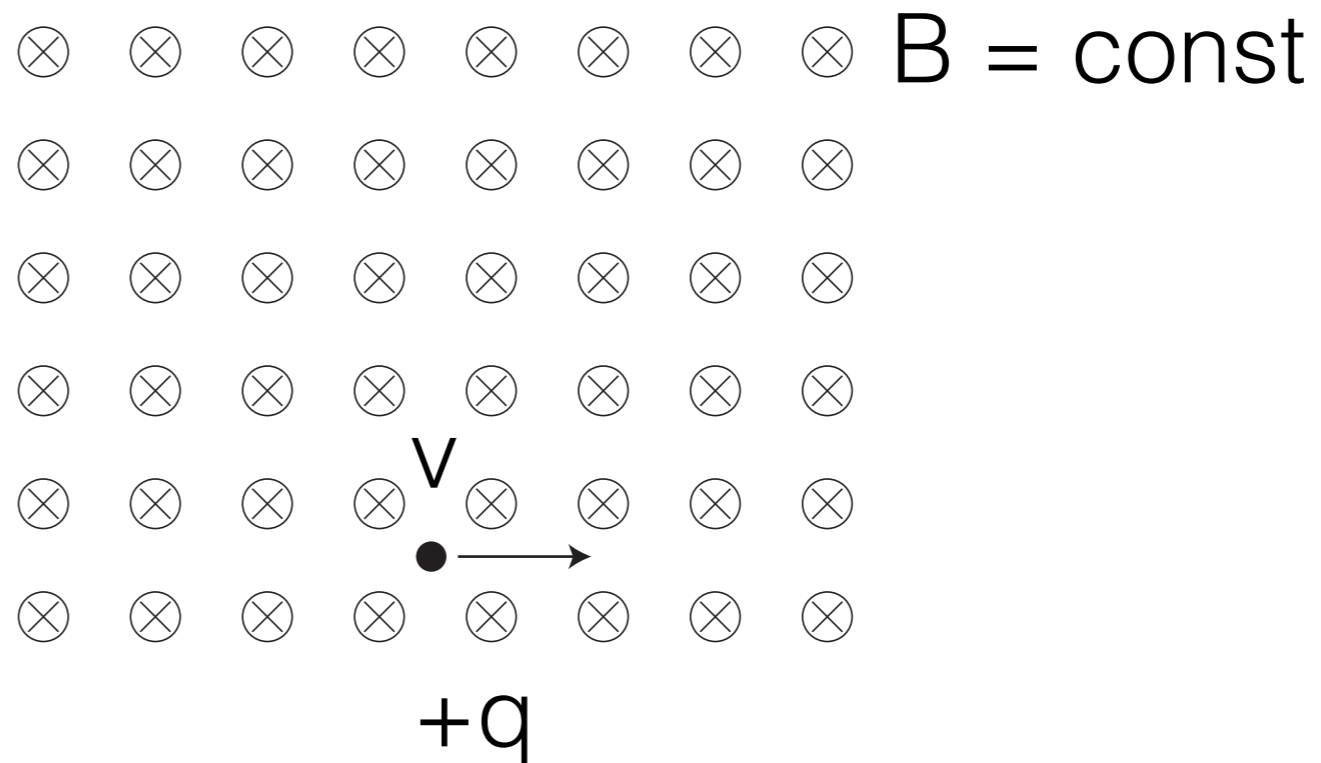
Applying the Lorentz Force Law

- Lorentz Force Law:

$$\vec{F} = q(\vec{E} + \vec{v} \times \vec{B})$$

circular
motion:

$$R = \frac{mv}{qB}$$



Application: Mass Spectrometer

