

Figures and Captions

Figure 1: Hans Christian Ørsted Portrait

Daguerreotype of Ørsted, age 65. Credit: Johann Peter Dinesen, 1842.

Figure 2: The Forks in the Road to Electromagnetism

Conventional current flow, based on Benjamin Franklin's single-fluid theory, was used to determine the direction of electric current.

Figure 3: Ampère's Right-Hand Rule

This applies to conventional current flow only. Credit: *Physics 12-8, Magnets and Electromagnets*, Nelson Education, 2012.

Figure 4: Ampère's Galvanometer (Modern Version)

Properly called a "tangent galvanometer", it is mainly used today for classroom demonstrations of the Tangent Law of Magnetism. It can detect and measure minute magnetic and geomagnetic fields, as well as steady electric currents. Credit: Eisco Labs.

Figure 5: Arago Demonstrates Rotating Magnetic Action

Frustrated by obstinate Académie members, Arago used a vertical metal rod with cardstock pushed down the center, sprinkled with iron filings. When the ends of the rod were connected to a galvanic battery—"Messieurs, et voilà!" Credit: *Physics 12-8, Magnets and Electromagnets*, Nelson Education, 2012.

Figure 6: Rotating Magnetic Action Caused by Electric Current

Credit: *H. C. Ørsted*, 1820.

Figure 7A: Experiment I

There is no observable effect when a current-carrying conductor is placed perpendicular to magnetic compasses, first aligned to magnetic north, using this over-and-under wire example (instead of changing battery polarity). Enlarged compass face inserts added for clarity.

Figure 7B: Experiment II

When a current-carrying conductor is placed parallel to magnetic compasses, first aligned to magnetic north, a noticeable deflection of the magnetic needles is observed using this over-and-under wire example (instead of changing battery polarity). Enlarged compass face inserts added for clarity.

Figure 8: The “Romagnosi Effect”

This Eisco (10-cell, 10-volt) voltaic/galvanic electrochemical battery is operating in open-circuit mode therefore no external electric current can flow. Yet “something” is pulling the compass needle—first aligned to magnetic north—north-north-east. This battery uses pure copper and zinc discs (both non-magnetic) and felt washers mounted on a plastic spindle and base. More importantly, there was no magnetic needle deviation until after the felt washers were dry-soaked in acetic acid (vinegar). This is definitely not a static electricity effect!

Additional References

Correspondance de H. C. Ørsted avec divers savant, tome I, M.C. Harding, 1920.

H. C. Ørsted, Naturvidenskabelige Skrifter, Kristine Meyer, 1920.

Persistent errors regarding Oersted's discovery of electromagnetism, Robert C. Stauffer, 1953.

Physics and Naturphilosophie: A Reconnaissance, Kenneth L. Caneva, 1997.

Romagnosi and the Discovery of Electromagnetism, Sandro Stringari and Robert R. Wilson, 2000.

Resistance to the Discovery of Electromagnetism: Ørsted and the Symmetry of the Magnetic Field, Robert de Andrade Martins, 2004.

Chance in Science: The Discovery of Electromagnetism by H. C. Ørsted, Nahum Kipnis, 2005.

The Correspondence of Michael Faraday: 1855-1860, Volume 5, Edited by Frank A. J. L. James, 2008.

Hans Christian Ørsted: Reading Nature's Mind, Dan C. Christensen, 2013.