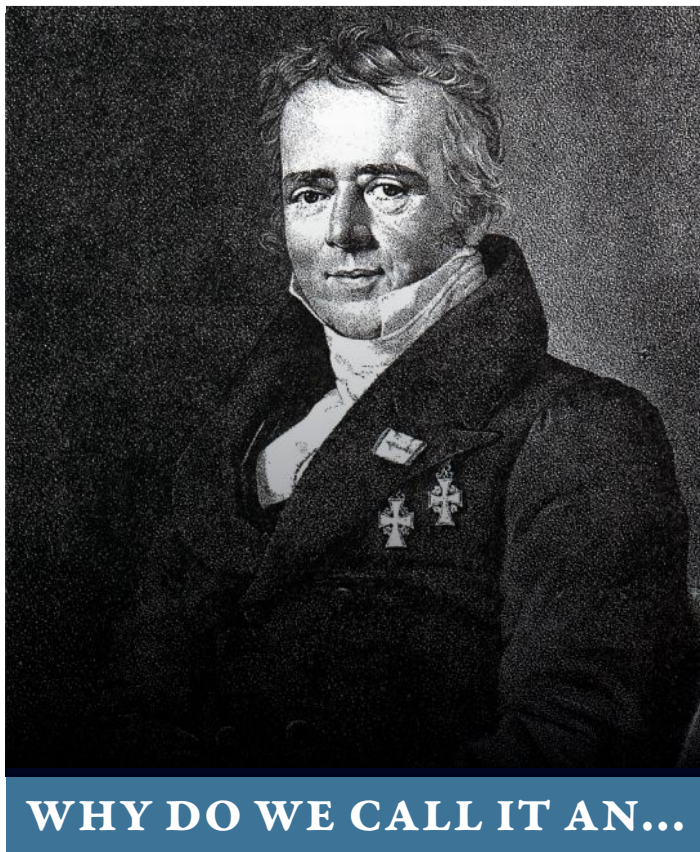


THIS IS THE
THIRTEENTH IN A
SERIES OF ARTICLES
THAT INVESTIGATES
THE HISTORY OF
SCIENCE AND
ENGINEERING.

*One way in which this history
has been preserved is in the
names of the scientific units
that we commonly use.
Those units will serve as
starting points for these
articles as we explore
“Why do we call it a...?”*

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Iowa Alpha '61



OERSTED

Back when I was doing useful work — i. e., teaching — I would often start a class by giving a short quiz. Let's do that to introduce today's subject.

Fill in the blank: Hans Christian _____ was a famous 19th century Dane. I would wager that if you did not take a clue from the title of this article, you would answer “Andersen.” And you would be correct. Hans Christian Andersen was a beloved storyteller whose fables and fairy tales are still popular with children and adults throughout the world. But there is another Hans Christian whose fame may be less universal but whose impact — or at least the impact of his discovery — is even more far reaching: Hans Christian Oersted.

To honor Oersted, the unit of magnetic field intensity in the centimeter — gram — second (CGS) system has been named the oersted, abbreviated Oe. Since the CGS system is little used today, the oersted is seldom seen in the technical literature, but the fame of its namesake is not diminished.

Hans Christian Oersted (spelled Ørsted, using the Danish alphabet) was born on August 14, 1777, in the town of Rudkøbing, Denmark, on the island of Langeland. Rudkøbing is still a thriving town of about 4,500 and boasts a fine statue of H.C. Oersted in the town square. The family did not have enough money to send Hans and his brother Anders to a formal school, so they were educated at home by their parents and various tutors. In 1793, at the age of 16,

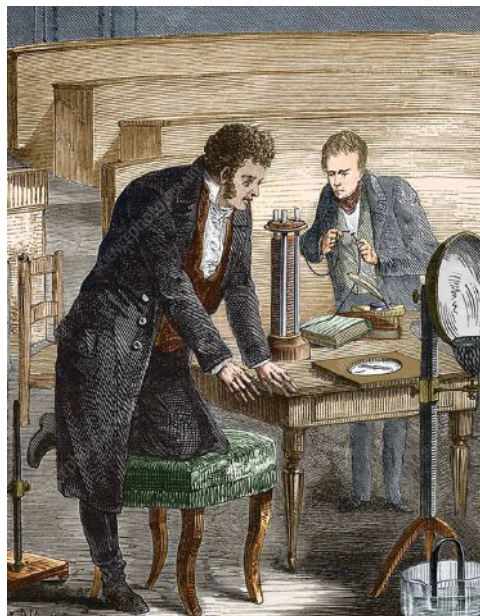
Hans enrolled in the University of Copenhagen to study science with the goal of becoming an apothecary like his father. His interests soon broadened, however, and he won various honors. He received a degree in pharmacology in 1796 and his doctorate in 1799 at the age of 22. In 1801, he received a grant that funded three years of travel around Europe to visit the various scientific laboratories. In 1806, his travels completed, he was appointed professor at the Univ. of Copenhagen. The stage was now set for his great discovery.

Today, when we consider electricity, we usually think of electrons flowing and the variables of voltage and current. Before 1800, however, the term meant what we today call *static* electricity. Any flow of charge was almost instantaneous,

occurring when a Leyden jar discharged with a flash and a bang. This changed in 1800 when Alessandro Volta invented what came to be known as the voltaic pile or battery, a source of continuous flow of what we now call electrons. All kinds of experiments were now possible. For instance, passing this newly available current through a thin platinum wire heated the wire to luminescence and demonstrated a connection between electricity and heat and light. *Hmmm*. Could there also be a connection between electricity and magnetism? It would certainly seem reasonable. Incredibly, scientists searched for that connection for *twenty years* before it was found. By whom? By none other than our hero, Hans Christian Oersted.

There had been a few examples of experiments that suggested electricity and magnetism might somehow be related. Benjamin Franklin, among others, observed that steel needles sometimes became magnetized when they were in the vicinity of an electrostatic discharge. But no one succeeded in generalizing the observation or systematically conducting a repeatable experiment. Until Oersted.

Some say that Oersted was actively looking for the electricity/magnetism connection and designed an experiment to test a theory he had developed. It is also possible — and often accepted — that his discovery was entirely accidental. In any case, on a spring day in 1820, Oersted and an assistant were conducting a demonstration as part of a lecture to Oersted's students when they made a historic observation. Whatever phenomenon they were demonstrating, the experiment involved opening and closing a connection to a voltaic pile, thereby creating an intermittent flow of current. By accident or by design, a compass had been placed near the wire. When the current was turned on, Oersted observed that the needle of the compass moved from its magnetic North position. When the current was turned off, the needle returned to its equilibrium direction. When the current was reversed, the needle moved in the



Oersted discovering electromagnetism.

opposite direction. Clearly — at least it is clear to us now — the electric current was causing a magnetic effect. The long-sought connection between electricity and magnetism had been found.

When scientists make a discovery, they have a natural inclination to announce it to the world immediately, before someone else beats them to it. Oersted must have felt the same way, but he also knew there was much more to be learned about the phenomenon and wanted to be dead sure of his results before he published. Oersted spent the early summer of 1820 conducting a series of careful experiments verifying his observations and precisely describing the magnetic effect of a current-carrying wire. By July, convinced of the validity of his experiments, he published a paper that was widely read and greeted with considerable excitement.

The scientific world was electrified — both literally and figuratively. It took twenty years from the invention of the voltaic pile to the discovery of electromagnetism, but within weeks after that discovery, scientists throughout Europe were repeating Oersted's experiment and extending knowledge of the phenomenon. In September, André-Marie Ampère (1775 – 1836) made the astounding discovery that two current-carrying wires would either repel or

attract each other, depending upon the direction of the current. Other scientists started designing rudimentary telegraphs based on electromagnetism and soon, some were starting to dream of using the phenomenon to create motive power. Both efforts were eventually richly rewarded.

Oersted is known primarily for his discovery of electromagnetism, but also made other scientific contributions. In 1824, he became the first person to isolate aluminum and reported the development but apparently didn't think the metal would find much use.

Oersted was also an inspiring organizer, founding organizations that eventually became the Danish Meteorological Institute, the Danish Patent and Trademark Office, and the Technical University of Denmark. And he was not the only talented one in the Oersted family; his younger brother Anders was a lawyer and politician who served as prime minister of Denmark in 1853-54.

On the personal side, the two Hans Christians — Oersted and Andersen — were very close friends, even though Andersen was some thirty years younger. At the tender age of 14, Andersen had come to Copenhagen to seek his fortune and had the audacity to call on Oersted who was already famous. Oersted and his family liked the young man, helped him with contacts and recommendations, and integrated him into their family. For many years, Andersen dined regularly with the Oersteds and celebrated holidays with them. He may even have courted Sophie, one of the Oersted daughters. Andersen referred to his friend and mentor as "great Hans Christian" and himself as "little Hans Christian," a reference to their fame and not to their stature.

So, dear reader, the next time you are asked to name a famous Dane with the given names of Hans Christian, I hope you will remember Hans Christian Oersted as well as his friend Hans Christian Andersen. Oersted is famous for his discovery of electromagnetism and his contribution to the definition of magnetic fields. And that's why we call an oersted an oersted.