

First electric motor ever made

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In 1820, the Danish physicist Hans Christian Ørsted threw electromagnetic theory into a state of confusion. Natural philosophers of the day believed that electricity and magnetism were two distinct phenomena, but Ørsted suggested that the flow of electricity through a wire created a magnetic field around it. The French physicist André-Marie Ampère saw a demonstration of Ørsted's experiment in which an electric current deflected a magnetic needle, and he then developed a mathematical theory to explain the relationship.

English scientist Michael Faraday soon entered the fray, when Richard Phillips, editor of the *Annals of Philosophy*, asked him to write a historical account of electromagnetism, a field that was only about two years old and clearly in a state of flux.

Davy, just 13 years older than Faraday, had already made a name for himself as a chemist. He had discovered sodium, potassium, and several compounds and invented the miner's safety lamp. Plus he was a charismatic speaker. Faraday took detailed notes of the lectures and sent a copy to Davy with a request for employment. When a position opened as a chemistry assistant at the Royal Institution, Davy hired Faraday.

Davy mentored Faraday and taught him the principles of chemistry. Faraday had an insatiable curiosity, and his reputation at the Royal Institution grew. But when Phillips asked Faraday to write the review article for the *Annals*, he had only dabbled in electromagnetism and was a bit daunted by Ampère's mathematics.

While reconstructing Ørsted's experiments, Faraday was not entirely convinced that electricity acted like a fluid, running through wires just as water runs through pipes. Instead, he thought of electricity as vibrations resulting from tension between conducting materials. These thoughts kept him experimenting.

On 3 September 1821, Faraday observed the circular rotation of a wire as it was attracted and repelled by magnetic poles. He sketched in his notebook a clockwise rotation around the south pole of the magnet, and the reverse around the north pole. "Very satisfactory," he wrote in his entry on the day's experiment, "but make more sensible apparatus."

For a helpful animation of Faraday's apparatus, see this tutorial created by the National High Magnetic Field Laboratory. And if you'd like to build your own Faraday motor, this video will walk you through it:

Although a great proof of concept, Faraday's device was not exactly useful, except as a parlor trick. Soon, people were snatching up pocket-size motors as novelty gifts. Although Faraday's original motor no longer exists, one that he built the following year does; it's in the collections of the Royal Institution and pictured at top. This simple-looking contraption is the earliest example of an electric motor, the first device to turn electrical energy into mechanical motion.

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Faraday knew the power of quick publication, and in less than a month he wrote an article, "On Some New Electromagnetic Motions and the Theory of Electromagnetism," which was published in the next issue of the Quarterly Journal of Science, Literature, and the Arts. Unfortunately, Faraday did not appreciate the necessity of fully acknowledging others' contributions to the discovery.

Faraday fought to clear his name against the charge of plagiarism and mostly succeeded, although his relationship with Davy remained strained. When Faraday was elected a fellow of the Royal Society in 1824, the sole dissenting vote was cast by the society's president, Humphry Davy.

Faraday avoided working in the field of electromagnetism for the next few years. Whether that was his own choice or a choice thrust upon him by Davy's assigning him time-consuming duties within the Royal Institution is an open question.

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