*Why do we call it an...*Ampere?

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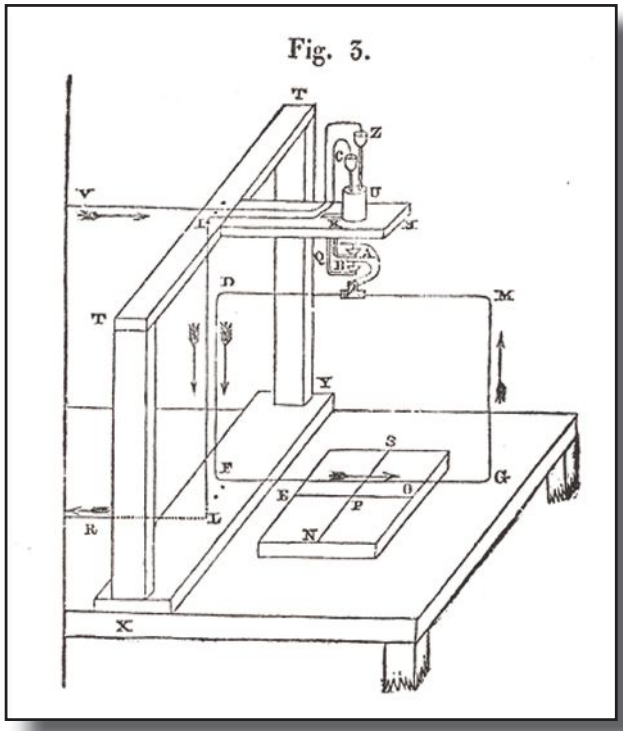
This is the second in a series of articles that explore the history of science and engineering. One way in which this history has been preserved is in the names of the scientific units that we commonly use. Those units will serve as starting points for these articles as we explore "Why do we call it a…?"

Ask any electrical engineer to name some electrical units and probably the first one named will be the volt. The second will likely be the ampere. Volts, as we all know, are the units by which we measure electromotive force. While volts have a lot of potential (so to speak) they can't get any work done without some amperes.

It takes one joule of energy to move one coulomb of charge through a potential difference of one volt. The important word there—at least for this article—is "move." The movement of charge we call current and we measure current in amperes, where one ampere is a flow rate of one coulomb per second. We will get to the coulomb in a future article but today, let's look at the ampere.

The abbreviations for meters, grams, liters, and the like are lower case letters. The ampere, however, is abbreviated with a capital A, since it is named for a person. That person is André-Marie Ampère (1775–1836). The right-leaning accent mark over the *e* in his first name tells us that it is pronounced "ahn-dray" while the left-leaning mark in his last name says that it should be pronounced "ahm-pehr." That fact is presented only for completeness because the unit, ampere, has no such marks and is usually pronounced "am-peer," at least by English speakers.



An experimental apparatus used by Ampère. From Ampère, "Exposé des Nouvelles Decouvertes sur L'Electricité," 1822.

So who was this Ampère and what did he do that caused the scientific community to name a major electrical unit after him? He was born in Lyon, France, on January 20, 1775, which the historically observant reader will recognize as the year the American Revolution was just heating up. His father, a wealthy merchant, didn't believe in formal education, so André-Marie—obviously a very bright child—learned at home, mostly by reading the books in his father's library.

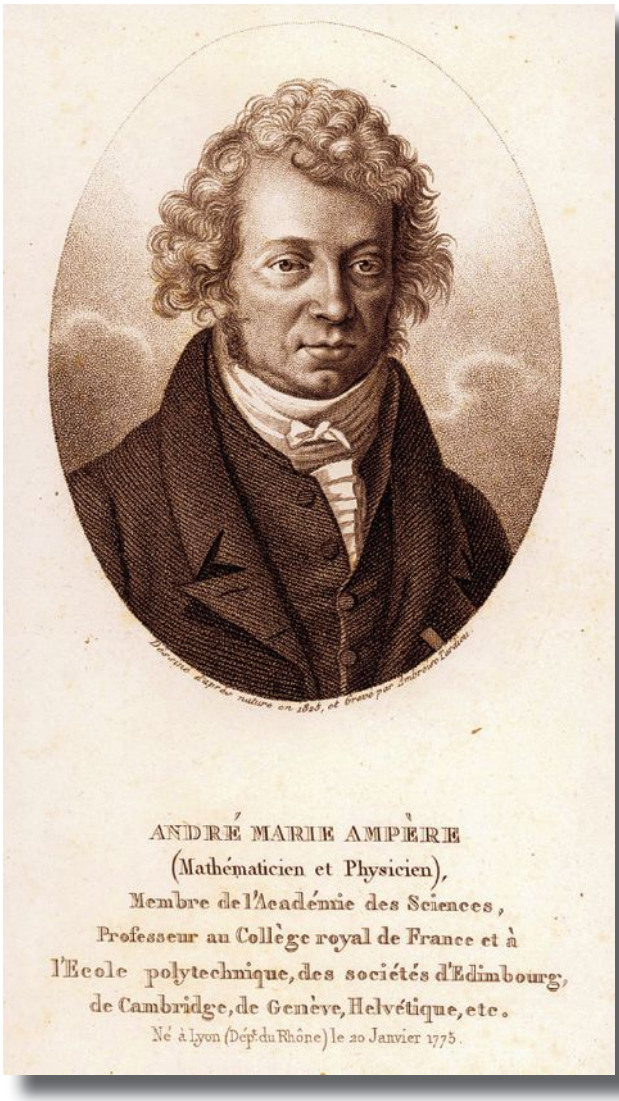
Turbulent Revolution

Just as Ampère was entering his teenage years, France began a decade of turbulent revolution (1789-99) when certain citizens became heroes until the next change of government when the same individuals became villains. His father was caught up in this maelstrom, first being appointed to public office and then, in the next reversal, being taken on a one way trip to the guillotine. Ampère was 18 years old and now pretty much bereft of the wealth with which he had grown up.

In 1799, Ampère took his first real job as a mathematics teacher. This was also the year that Napoléon Bonaparte came to power and started a period of stability in French society. Napoléon was a friend of science and education and Ampère, and others like him, prospered under the new regime. In 1804, he was appointed to the faculty of the new École Polytechnique where he studied, taught, and published papers on a variety of topics for the next 25 years.

This takes us to 1820 and the beginning of the tale of Ampère's impact on electrical science. By that date, the phenomenon of magnetism had been known for over 1000 years and it had been 20 years since Alessandro Volta invented the voltaic pile or, as we would call it today, the electric battery.

There was a general feeling that there should be some



connection between magnetism and the phenomena associated with the voltaic pile, but in 20 years, no one had found it. Then, on April 21, 1820, a Danish physicist named Hans Christian Oersted (more about him in a future article) made a discovery that may or may not have been accidental. He was conducting an experiment using a voltaic pile to heat a platinum wire when, as he connected the wire to the pile, he noticed that the needle of a fortuitously located compass moved, ever so slightly. Recognizing that this was a discovery of considerable significance, he ran a series of experiments verifying what he had seen and demonstrating that the effect was somehow connected to whatever was happening inside that wire connected to the voltaic pile.

By July, he was confident in his results and published a paper that was widely circulated throughout Europe. Electromagnetism was a new word in the scientific idiom.

One of the scientists who read the paper was François Arago, a colleague of Ampère at École Polytechnique. In September, just two months after the publication of Oersted's paper, Arago duplicated the experiment at a meeting in Paris. Ampère was in the audience and was so excited about the discovery that he went to his laboratory and repeated and extended the experiments, returning one week later to report various advances in this new field of science.

One new phenomenon that he reported was the attraction and repulsion of current-carrying wires. He reasoned —or at least we infer that he reasoned—that since a wire connected to a voltaic pile had an effect on a magnet, the wire itself is behaving like a magnet. If that is true, then two current-carrying wires should act like two magnets and exhibit attraction or repulsion. That was, of course, the case and he demonstrated that if the currents were flowing in the same direction, the wires attracted each other and if they flowed in opposite directions, the wires repelled. One of his experimental devices is shown at left.

Many More Experiments

Of course, Ampère didn't stop there. He went on to conduct many more experiments and make many contributions to the new science that he dubbed electrodynamics. Looking back from the 21st century, an electrical engineer is tempted to think that these discoveries were really pretty trivial. Remember, though, that in 1820 there were no instruments for measuring voltage and current. Indeed, the very concept of voltage and current had not yet been developed. Whatever apparatus was needed in an experiment had to first be invented and then fabricated. The talent of these early scientists is truly astounding.

It is also interesting to note that Ampère coined the term "cybernetics" (cybernetiques, in French) although he used it to describe the science of civil government and not the study of control and communication as defined by Norbert Weiner, a century later.

In his experiments in electrodynamics, Ampère was one of the first to recognize that something was flowing inside those wires. And that's why we call an ampere an ampere.

Want to know more about our history? Check out the Engineering Technology and History Wiki: *http://ethw.org/*.

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