

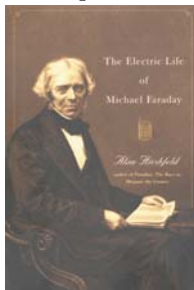
An experimental physicist extraordinaire

The Electric Life of Michael Faraday

Alan Hirshfeld
Walker, New York, 2006. \$24.00
(258 pp.). ISBN 0-8027-1470-6

Reviewed by Cyrus Hoffman

Ask people on the street to name some important physicists, and I doubt many would include Michael Faraday (1791–1867). Probably very few have even heard of him, which is unfortunate. Not only was Faraday one of the most productive and influential scientists who ever lived,



but the fairy-tale story of how he rose from an impoverished, uneducated beginning cannot fail to fascinate and inspire readers. Thus the appearance of an engaging, eminently readable account of

Faraday's life and accomplishments is most welcome.

Alan Hirshfeld, a professor of physics at the University of Massachusetts Dartmouth and the author of the popular *Parallax: The Race to Measure the Cosmos* (W. H. Freeman, 2001), is well suited to telling the story. In *The Electric Life of Michael Faraday*, Hirshfeld chronologically traces Faraday's life, from his humble beginnings—he was the third child of a poor blacksmith—to his death; he is arguably the greatest experimental scientist of his time—or perhaps of any time.

The book begins by drawing us into the world of an early 19th-century bookbindery, where Faraday was apprenticed; the author explores the scientist's insatiable thirst for understanding the natural world. Fortunately, George Riebau, the bookbindery's proprietor, encouraged Faraday's inquisi-

tiveness. It is also fortuitous that Humphry Davy, the preeminent chemist of his day and a luminary at the Royal Institution in London, recognized both the mind and energy of the young Faraday and took him under his wing. Under Davy, Faraday rose from bottle washer and valet to trusted assistant to, ultimately, peer. Hirshfeld is particularly effective at examining the evolving relationship between the flamboyant Davy and the reserved Faraday.

The field of Davy's expertise and Faraday's initial work was electrochemistry, the interaction of electrical currents and chemical compounds to uncover the underlying structures of those compounds. The faraday, a unit of electrical charge, is a testament to the impact of Faraday's contribution. Hans Christian Oersted's 1820 observation that an electrical current flowing through a wire caused a nearby compass needle to rotate encouraged Faraday to begin his seminal experimental studies on the connections between electricity and magnetism.

Hirshfeld reveals how Faraday turned his lack of understanding of mathematics and theoretical physics into an asset, leaving him free from preconceptions and allowing him to explore a wide variety of physical phenomena. Faraday was a methodical and creative experimenter; however, what set him apart from his peers was his fertile mind, which constantly sought a deep understanding of the underlying physics of each observation and ways to test his ideas. Faraday invented the concept of magnetic lines of force so he could visualize magnetism, because he could not understand the detailed mathematical description of it. I suspect that every college freshman physics student is deeply indebted to Faraday's ingenuity. The young James Clerk Maxwell studied Faraday's *Experimental Researches in Electricity*, published in three volumes between 1839 and 1855. The work is totally devoid of mathematics, and it eventually led Maxwell to his highly mathematical laws of electromagnetism. It is fascinating to read the contrasts between the interactions of Faraday and Davy and those of Faraday and Maxwell.

Hirshfeld also discusses at some length Faraday's passion for educating the general public, especially children. Faraday strongly believed in education, as he was mindful of how Davy's public lectures fired his own imagination.

The book has a few flaws, in addition to a somewhat silly title. The author occasionally fails to distinguish between our present understanding of a phenomenon and what was believed in the 19th century. Hirshfeld also provides several just-plain-wrong explanations of physics phenomena. For example, on page 74, in describing the magnetic force, the author writes that "were you to grasp the [current-carrying] wire in your fist, your fingers would curl in the manner of the magnetic force." I also wanted to learn more about the suspected causes of the debilitating headaches and loss of memory that plagued Faraday in his later years.

Nevertheless, *The Electric Life of Michael Faraday* discusses an intriguing and influential person. More important, it provides superb examples of the scientific method at work. The fact that Faraday was deeply religious leads to detailed discussions on the relationship between science and religion, a topic that remains of great interest. Hirshfeld's award-winning writing style makes the book approachable to scientists and nonscientists alike, and the extensive references render it useful to scholars.

Civilized Life in the Universe

Scientists on Intelligent Extraterrestrials

George Basalla
Oxford U. Press, New York, 2006.
\$29.95 (233 pp.).
ISBN 0-19-517181-0

George Basalla's *Civilized Life in the Universe: Scientists on Intelligent Extraterrestrials* is a curious book. It appears to be a history of the extraterrestrial (ET) life debate, yet Basalla offers much less detail than other histories on the subject written over the last two decades—for example, Michael Crowe's *The Extraterrestrial Life Debate, 1750–1900: The Idea of*

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