

## Helmholtz: A Life in Science

David Cahan

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This biography—the first in more than a century—weaves together 19th century science, politics, and the politics of science as lived by the physiologist and physicist Hermann Ludwig Ferdinand von Helmholtz (1821–1894), whose career ended just as the stage was set for the quantum revolution. Working from an enormous corpus of published and unpublished documents, personal and third party correspondence, official government documents, and secondary literature, Cahan paints a portrait of the man in full context.

The first-born child of a *Gymnasium* headmaster in the Berlin suburb of Potsdam, Helmholtz studied medicine at the Charité because the students were financially supported in return for service in the Prussian Army. However, theoretical physics was always on his mind: Helmholtz relaxed at home by reading Jacobi's treatise on elliptic functions. After a dissertation with Johannes Müller, he made lifelong friends in the scientific circle surrounding Heinrich Gustav Magnus and married Olga Leopoldine von Velten, mother to their two children and his intellectual partner.

Helmholtz began his academic career as a professor in Königsberg, where he invented the ophthalmoscope and found the intellectual compass that guided his

approach to science. As he recalled at Columbia University, almost half a century later (page 716),

*All that was original with me ... was that I went on to ask how the optic images could be produced by the light coming back from the illuminated eye.... As soon as I answered that question, I saw also how an ophthalmoscope could be constructed, and it took me two days to do it and successfully experiment with the new instrument.*

Helmholtz's images of the living retina, grounded in physiological observations connected to fundamental physics, put him squarely in the vanguard of those seeking to banish the concept of a special "life force"—the *elan vital*—and pure empiricism from scientific medicine.

In Königsberg, Helmholtz published a seminal paper on "The Conservation of Force"—based on studies of nerve impulses in frogs—that would mature into the idea of conservation of energy and elevate the trajectory of his career. Given the impact of that work, his departure from Königsberg was perhaps inevitable.

The offer of a professorship in Heidelberg, backed by an ambitious political administration in Baden that had already

brought Bunsen and Kirchhoff there, was a welcome relief. However, scientific success was increasingly overshadowed by Olga's increasingly fragile health. Her death shortly after moving to Heidelberg left him a widower with two young children.

At this dark time, Helmholtz's love for music—he was an accomplished pianist and organist—brought him face to face with Anna von Mohl. Their marriage in 1860 would inspire him—and surprise her—to focus on science.

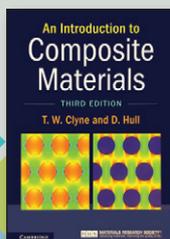
Anna gave birth to their son and daughter in Heidelberg and was at Helmholtz's side when he returned to Berlin as professor of physics, and eventually as rector at Humboldt-Universität zu Berlin.

The book includes rich details of the lifestyle of an extraordinary scientist, academic diplomat, and devoted husband and father. He knew all the stars in the firmament of classical physics, including Faraday, Maxwell, several Thomsons, Boltzmann, Kirchhoff, Bunsen, and Tyndall. The roster of his doctoral students—Planck, Wien, Eötvös, Lummer, Pupin, Michelson, and Heinrich Hertz—will be familiar to anyone who has labored through a textbook on modern physics.

Not for reading at a single sitting or even a transoceanic flight, the book is most rewarding when savored a chapter at a time. Almost every page delights with perspectives on that extraordinary era when the modern world of physics was born, and reminds us that many of the workaday challenges in pursuing fundamental science remain with us.

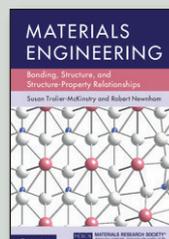
*Reviewer: Richard F. Haglund, Professor, Vanderbilt University, USA.*

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