



Helmholtz

From enlightenment to neuroscience

Michel Meulders (translated by Laurence Garey)
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In *Helmholtz: From Enlightenment to Neuroscience*, Michel Meulders has made an important contribution to the relatively sparse literature on this imposing figure in the scientific landscape of the 19th century. Meulders, an emeritus professor of neuroscience at the Catholic University of Louvain, provides an interesting and thoughtful account of Hermann von Helmholtz's life and numerous scientific achievements.

Helmholtz retains something of a cult following in a number of fields. To ophthalmologists, he is the inventor of the ophthalmoscope. To physicists, he is known for his theory of conservation of energy as well as his work on thermodynamics. Many physiologists know of his pioneering measurements of the conduction velocity of nerve impulses. Philosophers may know his work on the epistemology of science and his contributions linking principles of physiology and perception to aesthetics. His work on color vision and theories of perception in general ensure that he remains a key historical figure for vision scientists. His book on tone sensation as a physiological basis for the theory of music is still an important historical resource for auditory scientists nearly 150 years after its first publication.

Helmholtz achieved high recognition and status in his own time, holding chairs in physiology and later in physics in Königsberg, Bonn, Heidelberg, and finally Berlin, receiving a peerage, and ending his career as the Prussian Imperial Chancellor of Science. Yet according to Meulders, Helmholtz's work was eclipsed in the early 20th century by new ideas in neurophysiology. Although researchers in some scientific fields may dispute this notion, Helmholtz has arguably received less attention in

mainstream scientific literature than other comparably influential thinkers and scientists. Certainly this provides the premise for this book, which sets about reminding the reader of the dazzling breadth and scope of Helmholtz's contributions, framing them within fascinating biographical, cultural, and philosophical contexts.

The book begins with two imagined scenes from the time of Helmholtz's birth, one involving his father, the other an aging Goethe, with both contemplating the rapid cultural changes that marked the early 19th century. Helmholtz's father frets that the progress promised by the Enlightenment is threatened by the romantic notions of *Sturm und Drang* and a return by philosophers such as von Schelling, Schopenhauer, and Hegel to "the old demons of the irrational." Goethe, on the other hand, is lamenting the generally poor reception of his own scientific views and the fact that the empirical agenda embodied by Newton seems to be gaining widespread acceptance. The tension between these two strands of thought — empirical and rational science on the one hand, idealism and metaphysics on the other — forms a backdrop for the entire book. Indeed, the final chapter is devoted to a lecture that Helmholtz, a lifelong advocate of empirical science, delivered on Goethe's relationship to science in 1892. In his lecture, Helmholtz does not shirk from pointing out Goethe's scientific errors, but praises his attempt to frame diverse observations within unifying "primeval phenomena," highlighting the importance of insight and intuition in science as well as in art.

The intervening chapters explore a number of Helmholtz's greatest scientific achievements, along with concurrent life

events and the people of most influence and importance, including his mentor, Johannes Müller, and his Heidelberg colleagues, Bunsen and Kirchoff. Helmholtz's work on visual and auditory perception rightly takes up a substantial part of the book. Helmholtz famously viewed perception as "unconscious inference" — symbols or representations of the physical world that can be interpreted and disambiguated through converging evidence from different senses. The most important claim was, perhaps, that many of these inferences are learned rather than innate. This framework of perception as unconscious inference, developed and championed by Helmholtz, is a mainstay of current thinking in perception research. It is also easy to forget that Helmholtz's pioneering views on the interconnectedness of physiology and psychology were far from accepted in his day and declined in popularity within the physiological community in the early 20th century. Now, of course, the search for neural substrates of perception, cognition, and action has become the guiding rationale for much of modern neuroscience — something for which Helmholtz can take credit in no small measure.

This book provides a lucid and entertaining read, and the translator, anatomist and neuroscientist Laurence Garey, is to be congratulated on a transparent production without the awkward phrasings that often mar translated works. If Helmholtz's importance has been overlooked in mainstream science and medicine over the past century, this book will certainly help in restoring Helmholtz to his rightful position as one of the foremost figures of 19th century science.