

Ritz, Einstein, and the Emission Hypothesis

Alberto A. Martínez*

Just as Albert Einstein's special theory of relativity was gaining acceptance around 1908, the young Swiss physicist Walter Ritz advanced a competing though preliminary emission theory that sought to explain the phenomena of electrodynamics on the assumption that the speed of light depends on the motion of its source. I survey Ritz's unfinished work in this area and review the reasons why Einstein and other physicists rejected Ritz's and other emission theories. Since Ritz's emission theory attracted renewed attention in the 1960s, I discuss how the earlier observational evidence was misconstrued as telling against it more conclusively than actually was the case. Finally, I contrast the role played by evidence against Ritz's theory with other factors that led to the early rejection of his approach.

Key words: Emission theories of light; relativity; Walter Ritz; Albert Einstein; H.A. Lorentz; Paul Ehrenfest; John G. Fox.

Introduction

To solve theoretical problems in optics while unifying the branches of physics, physicists around 1900 tried to modify the theories of mechanics and electromagnetism through various innovative schemes. In due course, Albert Einstein's theory of relativity of 1905 became widely accepted as the solution to the problems at issue and many others. Einstein established a new foundation for physics, such that the laws of electromagnetism retained their form, whereas those of mechanics were modified. The opposite approach was taken by the Swiss theoretical physicist Walter Ritz,* who deemed the equations of electromagnetism to be the root of the difficulties and hence argued for their radical revision. In 1908 Ritz outlined an emission theory of light that was consistent with classical mechanics in an attempt to develop a new electrodynamics of moving bodies. While Einstein posited that all light rays travel with the same speed in empty space, Ritz argued that their speeds vary depending on the motion of their sources at the instant of emission, as with any other projectile. His approach was soon rejected by the physics community mainly, physicists said, because experimental and astronomical evidence was at variance with his fundamental premise. But even

* Alberto A. Martínez is a Research Fellow in the Center for Philosophy and History of Science at Boston University.

** Pierre Weiss, the editor of Ritz's collected works, inserted an "h" in Ritz's given name, although this is at variance with all contemporary sources; it thus has become common to give it as "Walther" instead of "Walter," although I use the latter spelling. See Forman, "Ritz, Walter" (ref. 1), p. 481.



Fig 1. Walter Ritz (1878–1909). *Source:* Société Suisse de Physique, Ritz, *Gesammelte Werke* (ref. 5), frontispiece.

before any empirical evidence against his work had become available, Ritz's theory had been dismissed by most physicists. Historian Paul Forman commented, "the point of view that he brought forward never received the critical attention or sympathetic extension it deserved."¹

The story of Walter Ritz's foray into electrodynamics is instructive for several reasons. Ritz (figure 1) was not one of the elder physicists who objected to Einstein's theory in favor of more traditional approaches; he was young and regarded his approach to electrodynamics as far more radical than Einstein's. Moreover, at first Ritz received more appreciation and support from the established physics community than Einstein. But Ritz's prolific labors ended abruptly when he died in 1909 at the age of 31. His incomplete theory of electrodynamics was rejected. By 1965, however, all of the empirical evidence that had been taken to refute Ritz's approach had been reexamined and shown to be as compatible with his emission hypothesis as with Einstein's theory. Thus, Ritz's fledgling work in electrodynamics provides not only a window into the time when physicists were still struggling to solve fundamental problems, but also a telling