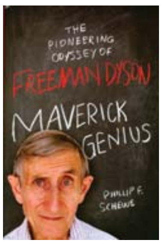
Stories of a transcendent scientist

Maverick Genius
The Pioneering Odyssey of Freeman Dyson

Phillip F. Schewe
Thomas Dunne Books/St. Martin's Press, New York, 2013. $27.99 (339 pp.). ISBN 978-0-312-64235-8

Reviewed by Gregory Benford

I have known Freeman Dyson since 1963, yet this first biography of him told me much I did not know. Author Phillip Schewe structures *Maverick Genius: The Pioneering Odyssey of Freeman Dyson* around stories—in doing so, he mimics Dyson's own use of stories to illuminate ideas. Schewe's writing is often stylishly vivid, giving a sense of the excitement Dyson feels for science and its myriad consequences. The sheer range of Dyson's interests and accomplishments is striking, as is his abiding concern for humanity. The book divides his life into eras that manifest aspects of his mind: for example, Dyson as mathematician, as seminarian, as artist. That construction works well and makes the book flow. It is one of several strategies in this fine book that biographers of scientists should study.



Dyson expected to die in World War II. His experience analyzing the Allies' bombing campaign shaped his subsequent concern with nuclear warfare. Even then, he did not go along with the conventional wisdom of massive deterrence, which led to ever-larger stockpiles; instead, he urged the US to accept the Soviet "defense-by-bluff" strategy, which might have led to fewer missiles being built. He was ignored by the defense intellectuals. His skepticism of bureaucracies, especially secret ones, made him remark that "secrecy hides failure and exaggerates success."

Maverick Genius includes several descriptions of Dyson's philosophical stance. For example, like transcendentalist Ralph Waldo Emerson, Dyson often reconciles "knowledge brought by science with the knowledge rendered by art, history, philosophy and religion." Moreover, "both chafe at the smugness of science and its exclusive reliance on a materialist viewpoint." Dyson "is not so much seeking religious experience . . . as he is spiritual experience." And he "imagine[s] a God who is not omniscient but who learns as he goes along, just as we humans do." Those philosophical ideas give Dyson a wide repertoire for reacting to life's buffeting.

Though Dyson claims to love complexity, diversity, and mystery, his greatest professional achievement was, ironically, unifying quantum electrodynamics. He proved that three rival formulations of QED that looked very different were indeed one and the same. Dyson, says Schewe, "felt that he stood in relation to [Richard] Feynman as the playwright Ben Jonson had been to William Shakespeare." He dealt with his exclusion from the Nobel Prize by saying it was "better to be asked why you didn't win the Nobel than to be asked why you *did*."

Dyson is regarded by many as the ultimate polymath; his greatest public impact has perhaps been in how he has presented the scientific worldview in such magazines as the *New Yorker*. He believes the artistic aspects of science matter and can reassure the public of its essential nature. At their best, he says, "art enchants . . . science enlightens." On climate change, Dyson feels the carbon problem has "more to do with soil management than with atmospheric mitigation." He insists that "remaking nature is exactly what the human species has been doing since the advent of agriculture 12,000 years ago." Those views have brought down a chorus of scorn, which he largely ignores.

His public engagements notwithstanding, Dyson never wanted to rise in powerful circles; he wanted to solve problems, not shape policy. "Science lurches forward when imaginative people offer disturbing ideas to explain puzzling observations," he has said. Ever interested in the practical as well as the theoretical, Dyson sought out clearly defined problems and solved them—for example, he helped design the fail-safe TRIGA nuclear reactor and the proposed interplanetary Orion craft that would ride on the shock waves of nuclear explosions.

Dyson likes "looking for the point of things," an uncommon habit among scientists. He thinks cosmological scales demand philosophical reflection and supports that view with statements such as "The architecture of the universe is consistent with the hypothesis that mind plays an essential role in its functioning," and "It would not be surprising if it should turn out that the origin and destiny of the energy in the universe cannot be completely understood in isolation from the phenomena of life and consciousness." In that, he crosses swords with Steven Weinberg, who concludes that the universe seems pointless. But Dyson believes life, in a way, gives the universe a point: "Mind has waited for 3 billion years on this planet before composing its first string quartet. It may have to wait for another 3 billion years before it spreads all over the galaxy."

Dyson is not a Pollyanna. Like the English science fiction writer Olaf Stapledon, he finds much in our universe majestic yet awful—the ultimate theological problem of why there is evil. In the closing sections of *Maverick Genius*, Schewe shows, through much background on Dyson's family life, that Dyson ranks family and friends before work—that the personal is his ultimate shelter.

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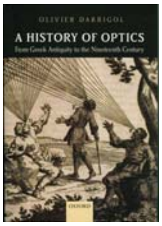
A History of Optics
From Greek Antiquity to the Nineteenth Century

Olivier Darrigol
Oxford U. Press, New York, 2012. $63.00 (327 pp.). ISBN 978-0-19-964437-7

Olivier Darrigol's *A History of Optics: From Greek Antiquity to the Nineteenth Century* presents an expert, long-term history of optics in the Western tradition, from the inception of optics in ancient Greek philosophy to the maturation of classical wave optics in 19th-century Europe. Darrigol's intellectual history examines a 2500-year-long conversation among philosophers, mathematicians, and scientists aimed at elucidating the nature of optical phenomena and resolving the debate between medium-based and corpuscular theories of light.



For the sake of economy, Darrigol construes the history narrowly. He does not incorporate the social and cultural history of optics. Instead he has constructed an internal history, an examination of optical theories largely detached from the contexts in which they were formulated. The success in this approach is the author's depiction, supplemented by frequent quotations from primary texts, of the historical actors' engagement with previous and even ancient optical theories.

The science of optics shifted in the 17th century from a theory of vision to a theory of light. The author, perhaps because of his expertise in the history of modern physics, concentrates on that latter development at the expense of investigating early theories in detail. Indeed, the history of optics from the ancient Greeks to Johannes Kepler comprises a single chapter, the book's first. The second chapter examines mechanical-medium theories of the 17th century. The third, the only one devoted to a single historical figure, examines the optics of Isaac Newton; perhaps because it gets its own chapter, the treatment of the development of Newton's optical theory is exceptional. The fourth chapter examines 18th-century optics, and the final three chapters examine 19th-century explanations of interference, polarization, ether, waves, and rays. The emphasis on the 19th century suggests that the audience for the book is not all historians of physics but historians of 19th-century physics and physicists interested in the history of optics as a backdrop to the science's more modern developments.

The chapter concerning the 2000 years of optics from the ancient Greeks to Kepler is in places inaccurate and a bit careless. For instance, reading Aristotle through the lens of 19th-century theories, the author conflates an optical medium with ether, as understood in the 19th century, and thereby misinterprets the relevance of Aristotle's Aether, the material of the heavens, to his theory of vision. In addition, explorations into the intersections of optics with other sciences are generally kept to a minimum in *A History of Optics*. When discussing Ptolemy's optics, the author only briefly mentions the relevance of refraction to astronomy and does not elaborate on how refraction comes into play in Ptolemy's astronomy. At the very least, it would have been useful to reference the changing explanations in Ptolemy's writings, from the *Almagest* to the *Optics*, for why celestial bodies appear larger at the horizon than at the zenith. In doing so, Darrigol would have at least acknowledged that Ptolemy's optics, like Newton's, developed over time. Furthermore, such a reference would have shown how optics intersects with other mathematical sciences—in this case, astronomy. However, the author does warn in his preface that, in composing a "compact long-term history," he made efforts to trim the narrative.

Although it targets a narrow audience, *A History of Optics* is a welcome addition since it is the only concise, intellectual history of optics covering such a long period. Instructors in the history of science will no doubt use it as a textbook in introductory history of physics courses; physicists, and specifically optical physicists, may enjoy witnessing the development of the discipline through the millennia.

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