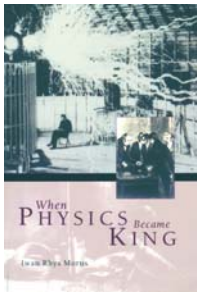
A Scientific Profession with Prominence

When Physics Became King

Iwan Rhys Morus
U. of Chicago Press, Chicago, 2005. $60.00, $25.00 paper (303 pp.). ISBN 0-226-54201-7, ISBN 0-226-54202-5 paper

Reviewed by Robert M. Brain

Iwan Rhys Morus's excellent history of physics in the 19th century, *When Physics Became King*, considers the field in an age when physics and physicists came to play a prominent role in the culture. Making physics the king of the sciences required more than simply producing powerful theories. It meant convincing people that the theories were true, that physics was the best way of finding out the truths of nature, and that such knowledge was important to society.



Morus, a leading historian of physics who teaches in the UK at the University of Wales, Aberystwyth, shows the magnitude of physicists' accomplishments. But the book's title also refers to the author's sense that physics may no longer reign as the king of the sciences. Today, science journalists look to molecular biology and the neurosciences to generate the excitement and novelty that physics used to provide. Still, physics remains a fundamental discipline, and physicists remain among the most trusted members of society. If physics occupies a throne, it reigns in a quieter fashion, more in the way of the kings of Spain or Sweden than of the British monarchs of the imperial age.

Against the background of the changing status of the field, Morus explores the ideas, institutions, and settings through which a new and international discipline was forged. He demonstrates that the rise of physics as an uncompromising discipline was accompanied by the strenuous efforts of physicists to define the field's social roles. Those varied roles might make much of 19th-century physics seem peculiar, even bizarre, to the 21st-century scientist. For much of the 19th-century, physics was a political hot potato, associated with materialism and secular modernity. Morus tells how physical theories arose in an arena that encompassed public shows, industrial entrepreneurship, and religious and cosmological considerations. Physicists like Michael Faraday, Hans Christian Oersted, and William Sturgeon became renowned public showmen, offering striking demonstrations of mechanical and, especially, electrical phenomena. Amid the arrays of batteries, galvanometers, induction coils, and magneto-electric machines, they provided models for the operations of natural systems before admiring audiences.

Many of those lessons had to do with utility and the burgeoning electrical industry. But the great physics exhibitions also drove home the point that the cosmos could quite literally be seen as being composed of machines analogous to the ones demonstrated by the electricians. Late Victorian models of the ether, with their gears and pulleys and wheels, bore the imprint of those worlds of industry and showmanship, and brought those worlds into accord with the religiosity of many great physicists of that age, such as James Clerk Maxwell and Lord Kelvin. Morus does not leave out those features of 19th-century physics that fail to conform to today's views of what physics is. Nor does he trivialize it with amusing anecdotes. Even in its colorful manifestations in exhibitions and shows, Victorian physics was a serious pursuit of sober men.

Physicists today might be particularly surprised to learn just how recently physics became an academic discipline. Throughout most of the 19th century, physicists were more easily found outside universities than within. They did not undergo similar training regimes but learned experimentation and problem solving in different settings and in a variety of traditions. Given the divergent spheres in which they worked, it is not surprising that 19th-century physicists were a far more varied bunch than their modern counterparts. During the second half of the century, however, the situation changed. Physics laboratories as we know them today began to appear in the 1860s, and physics departments only toward the end of the century.

Making physics an academic enterprise meant regularized regimes of training and opportunity. Morus examines the difficulties faced by the generation of physicists who established laboratory training. Physicists like Germany's Hermann von Helmholtz or the UK's Maxwell, Lord Rayleigh, and J. J. Thomson grappled with the best means to inculcate the skills of disparate practices of experimental physics to students of a new academic discipline. At the end of the 19th century, as many physicists began to believe that the general laws of the universe had been established and the end of physics was nigh, physicists set out to establish common metrological standards and push back the frontiers of precision measurement. Morus describes how the cult of precision gave purpose to the institutions of physics, securing thier privileged social position as the ultimate authority on nature. Those who had lived through the struggles to establish the prestige of their discipline and institutions worried that their gains could slip away. From a modern perspective, as Morus observes, their worries seem ironic: The social structures of physics proved much more durable than most 19th-century physical theories. A few good histories of physics during that remarkable age exist—but none as readable or comprehensive as Morus's superb book.

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A Modern Introduction to Quantum Field Theory

Michele Maggiore
Oxford U. Press, New York, 2005. $114.50, $54.50 paper (291 pp.). ISBN 0-19-852073-5, ISBN 0-19-852074-3 paper

Quantum field theory, which marries the principles of quantum mechanics