materials that underlie many well-understood phenomena in physics and engineering.

A number of books targeting various audiences have been written about the interface between physics and biology. However, most of them are organized around biological principles; they focus on particular functions, such as locomotion, that living organisms must perform or on particular structural features observed in plants and animals. In contrast, *Glimpses of Creatures in Their Physical Worlds* is organized first and foremost around physical principles.

Such a book could be written only by someone with a rich knowledge of biomechanics, and Vogel, an emeritus professor of biology at Duke University, fits the bill. Considered one of the founders of the biomechanics community in the US, his distinguished research career has focused on organism–fluid interactions and such diverse topics as the behavior of leaves in the wind, passive ventilation of prairie-dog burrows, and airflow through the branching antennae of some moths. His breadth of knowledge is clearly reflected in the examples presented and the creative thought embodied in *Glimpses of Creatures in Their Physical Worlds*.

Vogel uses the same approachable, entertaining writing style evident in his previous works, which include *Life in Moving Fluids: The Physical Biology of Flow* (Princeton University Press, 2nd edition, 1996), *Comparative Biomechanics: Life's Physical World* (Princeton University Press, 2003), and *Life's Devices: The Physical World of Animals and Plants* (Princeton University Press, 1988). Originally published as a series of essays in the *Journal of Biosciences*, *Glimpses of Creatures in Their Physical Worlds* includes an eclectic selection of topics that reflect Vogel's interests; he also touches on his ideas about areas of research that could benefit from further investigation. The book is detailed in its coverage of the major physical principles and also covers some topics that rarely receive attention, such as the behavior of real-world projectiles (for example, seeds, pollen, and spores propelled from their parent organism) and static versus dynamic stability of organisms during various modes of locomotion.

After briefly introducing each concept and providing relevant equations, Vogel proceeds to lay out an array of biological examples demonstrating how organisms are affected by, cope with, and take advantage of the basic principles to which they are subject. The book includes numerous tables of useful data accumulated or generated by the author; they cover such topics as launch speeds of biological projectiles and the twistiness-to-bendiness ratio of biological structures. It also contains a number of back-of–the-envelope calculations that engage the quantitatively minded reader. The diversity of case studies and examples is inspiring—just when the reader feels that a particular topic may be exhausted, Vogel redirects the discussion from external to internal mechanics, from the whole organism to the cell, or from actively locomoting animals to sessile invertebrates and plants. The text moves rapidly from one topic to another and is accompanied by simple black-and-white drawings that serve to illustrate key points. It all makes for an entertaining read.

Although organized around physical challenges, the main focus of *Glimpses of Creatures in Their Physical Worlds* is on biological examples of how organisms meet those challenges. The level of technical and mathematical detail is deliberately kept to a minimum; indeed, biologists seeking a more advanced understanding may want more. The book, accessible to the general public, could serve as a text for a college-level science course for nonmajors if supplemented with some basic explanations. Its diversity of examples and quantitative approach should also stimulate lively discussion in undergraduate or graduate courses in biomechanics, applied physics, and engineering. Moreover, Vogel provides references to more technical publications. For readers from a variety of backgrounds, this book is sure to serve as an inspiring entry into the field of biomechanics.

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The Art of Being a Scientist

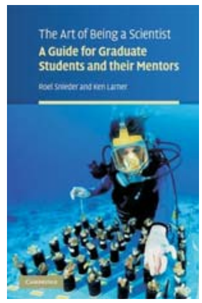
A Guide for Graduate Students and Their Mentors

Roel Snieder and Ken Larner
Cambridge U. Press, New York, 2009. $32.99 (286 pp.).
ISBN 978-0-521-74352-5

Graduate school, where the measure of success often seems intangible, can be a bewildering experience. A manual that demystifies the most important aspects of graduate school and subsequent careers would be useful. It would provide a clear description of the elements of graduate training and guidance in attaining the increasingly important "soft" skills—for example, time management, grant writing, and ethics training—required for advancement in school and beyond.

In *The Art of Being a Scientist: A Guide for Graduate Students and Their Mentors*, authors Roel Snieder and Ken Larner have taken on the challenge of constructing such a guidebook. The text, based on their course at the Colorado School of Mines, gives students practical skills and insights for getting the most out of graduate school. Although the authors, who occasionally draw from their own experience, are mostly concerned with science, the insights they offer can be applied to any research field.

Written in the voice of the "wise mentor," the book starts with an overview that describes the various scientific approaches and exhorts readers to analyze themselves to see how they best fit into the scientific endeavor. After detailed coverage of the different elements and stages of graduate education, the authors advise students on the research process—for instance, how to organize and prioritize tasks, how to ask the right questions, and how to proceed when stuck at a dead end. They also give detailed advice on writing research papers and selecting journals in which to publish, and they analyze the implications of such choices. The book also includes chapters on ethics, literature searching, communication, time management, and grant writing—all vital to graduate training. A section on gender issues describes potential problems, but unfortunately offers no advice on how to deal with them.



The latter part of the book contains an overview of careers in science. Snieder and Larner discuss various types of scientific careers that are available to PhDs, most notably those in academic, industrial, and national-labs settings. The primary distinctions in workplace and expectations for those settings are covered well, but, presumably because of the authors' backgrounds, academic careers receive a more detailed treatment.

Universities are under increasing pressure from funding agencies to provide the kind of training that is described in *The Art of Being a Scientist*. Professors who want to develop a course similar to Snieder and Larner's will find the book to be a useful template and text. It may not provide all the necessary detail, but it does describe most of the key elements. The appendices include a list of resources and a sample curriculum; combined, they provide a good coursework foundation.

One book cited in the appendices is *A Ph.D. Is Not Enough: A Guide to Survival in Science* (Basic Books, 1993), by physicist Peter J. Feibelman. The contents of that book overlap significantly with Snieder and Larner's text. Feibelman's text is written in a more charming and personal style, but *The Art of Being a Scientist* provides a more modern treatment of soft skills and an updated discussion of the differences between industrial and academic workplaces. Incidentally, neither book mentions the importance of international experience, which is an aspect of graduate education that will play an ever-larger role in the training of PhDs for the global workplace.

The Art of Being a Scientist is a welcome map for the voyage that is scientific graduate education. Graduate students will find it particularly useful and will likely consult it often throughout their academic experience and beyond; it will be valuable, as well, to undergraduate students as they consider graduate school. The book may also help parents gain a better understanding of what kind of life their child is choosing and what obstacles he or she will face. And it should be an excellent resource for graduate-school mentors, particularly those who endeavor to offer more comprehensive training to their students.

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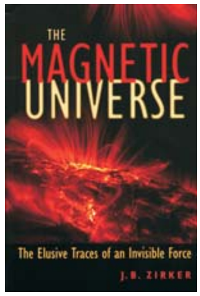
The Magnetic Universe

The Elusive Traces of an Invisible Force

J. B. Zirker
Johns Hopkins U. Press, Baltimore, MD, 2009. $70.00, $35.00 paper (542 pp.). ISBN 978-0-8018-9301-8, ISBN 978-0-8018-9302-5 paper

Plasma astrophysics, which includes space-plasma physics and solar physics, has flourished since the middle of the 20th century, roughly coinciding with the beginning of the space age. Instruments on spacecraft allow us to directly measure the properties of plasmas within our own solar system and to observe astrophysical plasmas remotely in parts of the electromagnetic spectrum that are not accessible from the ground. The wealth of data gathered by ground- and space-based instruments has led to a vast number of discoveries of beautiful, but also very complex phenomena.



In his book *The Magnetic Universe: The Elusive Traces of an Invisible Force*, Jack Zirker takes the reader on a journey through the cosmos, starting with a look at terrestrial magnetism and ending with magnetic fields that are generated at cosmological scales. Zirker, an emeritus astronomer at the National Solar Observatory, devotes approximately the first half of the book to descriptions of planetary and solar phenomena in our own solar system. In the rest of the book, he discusses the importance of magnetic fields to star formation and for compact objects, galaxies, and galaxy clusters. Zirker summarizes the history of the topics presented in each chapter and includes brief descriptions of more recent research developments and of some of the researchers involved in them.

Written in a clear, readable style, the book should be accessible to anyone with a high-school or college background in physics or astronomy. In the main text, no mathematical equations are used, and even in the notes at the end of the book, few are found. The chapters' capsule histories and brief summaries of recent research add to the book's liveliness. Although the material is complex, the author does an admirable job conveying to the reader the excitement and enthusiasm of the researchers for their work, even as they struggle to understand it.

Although I generally like the book, in some cases, additional figures would help readers better understand the text. Moreover, I am puzzled by the book's utter lack of color images. There are so many stunning ones that illustrate the beauty of the objects we study in plasma astrophysics, it's a pity that some were not used. For example, in chapter 7, "The Planets," Zirker describes, but does not show, images of Jupiter's and Saturn's magnetospheres taken by the Magnetospheric Imaging Instrument aboard the *Cassini* spacecraft. Whatever