BOOKS: ECOLOGY AND EVOLUTION

Despised Marvels of Deception and Adaptation

Albert O. Bush

"and on the following Monday God created parasites."

A caveat is in order. Once in a while—far too infrequently in the life sciences—a good book surfaces. This review is not about such a book. I have been studying the ecology of animal parasites for almost 30 years and I knew instinctively that I would not like *Parasite Rex*. With such a title, what could it be other than an overweight sibling to the numerous popular articles, many from the last decade or so, that focus on the blood and guts, the gross and disfiguring, and the morbidity and mortality that seem to dominate the pervasive view of parasitism? When the book arrived, I was not surprised. The subtitle, the gruesome-looking scanning electron micrograph of a tick on the cover, and the series of photographs to which the book flopped open were ample evidence that reading this monstrosity would be a painful chore. My goal was to trash the book in a meaningful way, in order that my review would still be published and, I hoped, dissuade any potential purchasers. However, *Parasite Rex* is not one of those good books; Carl Zimmer's tome is really a great book with a catchy title and an unfortunate subtitle. (Perhaps because this combination helps to sell books?)

Zimmer, a science journalist who writes a regular column for *Natural History*, takes a truly holistic view of parasitism. He dismisses members of no kingdom, and he is fluent in many dialects of biology, ranging from immunology to evolution. He begins *Parasite Rex* with a brief historical overview. Early on, he introduces the once (and still?) prevalent belief that parasites are degenerate losers. Throughout the book, he repeatedly returns to confront this opinion, and each visit convincingly undermines its validity. Zimmer also dispels the notion that parasites are the disgusting and loathsome creatures that we all love to hate. (Although, in the all-too-rare personal glimpses one can glean from the book, it is clear that his enthusiasm has its limits.)

He argues instead that parasites, in all their many guises, are marvels of adaptation and evolution in their own right. In addition, they have been a very powerful force that shapes the natural selection of their hosts. While discussing parasite influences on the evolution of their hosts, Zimmer presents easily understandable summaries of such current hypotheses as how parasites can maintain sex in populations and how they can enhance species richness in communities of free-living organisms. He provides a very readable primer on immunology, in which he notes how parasites have adapted to overcome this surrogate for environmental resistance. He concludes with interesting speculations on living "in a parasitic world." The environmentalist in each of us will be forced to ponder his closing suggestion that Gaia has parasites and we are they.

Gripping tail. Even the posterior end of the nematode *Echinocephalus janzeni* can appear horrific, especially if, as in the book, it is rotated 180° to look like a cobra rearing up and baring its fangs.

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The author's approach to researching and writing the book follows a popular formula. He began by visiting some of today's most respected and forward-thinking evolutionary parasitologists. He joined these scientists as they worked in locations such as the salt marshes of southern California, the tropics of Costa Rica, the bowels of an old guinea pig farm, or among the bricks and mortar of universities. In the book, he uses descriptive introductions to personalize the researchers for the reader. He then goes on to explain their work and describe how they have found elusive pieces of the evolutionary jigsaw puzzle.

The purist will find the odd mistakes, oversights, and minor errors of fact in Zimmer's account. All are insignificant, and they do not detract from the book's overall quality or, more importantly, its focus and take-home message.

Reading *Parasite Rex* is like taking a course in evolutionary biology, albeit one with an admittedly strong focus on parasitism. But that focus is fine. And if after reading this book you do not understand the importance of parasitism throughout evolutionary history, the failure is not Zimmer's. He writes with clarity, conviction, and seemingly without prejudice. It is apparent from the onset that he knows his subject, that he knows it very well indeed. He provides an unparalleled breadth of material that would not be found in the more traditional, more encyclopedic (and much less fascinating) courses offered as fare for the students of today and the scientists of tomorrow. Were it not for my efforts to adhere to the editor's suggested length, this would have been a very short review, to wit: If you are a student of the life sciences, and particularly of evolutionary ecology, read *Parasite Rex*. Read it twice.

Parasite Rex
Inside the Bizarre World of Nature's Most Dangerous Creatures
by Carl Zimmer
Free Press, New York, 2000. 320 pp. $26, C$38.50. ISBN 0-684-85638-7.

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BOOKS: MEDICINE

Teaching Healing and Healing Teaching

Robert G. Petersdorf

In 1985, a young physician-historian, Kenneth M. Ludmerer, published his first book, *Learning to Heal*. He portrayed the development of U.S. medical education from its birth in the 1850s through World War II, a task that he carried out with scholarship and style. However, his coverage of the subsequent modern era was compressed into one short 25-page chapter, which left many gaps. I had the privilege of reviewing that account, and I ended my review [*J. Higher Educ.* **59**, 594 (1988)] with the remark, "I only hope that Dr. Ludmerer is at work on Volume II in which he will bring the era from the 1930s to the 1980s into proper historical focus."

In his new book, *Time to Heal*, the author has approached this task with a ven-

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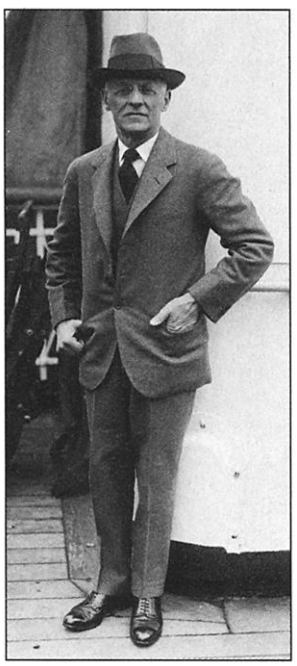
geance. Although there are some areas of overlap in the two books—in particular, the description of the founding of the medical education system—most of the new volume deals with more recent events. Ludmerer covers in scholarly detail such topics as graduate medical education (the training of interns, residents, and fellows), the evolution of the educational venues from medical school and teaching hospital to the academic health center, the ascension of research to displace medical education as the dominant mantra of American medical schools, attempts to achieve racial and gender parity in medical school admissions, and, more recently, the inexorable shift of academic medicine from education and research to clinical service. Indeed, it is the momentum gathered by the service ethic in the 1980s and 1990s that preoccupies Ludmerer throughout the last third of the book. In his view, the need for academic medical centers to keep themselves financially afloat has become their raison d'être. They have addressed this goal by competing for patients, expanding the scope of their services (whether needed or not), enhancing their facilities, and attracting to their hospitals and clinics a bevy of "clinical stars." But these changes have been to the detriment of the educational process and research. In short, Ludmerer argues that medical education is going to hell in a handbasket.

Time to Heal American Medical Education from the Turn of the Century to the Era of Managed Care
by Kenneth M. Ludmerer
Oxford University Press, New York, 1999. 540 pp. $29.95. ISBN 0-19-511837-5.



Superseded revolutionary? The reforms that followed Abraham Flexner's muckraking report of 1910 moved medical education from the environment of practice into the university. Current circumstances may promote movement from universities into integrated healthcare-delivery systems.

In this argument, Ludmerer has been aided and abetted by several distinguished medical educators who have reviewed *Time to Heal*. They have used it as a platform to advance their own conclusions that academic medicine and, by extension, medical education, ain't what it used to be. I admit that many changes have occurred—witness the advent of molecular medicine, the increasing sophistication in information technology, and the alterations in practice venues from predominantly inpatient to outpatient settings—and not all of them have been to the betterment of medical education. But I do not agree that medical education has suffered unduly. My impressions are that students are as eager and dedicated as ever and that house staff today continue to want to become as competent, knowledgeable, and compassionate physicians as they did 50 years ago. It may be that some faculty members are too busy seeing patients, presumably to generate clinical revenues for their institutions and for themselves, and thus do not have enough time to teach. This does not mean, however, that the medical school students (undergraduate and graduate) are not given opportunities to learn. On the contrary, many of the faculty of my generation who tried to teach, take care of patients, and run a lab at the same time have been replaced by full-time clinician educators who offer expertise both in content matter and pedagogy. Furthermore, a number of medical schools are in the process of revising their curricula. At least two have announced the formation of "academies," whose sole purpose is improved teaching and learning. My institution is in the process of raising endowed professorships to be given to teachers or clinicians rather than investigators. From where I sit, medical education is not in serious trouble, although medicine, as a profession, may well be.

We cannot argue with the fact that American medicine is not, as we like to claim, "the best in the world," at least not when 40 million U.S. citizens are uninsured, many patients cannot afford to buy their medicines, and the whole system is simply too expensive. There are many reasons for the high cost of medical care in the United States. At least one is that we in academic medicine have engaged in some of the same excesses as has the entire medical establishment. *Time to Heal* points out these flaws, but Ludmerer has not emphasized them vehemently enough. The message he seems to prefer to stress is that medical education has suffered. The evidence for this claim is not altogether convincing. It may be that Ludmerer has converted most of his readers. But even if he has not, by advancing new concepts that will govern medical education he will have performed a major service. If, through writing this book, Ludmerer has emerged as the conscience of American academic medicine, he has filled an important niche.

I have been in academic medicine for nearly 50 years, and the changes during the second half of the 20th century have been nothing short of amazing. In *Time to Heal* and its predecessor, Ludmerer chronicles these changes brilliantly. We can confidently expect medical education to continue to evolve, and I hope we can look forward to Ludmerer's next volume for his comments on these future developments.

BROWSINGS

Earth Systems. Processes and Issues. *W. G. Ernst, Ed.* Cambridge University Press, New York, 2000. 576 pp. $100, £80. ISBN 0-521-47323-3. Paper, $44.95, £28.95. ISBN 0-521-47895-2.

This textbook provides a process-oriented introduction to the global environment and the natural and human-induced changes affecting it. The contributors stress the complex interactions and feedback loops that link rock, water, air, and life. Their interdisciplinary presentation also incorporates regional case studies, environmental engineering, and the economic and social implications of policy decisions.

Perspectives on Genetics. Anecdotal, Historical, and Critical Commentaries, 1987–1998. *James F. Crow and William F. Dove, Eds.* University of Wisconsin Press, Madison, WI, 2000. 737 pp. Paper, $19.95. ISBN 0-299-16604-X.

This volume presents the first 140 essays from the enjoyable and informative series that appears at the front of each issue of the journal *Genetics*. The authors consider microbial, molecular, populational, and evolutionary aspects of their discipline. Many pieces provide short commentaries on important discoveries and the people who made them. Some mark anniversaries, and these are often written by researchers who were close to the work described. Other articles offer brief summaries of the current state of particular fields.

A Thin Cosmic Rain. Particles from Outer Space. *Michael W. Friedlander.* Harvard University Press, Cambridge, MA, 2000. 251 pp. $29.95, £20.50. ISBN 0-674-00288-1.

Friedlander offers general readers and amateur scientists a historical survey of our understanding of cosmic rays and what they reveal about the solar system and the universe. He discusses the origins of these high-energy particles, how they are detected, and their effects on Earth and its organisms.

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