BOOK REVIEWS

Darwin Lite

Darwin. A Life in Science. MICHAEL WHITE and JOHN GRIBBIN. Dutton, New York, 1995. xiv, 322 pp., illus. $24.95 or $C34.99.

In recent years Charles Darwin has been the subject of a wave of biographies. Adrian Desmond and James Moore have written one large book, Janet Browne is writing an even larger one, of which one volume has already appeared, and several authors have weighed in with more modest volumes. This book by Michael White and John Gribbin does not attempt to compete with either of the major scholarly biographies. The authors are science writers without significant experience in Darwin research. However, they have made good use of the large body of information now in print to fashion a nicely balanced account of Darwin's personal and professional lives.

To be sure, information alone cannot provide a conclusive answer to such questions as what caused Darwin's chronic, disabling ill-health. Ralph Colp and John Bowlby have argued that Darwin's troubles were largely psychosomatic, the results of his family experience and the stresses of arguing an unpopular cause. While acknowledging the stresses that Darwin faced and his inclination to depression, White and Gribbin largely reject this approach in favor of Fabienne Smith's recent suggestion that Darwin's illness was caused by allergies. The evidence is, of course, ambiguous. However, the authors' preference for a physical, as opposed to a psychological, interpretation reinforces the essentially positive view they take of Darwin's upbringing, education, and family life. They view him as a basically strong-minded individual who overcame his malady to achieve great things.

The great things in Darwin's career include a wide variety of discoveries in geology and biology that the authors pass over rather quickly. They assert, but do not illustrate, his versatility—largely in order to focus on his greatest contribution. In doing so, they again show an independent streak, this time in their treatment of religion. Recent scholarly opinion has been irenic on this subject, pointing more toward scientific as opposed to religious issues in the debate over evolution. White and Gribbin will have none of it; they revert instead to an older emphasis on conflict between enlightened science and religious obscurantism. Their chapter on the subject highlights the Huxley-Wilburforce debate, depicting the debate largely as Huxley wanted us to remember it. To be sure, in the next chapter the authors modify their stand somewhat by explaining Darwin's real difficulty in dealing with Sir William Thomson's extremely short estimate for the age of the Earth. For the most part, though, they look on opposition as an unreasoning failure to accept what they take to be an open-and-shut case.

The authors of this book rightly admire Darwin as a great pioneer of scientific reason, but reason can triumph only through cogent debate. Although Darwin's critics were usually motivated by religious conviction, they had their scientific arguments too, arguments that deserve primary attention if reason is to get its due.

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Chromosomal Structures

Telomeres. ELIZABETH H. BLACKBURN and CAROL W. GREIDER, Eds. Cold Spring Harbor Laboratory Press, Cold Spring Harbor, NY, 1995. xii, 396 pp., illus. $80. Monograph 29.

Over the past 10 years telomeres have garnered an exponential increase in interest among scientists. This rise to fame reflects both the fast pace of telomere research and the growing number of scientists who are finding that processes they are investigating are influenced by telomere biochemistry. Although Hermann Muller and Barbara McClintock pioneered the field in the 1930s and '40s, their studies were largely overlooked for many years. "Modern" telomere biochemistry started in the late 1970s and early '80s when researchers studying chromosome structure sequenced the telomeres of various ciliates. The discovery of telomerase in the mid-1980s piqued the interest of both enzymologists and the DNA replication community when it became apparent not only that this enzyme had a highly unusual structure but that it offered a mechanism for the replication of the 5′ end of a linear DNA molecule. More recently, discovery of the link between decreasing telomere length and aging and between elevated telomerase activity and cancer has aroused enormous interest among clinicians, and the realization that telomerase inhibitors might provide a way of combating cancer has drawn biotechnology and pharmaceutical companies into the fray.

Given these developments the present book is both timely and much needed. The literature has become increasingly diverse and voluminous, making it difficult for the casual reader or newcomer to the field to gain a balanced perspective. *Telomeres* provides an excellent, easy-to-read introduction for such readers. Moreover, since the book contains a wealth of information on all aspects of telomere biology and biochemistry, it should prove tremendously useful to even the most experienced telomere researcher.

A major strength of the book lies in the breadth of its coverage and the way it links the diverse topics. Each chapter concentrates on a different aspect of telomere research and where necessary describes the experimental system used in performing the research. Thus the book covers topics as diverse as telomere addition in ciliates, gene expression and telomere position effect in yeast, construction of mammalian artificial chromosomes, and telomerase and cancer in humans. Yet the various chapters are not isolated units. The authors frequently refer to other chapters and give short accounts of topics that are discussed in detail elsewhere, providing the reader with a sense of continuity. A further useful and enjoyable feature of the book is its historical perspective, which allows the reader to see how the field developed before being plunged into the intricacies of current knowledge.

The chapters on telomerase, telomeres and aging, and tumor telomeres will be particularly useful to readers who have had their curiosity kindled by journal editorials or articles in *Newsweek* or even local newspapers. The chapter by Greider on telomerase is particularly nice because it leads the reader through the early biochemical studies, explains how to interpret the somewhat complicated telomerase assay, and finishes with an excellent description of what is known about telomerase structure and its mechanism of action. After reading this chapter even a newcomer to the field should be able to interpret the gels shown in a telomerase paper. The chapters by Harley and by de Lange on

Vignettes: Functional Revisions

I was recently in the Périgord and purchased a flint blade made using upper Paleolithic techniques from a craftsman in Les Eyzies, near the Font-de-Gaume cave. In his mid-forties, with a horned callus half an inch thick on his right hand from hefting his hammer, an elk leg bone, he may be the singular member of our species who has made the largest number of flint artifacts in the past 60,000 years. But even he is making his living in a new niche—hammering flint for sale to the tourists awestruck by the Cro-Magnon habitat of our ancestors.

—*Stuart Kauffman*, in *At Home in the Universe: The Search for the Laws of Self-Organization and Complexity* (Oxford University Press)

Whenever a designed object is superseded by other methods and removed from daily use, it enters a new category. Engineers' slide rules began to be replaced by calculators in the early 1970s. One of my favourite photographs . . . showed more than six hundred engineers' slide rules stuck into the ground around a neighbour's lawn, forming a tiny, sardonic, white picket fence. When I asked about it, my neighbour's wife said, "We bought these slide-rules for one dollar for a barrel of them and used all six hundred."

—*Victor Papanek*, in *The Green Imperative: Natural Design for the Real World* (Thames and Hudson)

telomeres and aging and tumor telomeres go on to explain why clinicians are now so interested in telomeres and telomerase. De Lange provides an excellent perspective on the contribution of telomeres to tumorigenesis. She does not merely discuss the relationship between telomerase activity and cancer but includes sections on the structure and dynamics of tumor telomeres and the contribution of telomere loss to genetic instability and hence to malignant transformation.

Just in case the reader begins to get the impression that telomere biochemistry is nearly all worked out, the book ends with a provocative chapter on *Drosophila* telomeres by Mary Lou Pardue. Pardue points out that not all telomeres are the same: in fact *Drosophila* telomeres are made of retroposons instead of the short tandem repeats synthesized by telomerase. The unusual organization of *Drosophila* telomeres illustrates how telomeres can be maintained by a variety of mechanisms. This important concept must be borne in mind by people who want to kill cancer cells by simply inhibiting telomerase. This chapter is a very suitable end to the book, as it serves to remind us that, as usual, nature is more complex than we could ever have imagined. Despite the huge advances that have been made, we still have a long way to go before we fully understand telomeres.

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Simulation Methods

Computer Modelling in Molecular Biology. JULIA M. GOODFELLOW, Ed. VCH, New York, 1995. xvi, 243 pp., illus. $115.

In her preface Julia Goodfellow characterizes this book as providing "a series of snap-shots of the use of molecular simulation techniques to study a wide range of biological problems." In fact the book might more appropriately have been entitled "Computer Simulations of Molecular Systems." It is written for computational chemists and molecular modelers who are familiar with computer simulation of macromolecules and is not a book for the representative molecular biologist who is engaged in analysis of sequence data and worries more about restriction sites and cell lines than algorithms and CPUs.

The first chapter presents a brief description of computer simulations, referencing many original publications. The book focuses on the potential-energy–based techniques for molecular modeling.

Chapter 2 contains a concise introduction to the modeling of protein structures. This chapter was written to highlight the difficulty of protein structure prediction, making the case that there are several levels of structure prediction and that in some cases it may not be possible to predict more than secondary structure reliably. In the following chapter there is a succinct description of molecular dynamics simulations of peptides focused on conformational studies. The numerous references provided make this chapter especially useful for those interested in methods for studying peptide conformations. Protein molecular dynamics is explored in the next chapter by Shoshana Wodak and co-workers. This chapter provides a comprehensive description of how molecular dynamics techniques are used to study protein structure and the events associated with unfolding, including an example of the free-energy perturbation method.

In the next two chapters molecular dynamics is used to study the functional mechanisms of biological molecules, with the focus in one case on nucleic acid oligomers and in the other on ion transport for the gramicidin A channel. Theory and methodology are expounded in sufficient detail to expose the reader to the challenges of these approaches.

The last two chapters differ in character from the other six. One reports on protein modeling to study peptide binding to the major histocompatibility complex (MHC) and seems more concerned with the biochemistry of MHC than with the methods used. The other is focused on a potential-energy–based method, called PEM (path energy minimization), for studying conformational transitions in macromolecules that appears to be a recent development and would not be a technique routinely available to most computational chemists.

The computational chemist will find this book an attractive acquisition, while the molecular biologist may wonder at the choice of title.

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Books Received

The Anatomy and Physiology of the Mammalian Larynx. D. F. N. Harrison. Cambridge University Press, New York, 1995. xii, 288 pp., illus. $74.95.

Brainscapes. An Introduction to What Neuroscience Has Learned about the Structure, Function, and Abilities of the Brain. Richard M. Restak. Hyperion, New York, 1995. vii, 149 pp., illus. $19.95.

Climate Change 1994. Radiative Forcing of Climate Change and an Evaluation of the IPCC IS92 Emission Scenarios. J. T. Houghton *et al.*, Eds. Published for the Intergovernmental Panel on Climate Change by Cambridge University Press, New York, 1995. viii, 339 pp., illus. $59.95; paper, $24.95.

Dream Reaper. The Story of an Old-Fashioned Inventor in the High-Tech, High-Stakes World of Modern Agriculture. Craig Canine. Knopf, New York, 1995. xiii, 305 pp., illus. $25 or $C35.

Effects of Atomic Radiation. A Half-Century of Studies from Hiroshima and Nagasaki. William J. Schull. Wiley-Liss, New York, 1995. xvi, 397 pp., illus. $45.

Symmetry through the Eyes of a Chemist. István Haragittai and Magdolna Hargittai. 2nd ed. Plenum, New York, 1995. xiv, 469 pp., illus. $85.

T-Cell Signaling of Macrophage Activation. Cell Contact-Dependent and Cytokine Signals. Richard D. Stout and Jill Suttles. Springer, New York, and Landes, Austin, TX, 1995 (distributor, CRC Press, Boca Raton, FL). viii, 189 pp., illus. $79. Molecular Biology Intelligence Unit.