BOOK REVIEWS

The Politics of Evolution: Morphology, Medicine, and Reform in Radical London. Adrian Desmond. 1989. The University of Chicago Press, Chicago, IL. 503 p. $34.95 cloth.

Desmond focuses our attention midway between the French Revolution and the appearance of Darwin's *Origin of Species,* the score of years around 1830. He describes the political, social, and scientific ferment in radical London that fueled an evolving appreciation of natural law rather than divine creation to explain the what, when, why, and how of the living world. Signs of its emergence appeared "when the first wave of Scottish students arrived in Paris after Waterloo" around 1820 where "they found Jean-Baptiste Lamarck, at seventy-one, tetchy, pessimistic, and losing his sight." A more liberal medical education was available in Roman Catholic France than in Calvinistic Scotland. "Socialists began exploiting Lamarck's theory of the inheritance of acquired characters in 1826 to justify the education of women." Reforms in medical education and education in general were on their way.

Not only the medical corporations but also the entire legal, medical, and scientific establishment was part of the organization of the State. Control rested with the King and the Anglican Church. In reforming the management of medicine and science, "the radicals sought to substitute paid administrators and professional specialists for these 'public' gentlemen," the noblemen and Church dignitaries, who ran London's institutions of science. The conventional physician was educated in the classics and theology rather than trained in comparative anatomy and practical physiology. The reformers saw development and metamorphosis "as much a part of the great system of nature as the movements of the celestial bodies," an ethical naturalism. These "radicals, no less than the Enlightenment rationalists, saw this natural morality, resting on the truths of physics and biology, as superior to a Christian one." The radicals "asserted that life and intelligence were inseparable functions of organization, and that nature's series, in which mental attributes can be seen changing by degrees, was the best evidence that man's mind was the product of his superior organization."

These ideas were threats to the ecclesiastics and their power. The gentry and the clergy believed and taught that the "State was antecedent to man as the Logos was antecedent to life." The "evil consequence" of the democratic doctrines was "quite evident to reviewers: materialism in metaphysics, faction in politics, and infidelity in religion." Prelates and noble trustees would have been well-advised to be on guard; the authority of Crown and Clergy was in jeopardy.

Desmond indicates that the passive resistance of Quakers and the liberalism of Unitarians played roles in honing the new science. The essence of the nonconformist zeal of the Dissenters "was the denial of divinely ordained orders in society, an attitude which the Quakers symbolized by their refusal to doff their hats in the House of Lords and to bend their knee to the King." The alliance of the Church and State in perpetuating orthodox creationism was condemned by a Friend in "his denunciation of the Church's 'adulterous connection' with the state." He "abominated the 'fornicating' Church, indicting it for the 'filthy crime of adultery' with aristocratic government, which had left it with the 'stigma of disgrace' to degenerate into 'an inflictor of misery . . . a destroyer of moral principle . . . a subverter of the good order of society.'"

In a counterattack, the conservative scientists avowed "that the new crop of foul fruits being harvested in Britain, treason, blasphemy, and riots, was the result of a diseased 'speculative science' spawned by the French Revolution." The radicals were accused of "inciting the working classes." There were to be "fatal consequences of an atheistic self-developing nature for the authority of kings and priests."

The Radicals as physiologists "explained higher organic wholes by their physico-chemical constituents, while as democrats they saw political constituents, voters, empowered to sanction a higher authority: a delegate to act in their interest." Organisms derived their existence by self-development through transformations in lower forms from below, not by divine intervention on the part of God, a careful meddler, from above. The documented observations of "horticulturalists and breeders provided the strongest evidence supporting the transformists' cause."

The dilemma was that of "connecting the 'is' of nature with the 'ought' of politics." Mind and morality were subject to 'self-developing' forces as are man's dignity and individuality. "The moral strength of political conservatism was to lie in natural truth." The new biology was in place by the mid-1830s in the 'progressive' private medical schools and the University of London. The theory of natural law had evolved.

The only remaining problem was the manner whereby transformations become incorporated into developing lineages resulting in specialized, advancing organisms. Darwin provided the answer in the mechanism of natural selection.

In the Afterword, Desmond relates the professional biography of Charles Darwin, an interesting epilogue. Darwin had completed the work on the *Origin* by 1839; however, publication was delayed for 20 years. He lived under the dread of ridicule as he "began devising ways of camouflaging his materialism." He "feared being persecuted as an atheist" because he had "opted for a complete system of utilitarian materialism, one that could embrace the origin of structure, habits, reason, beauty, and morality."

The Politics of Evolution is a scholarly commentary on the social interaction between politics and medicine, and the development of the life sciences in Britain during the early 19th century. Except for Chapters 7 and 8 which deal with technical biology, the remaining seven chapters read much like a political novel, engaging and intriguing. A biographical list of 75 British medical men is included. There are 34 pages of bibliography.

This work is a must for those who teach the history of biology or the philosophy of science.

William P. Brown

Department of Biology
Marietta College
Marietta, OH 45750

Balancing on the Brink of Extinction: The Endangered Species Act and Lessons For the Future. Edited by Kathryn A. Kohm. 1991. Island Press, Washington, DC. 318 p. $34.95 cloth; $22.95 paper.

More often than not, those who lead us through changes of one sort or another rarely take time out to write about it—to name names and report on key debates. Consequently, those who know the most about the internal workings of the event go on to their next mountain, leaving documentation to others. Too often, this task is undertaken by someone who wasn't there and is thus dependent on the quality of the memories and paper trail available to the writer.

Editor Kathryn Kohm's objective in this book was to explore the evolution of the Endangered Species Act and related statutory infrastructure, and discuss lessons learned along the way. While the editor has collected a number of interesting essays and made a valiant effort to achieve a lofty goal, this book represents a missed opportunity—with just a little more work on her part—to capture for future generations a full historical accounting of how a national will to protect endangered species of flora and fauna has been translated into action over the past 25 years.

The Endangered Species Act (ESA) has a rich and colorful history. Sadly, this book does not generally benefit from the reflections of those who framed the issues and led the battles in the 1960s and early 1970s: the House and Senate sponsors of the various proposals, the Administration staff and lobbyists whose ideas were embodied in the various versions, the proposals, and compromises. (For instance, it's not generally known, but it was members of the Nixon Administration that pressured Congress in the early 1970s to take action, proposing language to radically expand the scope of the ESA and improve conservation programs.)

Section 7 of the 1973 ESA represented a turning point in the way endangered species are managed. Statutory concern over individual elements was augmented by a concern for the availability of critical habitat to support the elements and communities they depended upon for life. In this book, Steven Yaffee writes an entire essay on Section 7 without crediting Dingell staffer Frank Potter and Tom Garrett who conceived Section 7, nor Chairman Dingell himself who designed the language in such a way as to hide the Section's true intent from likely opponents during the legislative process—changing the face of wildlife law for a generation.

Others, ranging from Christine Stevens, the socialite animal rights lobbyist, who has wined and dined Members of Congress in pursuit of wildlife protection since the early 1960s, to powerful Senate Commerce Committee Chairman Warren Magnuson and current Senate Majority leader George Mitchell, to Zyg Plater, the Tennessee attorney who made snail darter a household name, aren't mentioned, even though the fruits of their labor are the subject of the book.

However, Kohm's and others' lack of depth of knowledge and the absence of enriching detail should not take away from individual essayists who have contributed to this collection, which does contain information of interest to students and wildlife policy addicts alike. Dennis Murphy does a terrific job of discussing invertebrate conservation. Former Ohioan Reed Noss expands our view from individual endangered species elements to ecosystems and concerns for protecting biological diversity. Tim Clark and Ann Harvey provide an interesting peek into the world of designing species recovery plans using the black-footed ferret as an example. Former U.S. Fish and Wildlife Service Director Lynn Greenwalt provides an interesting recollection of the ESA in the early 1970s; Holmes Rolston, property rights and Bill Reffalt overviews the listing process for species needing protection. Mark Trexler and Laura Kosloff discuss efforts to control international trade in protected species.

A glaring omission in Kohm's book is the absence of meaningful discussion about plants and aquatic species listed as endangered or threatened pursuant to the Endangered Species Act. Furbish lousewort, snail darter, blue whale—stand aside. Terrestrial fauna reign again. Tsk, tsk.

Anne Wickham

Ann Wickham & Associates
129 West Kenworth Road
Columbus, OH 43214

Far More Graphic Graphics. SlideWriter Plus: The Presentation Graphics Solution Version 3. Bessie Chin, Larry Daniele, and Ken Bielenberg. Three 5-inch diskettes for PC. Advanced Graphics Software, Inc., Sunnyvale, CA. $445. (Quantity discounts available.)

It is said that a scientific work is incomplete until the results are communicated to others. Whether by an oral presentation with slides or overheads, by a poster, or by a published paper, data are most often presented in graphic form. In the "good old days," making graphs and diagrams meant long sessions with Leroy lettering sets or press-on letters, for the do-it-yourselfers, or expensive artwork by professionals. Now computer graphics make it all so simple and, with programs like *SlideWriter Plus*®, even beautiful.

I first met *SlideWriter Plus* as a free demonstration program distributed by the publisher, Advanced Graphics Software. The demo disk allowed me to try out the various features which included graph-making, ordinary text in various fonts and sizes, and a drawing program. The demo diskette did not allow me to save my work and it printed a commercial message across the bottom of all its production. Nevertheless, the products printed on my bare-bones 9-pin dot matrix printer were as black and crisp as any produced on the plotters and laser printers that others used. When printed on glossy paper, the output was indistinguishable from a photographic print. Data could be entered on the keyboard or from ASCII or Lotus® files. Making complex graphs was simple.

When the full program arrived for review I appreciated its power even more. The data can be analyzed statistically, producing standard deviations and standard error, and even confidence limits. Least squares analysis fitted a line to my scattered points and made them all the more impressive. Error bars graced the data with statistical elegance. The drawing program included a library of pictures and chemical diagrams that made complex formulae easy to design and save for future use. The drawings were enlarged and shrunk and rotated at will and could be exported to word processing programs for incorporation into my grant applications or annual reports.

I recommend *SlideWriter Plus* to all who collect and print information, not only because of the elegance of the presentations but also because the process of entering, analyzing, and reducing the data to an illustration is conducive to seeing patterns and relationships that otherwise might be missed if the raw numbers were simply given to others to put into graphic form.

But, I have two reservations about *SlideWriter Plus.* The first is its seductiveness. I spent many long hours exploring its capabilities and enjoying the many beautiful diagrams and graphs that it can produce. The second is the manual. The instructions for using the program are logically laid out in the sequence of the menus, but this makes it difficult to find the method of performing a desired task. For example, data for five curves can be entered, but only three of the curves are needed for a graph. How can the data for the other two be kept, but not included in the graph? It is actually simple to do, but the beginner has to search carefully through the manual to realize how it's done. Or, how it is possible to get a printout of the data in columnar form? Again, this is possible, but the instructions for this very important task are in a very short paragraph hidden in the midst of other information. In other words, the manual is not as user-friendly as it might be. Eventually the program did everything I wanted it to do, but it took me some time to figure out how to do it. A task-oriented manual, written by a user, would be an asset to an otherwise excellent product.

Other graphic programs are available but, of those in this department, *SlideWriter Plus* is certainly the best. The price is competitive. Readers can try out the demo diskette at no cost and see if the program is user-compatible.

P.S. Version 4 is now available. It should be even better!

MURRAY SAFFRAN

Department of Biochemistry and Molecular Biology
Medical College of Ohio
Toledo, OH 43699

The Visual Display of Quantitative Information. Edward R. Tufte. 1983. Graphics Press, Cheshire, CT. 199 p. $36.00 hardcover.

Since its publication in 1983, this text has become the classic book on statistical graphics. The text is both entertaining and educating; it is superbly illustrated, and written with humor, verve, and wit. This volume should be required reading for everyone engaged in statistical graphics, whether in science, business, medicine, journalism, academics, or government.

The brief introduction is followed by nine chapters divided into two sections: Part I devoted to graphic practice (Chapters 1-3), and Part II on the theory of data graphics (remaining chapters). In Chapter 1, Tufte introduces the reader to the components of graphical excellence (viz., to communicate complex ideas with clarity, precision, efficiency, and honesty); he reminds us that statistical graphics are only as good as the model that goes into them (i.e., silly theory equals silly graphics); and, he exposes us to examples of graphic excellence with respect to data maps, time series, space-time narrative, and relational graphics. Chapter 2 is devoted to graphical integrity, or the lack thereof. Included in this chapter are various ways in which data can be distorted, selective reporting or taking data out of context, the "lie factor" as a visual disproportionality, and how "Graphic Hacks" beautify and puff up data with decorative schemes. The sources of graphical integrity and sophistication are dealt with in Chapter 3. In this chapter, the author addresses graphic mediocrity as a consequence of lack of quantitative skills by professional graphic artists and/or beliefs in the doctrines that statistical data are themselves boring and that graphics are only for the unsophisticated. By contrast, graphic competence is achieved by those with artistic and statistical skills who hold to the belief that graphics should have something substantive to say to sophisticated audiences.

In Chapters 4 and 5, Tufte discusses the processes of data-ink (how much graphic ink actually devoted to data) maximization, erasing principles, and removal of chartjunk such as graphical decoration, unintentional optical art, grids, and self-promoting graphics (e.g., fake perspectives). Chapters 6, 7, and 8 are devoted to a more detailed view of how to maximize data-ink (redesign of box and scatter plots and introduction of quartile, range-frame, dot-dash, and rug plots), working with multifunctioning graphical elements, and data density and small multiples. The concluding chapter addresses aesthetics and technique in data graphical design. This chapter draws our attention to the most important elements of successful graphical design including properly chosen format; integration of words, numbers, and drawing; balance, proportion, and relevant scale; accessible complexity of detail; narrative quality; free of decoration and chartjunk.

Any scientist who has ever drawn a figure or illustration for subsequent publication (particularly in this Age of Computer Generated Graphics) would benefit from reading this text.

STAN L. SMITH

Department of Biological Sciences
Bowling Green State University
Bowling Green, OH 43403

Principles of Geology. Vol. 1: A facsimile of the first edition (1830). Charles Lyell. 1990. The University of Chicago Press. 574 p. $39.95 hardcover; $17.95 paper.

With the work of James Hutton and Charles Lyell the earth acquired a history, and with the work of Alfred Russell Wallace and Charles Darwin life on earth acquired a genealogy. Lyell's *Principles of Geology* (1830-1833, 3 vols.) amplified and further documented Hutton's *Theory of the Earth* (1795) and placed geology on a firm scientific foundation based upon principle. Their demonstration of the principle of uniformitarianism provided a valid actualistic method for reconstructing the history of the earth from the geologic record whereby modern processes and environments are used as analogs for interpreting the past. Darwin took the first volume of the *Principles* with him on the voyage of the Beagle and was admittedly strongly influenced by Lyell. Darwin's origin of species was a natural continuation of Lyell's history of the earth. Thus, the major unifying concepts in geology and biology emerged within three decades and constituted a major scientific revolution.

The first edition of Charles Lyell's *Principles of Geology* has become a rare book, difficult to acquire. The paperback facsimile of the first edition of Volume 1 makes this important work available to all students of the earth sciences at a reasonable price. Just as few biologists today seem to have read Darwin, few geologists have read Lyell. Many geologists today seem to lose sight of the historical context within which their working principles were generated, thus slipping into the constraints of authoritarianism. Because of the basic role of the uniformitarian approach in geology, it is important for the geologist not only to grasp the significance of the concept but also to understand its historical derivation. Science must be grounded upon a firm foundation of demonstrated principles that are available for making valid inferences. Hutton's formulation of the principle of uniformitarianism and Lyell's subsequent demonstration of the application of the principle provided the foundation for geology as a science.

When Lyell began his investigations, geology still was influenced by the constraints of a Biblical time scale and by the notion that sudden catastrophic changes were dominant in shaping the surface of the earth. It was the intention of Lyell to demonstrate that processes at work today are sufficient to explain the geologic record, as indicated by the subtitle of his book: "An attempt to explain the former changes of the earth's surface, by reference to causes now in operation." In the *Principles,* Lyell provided the foundation for modern actualistic geology by presenting a methodology for reconstructing the past based upon natural processes observable today. The past is interpreted with reference to the present through the principle of uniformitarianism. But Lyell's uniformitarian approach encompassed not only a uniformity of natural laws and processes through time, but also a uniformity in rates of processes, with changes generally occurring in a slow, gradual fashion. Superimposed upon this was a steady-state system for the earth in which change is continuous but without direction. William Smith, however, had already demonstrated the use of fossils for determining the temporal order of strata, thus imposing direction upon geologic history.

In 1965, Stephen Jay Gould made a distinction between two distinct aspects of Lyell's uniformitarianism. Substantive uniformitarianism postulates a uniformity in rate of geological change and is not a demonstrated principle. Dismissal of one aspect of Lyell's uniformity of nature in no way invalidates the other aspect. Methodological uniformitarianism asserts that the processes and functions of the present apply, in principle, to the past—in principle, not in particular. As such, methodological uniformitarianism is the requisite principle for all studies of prehistory in that it allows the recognition of bygone processes and dynamics through time.

Martin J. S. Rudwick's 52-page introduction to this reprinted edition provides an informative background to the development of the *Principles,* and a summary of the structure of the three volumes of the first edition. The table of contents serves as a concise and helpful guide to each chapter. At the beginning of the first chapter, geology is defined as "the science which investigates the successive changes that have taken place in the organic and inorganic kingdoms of nature," which occasionally may be lost sight of with increasing emphasis on such areas as environmental geology. Chapters 2-5 review the history of the subject. Lyell argues against the concept of directional change in Chapters 6-9, which deal with climate and life. In Chapters 10-26, evidence is marshalled for the adequacy of observable modern processes in explaining the geologic past. Processes of erosion and deposition are described in Chapters 10-17. The next five chapters (18-22) are devoted to volcanism. And the final chapters (23-26) deal with earthquakes, ending with the conclusion that the "elevating and depressing power of earthquakes" is "a conservative principle in the highest degree, and, above all others, essential to the stability of the system," thus emphasizing Lyell's vision of a steady-state, nondirectional system for the earth.

The 12th edition of the *Principles* appeared in 1875, attesting to the sustained popularity of this work, which still stands as a classic in scientific prose. As Rudwick notes in the introduction to the current edition, Lyell's purpose was to establish the principles of reasoning in geology. The fact that Hutton and Lyell generally are regarded as the founders of modern geology attests to the success of Lyell in fulfilling this purpose. Although there has been a de-emphasis on the history of the subject in modern geological education, all students of the earth sciences should gain some first-hand familiarity with the work that established the methodological foundation for their science.

DON C. STEINKER

Department of Geology
Bowling Green State University
Bowling Green, OH 43403

Molecular Cell Biology, 2nd Edition. J. Darnell, H. Lodish, and D. Baltimore. W. H. Freeman and Company, New York, NY. 1990. 1,105 p. $54.95 hardcover.

This book has quickly become one of the most important texts and research resources in its field. Its "field," as described by the authors, is molecular genetics: a group of techniques bringing together the disciplines of genetics, biochemistry, and cell biology. Indeed, this book contains as much information as would three separate texts in each of the disciplines mentioned, and is actually organized so that it can be used as such. The book is divided into four major sections: "Molecules, Cells, Proteins, and Experimental Techniques: A Primer" (six chapters); "Gene Expression, Structure and Replication" (six chapters); "Cell Structure and Function" (eleven chapters); and "The New Biology: Facing Classic Questions at the Frontier" (three chapters).

The authors outline specific goals in their introduction, such as creating a text that is neither more nor less demanding than standard texts in chemistry or physics, and making the second edition simplified and more clear than the first. It is also hoped that the large scope and depth of this book make it appropriate for a unified experimental approach to teaching molecular genetics, as well as for more focused and intense concentration on individual subjects and techniques.

In general, the authors seem to have met their stated goals with this book. It is probably most appropriate for upper-level undergraduate science majors and graduate students, since knowledge of introductory physical, organic, and biochemistry is assumed. However, the necessary concepts are well reviewed in the first chapters. As far as making the second edition easier to understand than the first, the authors graciously accepted and incorporated suggestions and constructive criticism of their first edition, resulting in a well-organized and understandable text and reference book. That is not to say that the book is simplistic. It is "chock-full" of information, and although its 1,105 pages may seem formidable (and heavy), every paragraph and illustration is purposeful. This edition presents much of the same information as the first in a much more efficient manner.

The greatest strengths of this book are its organization, and its focus on research. The table of contents is a series of factual statements which serves as a review in and of itself. The separate sections could conceivably be used to teach separate courses in genetics, cell biology, and biochemistry. There is enough information in each of these sections to serve as the major text for a semester course in each of these disciplines. An integrated course using this text would almost have to be a two- or three-semester undertaking. One could also focus on the experimental methods presented and use the book to teach a course on that subject.

Inclusion of detailed experimental methods is something that is almost always missing in undergraduate science textbooks. Facts are usually presented without the logic leading to their discovery. Most students normally do not understand the research component of science until they reach graduate school, since most undergraduate laboratories are still using the "cookbook" method. One of the greatest services of *Molecular Cell Biology* is that it exposes students to the "real world" of science. Chapters 4, 5, and 6 outline most of the techniques used in laboratories, and help students understand the everyday process that is science.

The average undergraduate may be somewhat intimidated by the amount of information and detail presented in this book, and may be discouraged at the prospect of being expected to know so much about a diverse and expanding field. Hopefully, the organization and perspective of the text should also emphasize to the student how much has been accomplished in the field, and how integration and cooperation among the previously "classical" disciplines of cell biology, biochemistry, and genetics have resulted in a much better understanding of the life sciences. The final chapters on cancer, immunity, and evolution help to illustrate this point.

If one can judge the value of a book by the number of times it has disappeared from one's desk while trying to write this review, I would say that this is an excellent resource. It is well-organized at many levels, the pictures and diagrams are attractive, clear, and useful, and it is appropriate as a course textbook as well as for reference.

LILLIAN M. SHAFFER
Department of Biochemistry and Molecular Biology
Medical College of Ohio
Toledo, OH 43699