evolution and multigene families, evolution by transposition and horizontal transfer, and genome organization and evolution. Parts of these chapters are also taken from Li and Graur, but others are new. The concluding chapter summarizes Li's own views on the roles of mutation and selection in molecular evolution.

This book is truly a treasure trove of observations and views on its subject. Each of the non-pedagogic chapters provides wonderful summaries that are enjoyable reading on their own and will prove a boon to instructors looking for examples for their lectures. The treatment of controversial areas is remarkably even-handed, even when Li clearly disagrees with a position he is describing.

Like any good book of broad scope, this one has some weaknesses. The pedagogic chapters, which are mostly taken from Li and Graur, are very uneven. I have used Li and Graur in teaching molecular evolution to graduate students and have found that these chapters are often confusing to them. As an example, in chapter 3 the description of the Jukes-Cantor model begins by calling α a "rate of substitution" when it is in fact a probability of substitution in a model that unfolds in discrete time, although the discreteness is not mentioned until the model switches unceremoniously to continuous time. At this point, α quietly becomes a rate rather than a probability, but no longer equals its discrete-time value but rather $-\ln(1-4\alpha)/4$. This sort of imprecision will derail someone seeing this material for the first time. Similarly, I have had difficulty programming some of the algorithms as described in the phylogenics chapter. By contrast, I have had little trouble programming these same algorithms using Swofford and Olsen's superb chapter covering the same ground in Hillis and Moritz's *Molecular Systematics*.

In the final chapter, laying out his own views on the mechanisms of molecular evolution, Li begins with a surprising dichotomous question: "Is evolution mutation or selection driven?" Most others have asked, Is genetic drift or selection responsible for the fixation of mutations in evolution? This distinction is important because Li uses the one-million-times-faster silent and replacement substitution rates in HIV compared with typical human nuclear genes to argue that mutation rather than selection is driving the evolution in both cases. By contrast, the late Motoo Kimura argued that the rate of substitution with selection is $4Nu_s s$ (N is the population size, s the selection coefficient, and u_s is the mutation rate to advantageous alleles) and that the neutral substitution rate is u_n, which is also the neutral mutation rate. If both mutation rates are increased, then both substitution rates will increase as well. Thus, Li's HIV-human comparison does not rule out a role for selection, at least in Kimura's model of selection. Apparently Li has some other model of selection in mind, but that model is only hinted at, so it is impossible to understand the substance of his argument. For me, the elevated substitution rates in HIV simply point out that much of evolution may be mutation-limited, whether it is selection or drift that is responsible for the substitutions. Subsequent arguments also lack the clarity one might expect.

Tomoko Ohta's theory of nearly neutral evolution is the dominant paradigm among molecular evolutionists today. Her theory, which is based on models for which the rate of substitution decreases with increasing population size, can explain a bewildering array of observations on molecular evolution, the most central being the reduced generation-time effect in mammal protein evolution. Yet Li summarily dismisses the theory with "whether the slightly deleterious hypothesis can explain the patterns of molecular polymorphism and evolution is a subject of debate (see Nei 1987)." What is debatable is whether any other hypothesis can explain even a fraction of the observations explained by Ohta's theory.

Molecular Evolution is an impressive accomplishment and will surely find an enthusiastic audience. Its broad coverage more than compensates for some of its conceptual shortcomings.

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Browsings

The Colours of Life. An Introduction to the Chemistry of Porphyrins and Related Compounds. Lionel R. Milgrom. Oxford University Press, New York, 1997. vi, 249 pp., illus. $95 or £49.50, ISBN 0-19-855380-3; paper, $39.95 or £22.50, ISBN 0-19-855962-3.

An exposition of the primordial origins, chemical and physical properties, metabolic functions, and industrial uses of a macrocyclic ring of carbon and nitrogen atoms that makes biological processes possible, with reflections on such matters as whether vampires are sufferers from porphyria.

The Cretaceous-Tertiary Event and Other Catastrophes in Earth History. Graham Ryder, David Fastovsky, and Stefan Gartner, Eds. Geological Society of America, Boulder, CO, 1996. x, 569 pp., illus. Paper, $149. ISBN 0-8137-2307-8. GSA Special Paper 307.

Thirty-nine peer-reviewed papers derived from the conference known as "Snowbird III."

The Handicap Principle. A Missing Piece of Darwin's Puzzle. Amotz and Avish Zahavi, with Naama Zahavi-Ely and Melvin Patrick Ely. Oxford University Press, New York, 1997. xvi, 286 pp., illus. $25 or £18.99. ISBN 0-19-510035-2.

The first enunciator of an evolutionary principle, with co-authors, gives his view of its current status and interprets animal communication in light of it.

The Natural History of the Long Expedition to the Rocky Mountains, 1819–20. Howard Ensign Evans. Oxford University Press, New York, 1997. xii, 268 pp., illus. $30 or £25, ISBN 0-19-511184-2; paper, $14.95, ISBN 0-19-511185-0.

A chronicle of the first scientific exploration of the Louisiana Territory, drawing on accounts by the participants and including illustrations they produced.

Reports on Astronomy. Immo Appenzeller, Ed. Kluwer, Norwell, MA, 1997. viii, 605 pp., illus. $195, £117, or Dfl 315. ISBN 0-7923-4540-1. Transactions of the International Astronomical Union, vol. 23A.

Reviews of recent activities and progress in astronomy and astrophysics, prepared by some 40 commissions and working groups of the International Astronomical Union in conjunction with its 1995 General Assembly.

Victorian Telescope Makers. The Lives and Letters of Thomas and Howard Grubb. I. S. Glass. Institute of Physics, Philadelphia, 1997. xiv, 297 pp., illus. $50 or £30. ISBN 0-7503-0454-5.

The doings of a Dublin firm that supplied instruments to four continents.

Other Books Received

Common Families of Flowering Plants. Michael Hickey and Clive King. Cambridge University Press, New York, 1996. xii, 212 pp., illus. $64.95, ISBN 0-521-57281-9; paper, $22.95, ISBN 0-521-57609-1.

A Conceptual Introduction to Modeling. Qualitative and Quantitative Perspectives. David W. Britt. Erlbaum, Mahwah, NJ, 1997. x, 219 pp., illus. $49.95, ISBN 0-8058-1937-1; paper, ISBN 0-8058-1938-x.

Contraceptive Research and Development. Looking to the Future. Polly F. Harrison and Allan Rosenfield, Eds. National Academy Press, Washington, DC, 1996. xiv, 519 pp., illus. $49.95. ISBN 0-309-05442-7. Based on two workshops, Washington, DC, Dec. 1994 and May 1995.

***Drosophila* Cells in Culture**. Guy Echalier. Academic Press, San Diego, 1997. xxxii, 702 pp., illus. $135. ISBN 0-12-229460-2.

Electromagnetic Response of Atomic Nuclei. Sigfrido Boffi *et al.* Clarendon (Oxford University Press), New York, 1996. x, 508 pp., illus. $150. ISBN 0-19-851774-2. Oxford Studies in Nuclear Physics, 20.

Electrons and Phonons in Semiconductor Multilayers. B. K. Ridley. Cambridge University Press, New York, 1996. xx, 330 pp., illus. $69.95. ISBN 0-521-47492-2. Cambridge Studies in Semiconductor Physics and Microelectric Engineering, 5.