Book Reviews

Population Biology: Bicentennial Assessment

Changing Scenes in Natural Sciences, 1776–1976. Papers from a symposium, Philadelphia, April 1976. CLYDE E. GOULDEN, Ed. Academy of Natural Sciences, Philadelphia, 1977. iv, 362 pp., illus. Cloth, $25; paper, $15. Special Publication 12.

The venerable Academy of Natural Sciences of Philadelphia attracted an extraordinary group of population biologists to a bicentennial symposium in 1976. The published results, which might more accurately be entitled "Recent Advances in Population Biology in a Historical Perspective," are well worth the attention of anyone interested in either the past or the future of the field.

G. Evelyn Hutchinson's charming introductory essay, "The influence of the New World on the study of natural history," does not fit the title temporally (the events discussed preceded the American Revolution) or the rest of the book in tone. It is nonetheless an informative piece, handsomely illustrated, showing how early discoveries of the diverse biota of the Western Hemisphere influenced European intellectuals, including Thomas Malthus.

The contributions of Ernst Mayr, Peter Raven, and Ruth Patrick are the others that have a strong historical cast. Mayr, for instance, does a nice job of placing Lamarck's contributions in perspective. His comments on the current scene were more interesting to me, however. Much to his credit, for example, he suggests that "the pendulum has perhaps swung too far" toward the view that speciation rarely, if ever, occurs without geographic isolation and cites Guy Bush's work on sympatric speciation through behavioral host specialization. Mayr himself, of course, has been the major force pushing that pendulum toward allopatric speciation for years.

Raven's essay, "The systematics and evolution of higher plants," is a showcase for the breadth of interest that has made him one of the great intellectual forces in the plant sciences today. He ranges from the nature of the taxonomic system and the history of plant genetics to the accelerating destruction of the tropics. His brief discussion of the origins of taxonomy, cast against the background of his own work with Berlin and Breedlove on folk taxonomies, is a gem. Patrick, sticking most closely to what I suspect was the original charge to the symposium participants, provides a fine, concise overview of the history of aquatic ecology from Hooke to herself. Raven and Patrick share a deep interest in the impact of human activities on the systems they study. Their utterly different approaches to the problem make a fascinating contrast.

Mathematical theory in population biology is represented in the volume by two of the top practitioners: Warren Ewens in population genetics and Robert May in ecology. Ewens is somewhat defensive; mathematical population genetics has gained a reputation in some quarters as a body of theory rather divorced from the real world, and several other contributors to the symposium, notably Mayr, E. B. Ford, and A. J. Cain, have expressed doubts about its usefulness. May is not overtly defensive but deplores the post-Darwinian "divorce between mathematics and biology" before showing how mathematical models have increasingly illuminated ecological problems.

As a nonmathematician who works primarily with natural populations, I am saddened at the persistence of this "tension about the contributions of mathematics" (as Thomas Uzzell describes it in the introduction to the population genetics section of the book). Certainly some mathematical models of population phenomena have been trivial, based on incorrect assumptions, or, as Cain complains, used to "explain away" rather than "explain." But then some field biologists still collect data at random without the attempts to test significant hypotheses or otherwise fit their activities into a theoretical context that are the hallmark of good science. Mathematical theoreticians need the field people both to help them select important problems and to provide systems against which to test theory. And the field people equally need the mathematicians for reasons eloquently covered in Ewens's and May's chapters. Cooperation, not hostility, is what is called for.

The need for mathematical theory, by the way, is also implicit in the chapters by E. O. Wilson and R. D. Alexander on sociobiology, a discipline based in part on interpretations of mathematical genetics. The "tensions" surrounding sociobiology are, of course, even greater than those felt by mathematical population biologists. Wilson's brief chapter is notable mainly for two pages on the "ethical consequences of sociobiology," in which he ably makes the point that sociobiology does not provide automatic support for any particular social or political point of view.

Alexander's chapter, more than 50 pages long, is slow going in places but worth the effort, especially for his analysis of the "mother's brother" and "asymmetrical treatment of cousins" phenomena in sociobiological terms. In the former case, Alexander shows that the mysterious assumption of paternal duties in some societies by the mother's brother rather than the putative father may be explained as an adaptation in cultures having relatively low confidence of paternity. In the latter case, the distinction between parallel cousins (offspring of siblings of the same sexes) also appears to be related to uncertainty of paternity. In sororally polygynous societies where brothers may have access to each others' wives, "parallel cousins" may actually be much more closely related than "cross cousins"—being offspring of sisters and having the same father. As would be predicted under these circumstances, the vast majority of societies with sororal polygyny treat cross and parallel cousins asymmetrically, whereas only about one-third of monogamous societies do.

Ford gives a rather brief, narrow overview of recent advances of the field he long ago christened "ecological genetics." Most of his examples are drawn from work in Britain, and more extensive work by Americans is largely ignored. Cain, one of the best-known ecological geneticists, uses work done on the polymorphic land snails *Cepaea nemoralis* and *C. hortensis* to illustrate his views on "the efficacy of natural se-

lection in wild populations." Both chapters are recommended to American students, who often are not sufficiently exposed to the work of British ecological geneticists.

Another Englishman, John Harper, writing on terrestrial plant ecology, is less parochial than Ford or Cain and has contributed an essay full of fascinating tidbits of information (for example, that cereal plants absorb 75 percent of their required nutrients before they have made 25 percent of their growth) and analysis. He believes that "the development of terrestrial plant ecology has been desperately hindered because of the failure to develop theory and the existence of the intellectual gap between scientists concerned with natural communities and those concerned with man-used systems." According to my prejudices, he might have added, "and because plant ecologists have stubbornly refused to recognize the major role herbivores play in shaping plants and plant communities," a defect so glaring that Harper's recent monumental book is the first general work on plant ecology to deal with plant-herbivore coevolution.

Daniel Janzen, who started on the road to becoming today's premier tropical ecologist with coevolutionary studies of ants and acacias, has contributed the most unusual chapter in the book. He describes very well what he has done: "I have . . . poked into the ecological literature much as I poke into habitats in the field." The result is an analysis of the contributions of research in the tropics to our understanding of ecology. The temperate-zone bias in the literature is worse than I had imagined. It is difficult not to agree with Janzen that "the new frontiers in ecology are in the tropics" and not to marvel at the wide-ranging ideas he would like to test there. But when one has seen what is happening there (or reads statistics such as Raven cites in his chapter or Janzen's statements here and elsewhere about the disappearance of tropical ecosystems), it is hard to be sanguine about the chances that those frontiers will be properly explored before they are closed.

I was disappointed by only one thing in this otherwise extraordinary volume. The Academy of Natural Sciences is one of our oldest museums and repositories of taxonomic collections. Fourteen years ago (*Syst. Zool.* **13**, 109 [1964]) I raised a series of questions about how, in the face of a biota going extinct faster than it could be adequately described, taxonomists should attempt to sample the global flora and fauna and how museums might attempt novel ways to preserve representatives of them. It would have been most appropriate for a section of *Changing Scenes in the Natural Sciences* to explore these questions, but only Raven touches on them. Perhaps this is because taxonomists and museums persist in behaving as if they had all of eternity to complete a catalog of the earth's living things. But even apart from these questions, taxonomy is short-changed in the volume to the extent that its one true revolution since Linnaeus, that of numerical taxonomy, is not discussed. This is all the more surprising because one of the principal revolutionaries, Robert Sokal, provides the introductory remarks to the section on evolution and systematics. The Academy, perhaps in an attempt to be "modern," has neglected the nuts-and-bolts discipline that is still crucial to so much work in population biology. But on the whole, symposium convener and editor Clyde Goulden and his organizing committee are to be congratulated on producing a book of unusually high quality.

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Genetic Apparatus

The Eukaryotic Chromosome. C. J. BOSTOCK and A. T. SUMNER. North-Holland, Amsterdam, 1978 (U.S. distributor, Elsevier, New York). xviii, 526 pp., illus. $79.75.

From the frequency with which it is cited, it seems that the most popular general work on chromosomes in recent years has been E. J. DuPraw's *DNA and Chromosomes*. Since its publication in 1970, however, there have been remarkable advances in our understanding of the structure and function of eukaryotic genetic apparatus, so that a book such as the one under review can be welcomed for its fairly comprehensive, up-to-date coverage of the subject. In a sense the same may be said of volume 2 of Benjamin Lewin's *Gene Expression*, but its scope is more limited than that of *The Eukaryotic Chromosome*, and its review format limits its usefulness for students.

Bostock and Sumner have brought together in a quite readable way a large body of information published before about the middle of 1976 on the structure and composition of chromosomes and on the general behavior and properties of chromosomes in mitotic and meiotic cells. Most passages in the book contain sufficient background or explanation of techniques to enable readers new to the field to appreciate details and implications, and the book is well illustrated with drawings and with figures reproduced from original articles. The authors do well, on the whole, in interpreting disparate data where issues are not yet resolved, and their errors and misstatements are few.

Bostock and Sumner have focused on the 15 or so years preceding 1977, and their account is biased toward molecular aspects. This is proper and useful as long as readers are aware of complementary works, such as M. J. D. White's *The Chromosomes*, that deal with more classical aspects. The book covers DNA, RNA, and chromosomal proteins, properties and activities of interphase nuclei and polytene and lampbrush chromosomes, chromosome mapping, and chromosome damage and repair. For many of the topics covered, Bostock and Sumner incorporate information on diverse organisms, thus illustrating both the generalities that can be drawn and the variety of strategies that have been successful in chromosome evolution. The authors have also been fairly generous with citations, so that bibliographies at the end of each chapter are extensive.

In their preface, the authors suggest that much of the book will be of interest to specialists in that it can help them come abreast of related specialties and develop a perspective for their subject. Good idea. However, I think the book will find its most appreciative readership among advanced undergraduate and graduate students, for whom it is very appropriate.

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Phenomenology of Perception

The Perceptual World. K. VON FIEANDT and I. K. MOUSTGAARD. Academic Press, New York, 1977. viii, 680 pp., illus. + plates. $62.50.

The study of perception in the United States has recently been dominated by researchers concerned with how perception takes place, in terms either of physiological mechanisms or of the structure of the perceptual information processing system. This interest in mechanism and process has often lead to