Modern dictionaries typically define natural history as a rather unsystematic activity in which natural objects are studied in the field from an amateur or popular point of view. At the extreme, definitions imply that naturalists usually engage in nothing more intellectually rigorous than naming birds and sniffing flowers while gamboling through sunny meadows. Descriptions of natural history seldom even hint at the possibility that it could be a serious, scientific discipline. Nonetheless, natural history today is as vigorous and scientific as any field of biology. Put simply, natural history seeks to integrate within single species the often disparate data of narrow, process-oriented scientific fields. Because many areas of biology have undergone serious reductionism in recent decades, natural history’s capacity to unify and give meaning to a multitude of otherwise disjointed facts continues to play an enormously important role.

A major reason that natural history still suffers from a tainted reputation is that its chief proponents often function under the guise of other titles, for example, “ecologist.” But with Mary Willson’s fine new book, closet naturalists now can proudly stand and be counted. Willson, aware that natural history is widely misunderstood, writes that “... for the modern study of natural history, it is inadequate to construct a catalog of cute little tricks employed by organisms and call that ‘natural history.’ ” She then describes how an evolutionary framework can give meaning to the “tricks” and curiosities with which so many naturalists have been preoccupied.

Inspecting Willson’s scholarly text should convince anyone that natural history has indeed come of age. In 15 chapters under four major headings (“Perspective,” “Relations with the Physical Environment,” “Relations with Other Species,” and “Social and Reproductive Patterns”), she covers virtually every major topic of interest to the modern vertebrate biologist. Figures, tables, and graphs abound. For each class of vertebrates, from Agnatha through Mammalia, she successfully integrates basic information on morphology, physiology, locomotion, food and foraging, predation, social organization, and life history patterns. Although vertebrate biology texts often slight fishes, this book covers them well. Willson engages the reader with clear, lively discussion; I nearly always wanted to continue reading after completing each section, even if the topic was far from my own interests. Particularly lucid are the sections on topics ordinarily included under comparative physiology: perception, thermoregulation, osmoregulation, respiration, etc.

Selected references end each chapter; they number over 1400, although she cites some references more than once. Many are very recent, reflecting both the healthy advancement of scientific vertebrate natural history in the last ten years and Willson’s quest to be up-to-date. Approximately one-half the total citations refer to the one-third of the text covering social and reproductive patterns, pointing to both the recent surge of literature in this area and the author’s interests and biases. Unsurprisingly, the
chapter on sex has the most references (157 titles). Titles representing behavioral ecology are especially numerous and include many of the cloyingly anthropomorphic terms, e.g. nepotism, cuckoldry, gallivanting, and wife-swapping that continue to appear in that subfield’s citations.

I noted several errors. In particular, the figure captions show signs of carelessness. Hornbills are in the Coraciiformes, not Piciformes (Figure 2-15); the captions to Figure 7-26 are reversed; the “loon” in Figure 9-16 is a merganser; and the scientific name for Gambel’s Quail is incorrect in the legend to Figure 15-5. Furthermore, in the European sparrowhawk (Accipiter nisus), females are larger than males, not the reverse as page 457 states.

Although the book seems to have no serious weaknesses, some important aspects of natural history receive little or no attention. For example, it neglects the field’s historical underpinnings. Willson totally ignores the precocious and, in many ways, brilliant writings of Joseph Grinnell, early 20th century America’s premier vertebrate naturalist. But this omission, although an unforgivable sin, is not unexpected; only very recently have Grinnell’s profound insights received the attention they have so long deserved (F. C. James, et al. 1984. Am. Nat. 124: 17-30).

Nonetheless, Willson’s book is far more complete than any of its predecessors. I am aware of no other single text that covers and logically blends so much material on vertebrates. In breadth of contents, degree of quantification, and general sophistication of treatment, Willson’s book far surpasses Robert Orr’s Vertebrate Biology, a competing and widely successful text also published by Saunders College Publishing (5th ed., 1982). And, considering the near impossibility of encompassing the burgeoning literature of vertebrate biology within the scope of a single text, this volume is all the more impressive. Indeed, this comprehensive work could well be the last of its kind. If vertebrate natural history continues its phenomenal growth, future authors attempting to write major synthetic works will find it difficult, if not impossible, to match this one.

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Molecular Genetics

Some half-dozen articles deal with aspects of the Ti system and together constitute a varied and lively introduction to its history, present status, and future prospects. However, some articles have already been overtaken by events, such as one on using a chimeric gene to confer antibiotic resistance to plant cells. The authors, Fraley et al., and their collaborators have reported at more recent meetings that they have applied their chimeric gene to transfecting modified genes between plants, a development only briefly alluded to in their contribution here. And the oft-repeated hope that the Ti system could be used for monocots as well as dicots was recently fulfilled, at least for three species (Hernalsteens et al., EMBO J. 3: 3039, 1984; Hooeykaas-Van Slogteren et al., Nature 311: 763, 1984).

Four articles on chloroplasts provide an interesting mix of molecular biology, biochemistry, and agricultural applications, including Aartzen and Duesing’s contribution on chloroplast-encoded herbicide resistance. Several articles on the fusion and genetics of somatic plant cells and their regeneration into whole plants, although less biochemical in tone, illustrate another exciting approach to manipulating plants. If the symposium were held now, it would almost certainly include two emerging topics: stress and disease.

I also enjoyed the panel discussion on the future of agricultural research. Moderator Ralph Hardy of DuPont assembled a panel representing areas of the agricultural research community—national, foreign, academic, and industrial—to comment on key issues in agricultural biotechnology. This section will particularly interest students considering careers outside the familiar academic environment. Participants argued for different viewpoints on concerns such as the need to fundamentally reform our patent system in relation to agricultural biotechnology; generate more genetic knowledge about agronomically important characteristics, especially those determined by multiple genes; encourage better communication between molecular biologists and plant breeders; and continue investing in agricultural research despite agricultural surpluses in Western countries. Jack Marvel of Monsanto expressed optimism about the return that companies and nations can expect from investing in agricultural research at every level and stressed the need to educate the public about what is now possible and what is still needed.

MOLECULAR GENETICS


This 20th volume in the Miami Winter Symposium series records the meeting held January 1983. Along with regular articles, it includes the 14th Lynen Lecture, delivered by Melvin Calvin, a panel session on agricultural research, and 51 one-page free communications.

With 23 articles, the proceedings strongly emphasize the molecular genetics of plants. The general theme is the development of new techniques that widen the scope for gene transfer into and between plants. Calvin reviews his past and current research, including hydrocarbon biosynthesis and artificial photosynthesis; following this are articles on the organization of plant nuclear and chloroplast genomes; the transformation of plants using vectors based on the Agrobacterium Ti and Ri plasmids; somatic cell fusion and genetics; nitrogen fixation; and seed storage proteins. The shorter section on molecular genetics in animals, with eight chapters, explores the same general theme, especially in relation to introducing genes into embryonic cells; it also deals in some depth with new techniques for diagnosis and vaccine production.

The articles are generally high quality, making it an unenviable task to highlight just a few of them. The symposium’s organizers clearly wanted a broad approach to the molecular genetics of plants without sacrificing detail. I enjoyed the five articles on vaccines, antitoxins and animal viruses, and Beatrice Mintz’s article on changing the genes of mice. Vaccine research provides an excellent example of the close relationship that has developed in recent years among protein chemistry, immunology, genetic engineering, and veterinary and human medicine.

Useful reviews in the plant area include Schell et al.’s contribution on Ti plasmids as experimental gene vectors for plants, Gamborg and Dunn-Coleman’s on new plant variants and hybrids from somatic cells, and Somerville et al.’s on enhancing net photosynthesis by genetically manipulating photorespiration and RuBP carboxylase/oxygenase.