ings—namely, the tendency of life to produce more complex and higher organization and the influence of circumstances explaining the branching of the phylogenetic tree—these are only two aspects of a single cause, the mechanical or hydrodynamic action of internal fluids producing organizational diversity and complexity. Lamarck's terminological uncertainties, mirroring attempts at finding the proper expository strategy, would have misled most historians. However, Corsi admits that "the ambiguity of the expressions that the author used to summarize his own doctrine were to be accentuated" in later years. Indeed, Lamarck's *Philosophie zoologique* of 1809 and the *Histoire naturelle des animaux sans vertèbres* of 1815 do emphasize the existence of a dual mechanism: it is the inner drive of life that accounts for the traces we find of an ascending series of animals, a series that has been distorted by the branching effects of the action of circumstances. It seems difficult to maintain that we have here only a terminological artifact; one may wonder whether Corsi is not trying to introduce a consistency that Lamarck never achieved or even aimed at.

Be that as it may, in his broad and careful examination of the relevant texts of Lamarck and of his contemporaries, Corsi has set an exacting standard for Lamarckian scholarship.

This may not be the definitive book on Lamarck; but there could be no such book. Lamarck was far from being a consistently lucid writer; he will probably remain up to a point intractable, in part because of the lack of manuscript sources and in part because of the palimpsest nature of his writings. Lamarck often reused whole segments of previous works and incorporated them word for word in new contexts, not always with perfect fit; and it is likely that there are in his works many such segments whose absent former contexts we will never know anything about.

This is not to say, however, that the study of Lamarck is a futile enterprise. There is much that we ought to consider firmly established, and with *The Age of Lamarck* Corsi has contributed to that body of knowledge outstandingly. Indeed, because of its scope, its thoroughness, and the wealth of challenging new interpretations it offers, I see this book as a turning point in the interpretation of Lamarck in his historical context.

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The Sociobiology of Plants

Plant Reproductive Ecology. Patterns and Strategies. JON LOVETT DOUST and LESLEY LOVETT DOUST, Eds. Oxford University Press, New York, 1988. xiv, 344 pp., illus. $49.95.

A volume on plant reproductive ecology has a great deal of material to cover. Included are life history strategies, competition, dispersal, pollination, and herbivory, topics that are each large enough in themselves to merit substantial review volumes. Each of these topics receives some treatment in the 15 reviews that constitute *Plant Productive Ecology*, but the most distinctive feature of the volume is the amount of attention given to the nascent field of plant sociobiology.

Sociobiology has come relatively slowly to the plant kingdom. That there could even be a field of plant sociobiology may come as a surprise to the uninitiated. Sociobiology is the discipline that studies the evolution of social interactions, and we do not usually think of plants as highly social organisms. There are, however, a number of ways in which a sociobiological perspective can be helpful. If plants must divide their effort or their time between being male and being female, then we might expect to gain some insights from the game models of sexual allocation theory. If plants compete for mates, or if plants do not raise the progeny of all pollen contributors at random, then sexual selection theory would seem to be relevant. If plants must allocate limited resources among seeds, with each seed potenially exerting some influence on the allocation, then kin selection theory leads us to expect conflict between the parent and its offspring.

All of this implies that botanists have something to gain from the sociobiological perspective, and this book could be recommended for this reason alone. But the gain is not one-sided, with sociobiologists doing the teaching and botanists the learning. Indeed, the gain to sociobiologists is more than simply having a few examples from the plant world to fill out their undergraduate lectures. Plants differ in profound ways from the animals, primarily vertebrates and insects, around which sociobiological theory developed. One need only reflect on how plants get their gametes together to appreciate how different their social lives are from our own. In addition, they are autotrophic, their growth tends to be modular, with considerable vegetative reproduction, and they do not sequester germ lines early in development. These differences and others have consequences for social evolution, and as a result plants present interesting new problems for sociobiologists to consider.

For example, while we can use sexual allocation theory to predict how hermaphroditic plants should allocate resources to male and female functions, how are we to include investment in flowers, which presumably function in both male and female reproduction? With respect to sexual selection, much of what might be called mate choice in plants occurs by abortion of seeds, and choosing on the basis of embryo traits may be very different from choosing on the basis of male traits. Finally, when seeds compete for resources from the maternal plant, the process is not necessarily a simple analogue of parent-offspring contests in animals. Seeds may include not only maternal and embryonic tissue but also the haploid gametophyte and the (usually) triploid endosperm. This makes the inclusive fitness situation more confusing but also much richer. Even these differences have to do primarily with the more familiar flowering plants, and additional differences appear in algae, bryophytes, and pteridophytes, covered in the last three chapters of this book.

Among previous books, those most similar to this one in ground covered are Mary Willson's *Plant Reproductive Ecology* and (with Nancy Burley) *Mate Choice in Plants*. In comparison, the present volume has both the advantage and the disadvantage of having many authors; it gains diversity of viewpoint at the expense of singularity of purpose and tightness of organization. It also has the advantage of five extra years of coverage, and in this new and growing field five years is significant. As was not the case when Willson wrote, the authors of this volume can write for a fairly large group of colleagues familiar with both plants and sociobiology. This may make it somewhat more difficult for outsiders. Botanists with little background in sociobiology will not always find the theories explained in sufficient detail, but references to the primary literature are provided. Similarly, those coming from the other side may have to devote some effort to keeping straight the welter of botanical terms. But, despite the costs, both botanists and sociobiologists should appreciate that cross-fertilization has advantages, not only in plants but also in science.

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