problems encountered with various control techniques. Population biologists have been preoccupied with predator-prey and competitive interactions, so it is not surprising that the conferees disagreed on whether pathogens regulate their host populations. It is also clear that very little is known about the regulation of parasite populations themselves. Dietz reviews the use of different types of mathematical models for parasite transmission, and Anderson explores the concept of an infection's (or parasite's) basic reproductive rate, an extremely useful variable in predicting the success of a disease control technique. A. C. Allison reviews the coevolution of human hemoglobins and malaria parasites and argues that parasite evolution is typically from virulent to commensal. The conferees doubted that this was a necessary progression and noted that the rabbit and myxoma virus have evolved intermediate relationships repeatedly. In fact, host-parasite systems are most likely to have unstable equilibria, coadaptational limit cycles, and permanent dynamical behavior. Finally, W. D. Hamilton proposed that parasitism is responsible for sex, for meiosis, for all Mendelian variation, and for real species—guilds of genotypes committed to the free exchange of biochemical technology for parasite exclusion. The conferees were not completely convinced and suggested a number of tests for Hamilton's hypotheses.

The conferees agreed that existing models of host-parasite interaction have three weaknesses. First, they fail to allow for the spatial and temporal heterogeneity found in nature. Transmission equations rarely credit the asymptomatic Typhoid Mary and the promiscuous superspreaders of venereal disease any differently from the rest of us. Second, most models fail to allow for the complex interactions between various parasites within an individual and between parasites and malnutrition. Third, present models are rooted in ecology and lack the necessary genetic basis. This is their most serious weakness, because it is increasingly clear that there is considerable genetically controlled variation in compatibility between parasites, their vectors, and their final hosts. Unfortunately, the mechanisms of genetic regulation of host-parasite compatibility are generally unknown, and, for now, the theorists may be excused their simplifying assumption that all mosquitoes, snails, trypanosomes, and people are created equal.

These books come at a time when infectious diseases have never been so prevalent, when parasites and their vectors are being moved and mixed with increasingly serious consequences, and when both are rapidly evolving resistance to drugs and pesticides. They demonstrate both the great need for robust models of infectious disease epidemiology and the strengths of an analytical approach that is strongly linked to the real world. Yet, by drawing attention to the inadequacies of reductionism and to numerous unsolved problems in parasitology, the editors admit that attempts to produce a Newtonian epidemiology have failed. Therein lies the importance of these two volumes—the challenge to join in the development of a Darwinian epidemiology. Anderson and May have succeeded in clearly defining the significant contributions that population biology might make to controlling the great neglected diseases of mankind.

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Reproductive Tactics

Mate Choice in Plants. Tactics, Mechanisms, and Consequences. MARY F. WILLSON and NANCY BURLEY. Princeton University Press, Princeton, N.J., 1983. xii, 252 pp., illus. $35; paper, $12.50. Monographs in Population Biology, 19.

Mating patterns in plants have been prime subjects of evolutionary thought for decades. Patterns of mating have been characterized from pollen and seed dispersal patterns and from genotype distributions within and among families. The prime purpose has been to determine the extent of inbreeding and assortative mating in natural populations. Recently, there has been considerable interest in the cost of mating and how it may be optimized. The parental investment that a plant makes during one reproductive session and the allocation of that investment to different functions may be under strong control to maximize individual fitness. If plants can deploy parental investment in an adaptive manner, might they not also be able to choose their mates, as this too would enhance their individual fitnesses?

This volume presents a series of arguments and hypotheses that mate choice is made before and after fertilization by females and that males compete for mates. The volume is an interpretation of a number of pre- and post-zygotic processes and phenomena in terms of mate choice and sexual selection. The authors' objectives are to explore the potential role of mate choice in influencing the reproductive biology of higher plants and to suggest some mechanisms by which mate choice may be accomplished. They have been successful in their advocacy of sexual selection through skill in argumentation and in the use of data from the literature, while recognizing the paucity of supporting evidence. In a sense, the book is an exercise in the subjunctive, about what might be, if . . . then. . . . The conceptual framework is formulated with regard to sexual selection in animals. The assumptions that plants have the ability to discriminate among an array of pollen donors, that donors possess mechanisms rendering themselves discriminable by pollen recipients, and that plants act upon such discrimination for the most part remain to be validated.

The authors contend that reproductive success in females is resource-limited rather than pollen-limited, whereas male reproductive success is more often limited by the number of mates than by resources. This sets the stage for female choice and male-male competition. Female choice may be exercised prior to fertilization through differential acceptance of pollen based upon its self-incompatibility, vigor, and contribution to the progeny. Female choice may be exercised after fertilization through selective seed and fruit abortion. Male-male competition is through the duration of pollen availability, flower number, pollinator attraction, and differential pollen grain germination and pollen tube growth. The exposition of these general points is accompanied by data and a discussion of subordinate hypotheses and their interrelationships.

This volume provides a new perspective on plant reproductive biology and attempts to explain and unite many previously unrelated aspects of reproduction such as delayed fertilization, pollen tube growth rates, double fertilization, and seed abortion. Traditionally, pollination, pollen-pistil compatibility, and fruit and seed development have been treated as separate matters. The volume also contains a substantial amount of synthesized information on plant reproductive biology that is of considerable interest regardless of its relationship to mate choice. Given the challenges and questions raised in this book, it will provoke critical thinking and experimentation on a fascinating subject.

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