Book Review

The Differences Between the Sexes. Edited by R. V. Short and E. Balaban. Cambridge University Press, New York, 1994. xvi + 479 pp., $100.00 (hardback), $29.95 (paperback).

Sex is a perennially fascinating topic. This volume is a collection of articles on the evolutionary, cell, and molecular biology of sex differences, arising from a meeting in Switzerland. I concentrate on the articles with an evolutionary emphasis, since that is my area of expertise. Few species of animals or plants reproduce by "some harmless mode of vegetation," which according to Edward Gibbon would have been preferred to sexual reproduction by the Fathers of the early Christian Church. One of the most challenging problems for evolutionary biologists has been to explain why higher organisms should employ a mode of reproduction that requires the union of reproductive cells produced by different individuals, rather than this simpler alternative.

This question is tackled in the opening chapter by Roger Short. Unfortunately, he seems to be ignorant of the extensive literature on the subject, which has developed over the last 20 years. He confines himself to bland generalizations to the effect that sex leads to the shuffling of genes contributed by paternal and maternal gametes, which produces the variability on which natural selection acts. While this is undoubtedly part of the story, it fails to do justice to the subtleties of contemporary population genetic models of the evolution of sex and genetic recombination. Short also makes the absurd claim (p. 3) that "selfish" transmission advantages of genes cannot occur because "the gene would always be the loser; if the organism suffered, the gene would not be transmitted to succeeding generations." This flies in the face of the existence of the well-studied systems of distorted segregation, such as t alleles in mice, in which a gene complex that lowers the fitness of its homozygous carriers is maintained in the popu-
loration because heterozygotes transmit it to nearly 100% of the male gametes, rather than the Mendelian 50%. At the end of the chapter, Short speculates about the origin of the male/female gamete size dimorphism, which is clearly the most fundamental difference between the sexes, and which probably goes back to the earliest eukaryotes. He proposes that this has evolved "to ensure the transmission of sufficient mutation-free maternal mtDNA to the embryo" (p. 20), without mentioning any of the evolutionary models of anisogamy which have been proposed over the years.

Chapter 2, by David Crews, has the illiterate title of "Constraints to parthenogenesis." This article pulls off the remarkable feat of discussing the evolutionary biology of asexuality without giving a clear account of the cost of sex: the fact that a rare mutant that causes females to produce all-female broods by parthenogenesis will double in frequency each generation, if net fertility is not affected (the concept is mentioned at the end of the chapter, but in such a garbled form that it is intelligible only to someone who is already familiar with it). No coherent account is given of the possible adverse long-term consequences to population fitness of the abandonment of sexuality, which may account for the fact that sexual reproduction persists in face of this intrinsic reproductive disadvantage. Instead, we are treated to anecdotes about lesbian activities of parthenogenetic whiptail lizards.

The level of the contributions improves markedly after these two chapters. There are several useful articles on sexual selection and sexual dimorphisms in mammals, hymenoptera, and fish, and up-to-date contributions on mammalian sex chromosome systems. Overall, the book is heavily biased toward mammals; it is astonishing that there is no chapter on the genetic control of sex determination and dosage compensation in Drosophila, surely the best-understood system of them all. The wealth of information from plants about the evolution of separate sexes is never mentioned, and modern ideas concerning the evolution of sex determination and sex chromosomes are also largely ignored.

While there is much valuable and entertaining information in this book, it suffers from the intellectual disease that afflicts much of biology: the accumulation of piles of facts is regarded as the prime goal of research, rather than the attempt to construct a coherent framework for understanding the processes which underlie them. In the Preface, the editors emphasize their debt to Charles Darwin's work on the evolutionary biology of sex. Their book unfortunately largely fails to follow his wonderful example of how to combine knowledge of the wealth of biological data with theoretical insights. Perhaps next time an evolutionary geneticist who has thought hard about the questions posed by sexual reproduction might be invited to a meeting of this kind.