Genome projects are clearly providing a rich source of data for evolutionary biologists and several papers cover current advances in this area. Furthermore the book includes interesting papers on transgene stability, and the influence of genome structure on gene expression and on recombination frequency.

For those not directly involved in large-scale genome research this book provides a snap shot of the state of the art in 1995. The book brings together work from prokaryotes and eukaryotes, and from plants and animals, demonstrating the broad range of possible applications. It will clearly become out-dated quickly, but none-the-less includes much information and theory which are more durable. This sort of information is hard to come by without tracking down individual research papers in the area, which are scattered over diverse journals.

The impact of the technical and theoretical consequences of genome analysis projects are being felt right across biology. Whether or not you think that the money could have been better spent, there are few biologists who have not benefited directly or indirectly from their output. There are still some who seem to think that genome projects generate nothing but a string of As, Gs, Cs and Ts, to them this book will be a much needed wake up call. There are many more who think that the most important results of genome analysis are ethical dilemmas which we would rather not have to face. Dick Flavell's concluding paper addresses these issues too. He stresses the need for openness and for better education for all sectors of society, so that we can benefit from the enormous opportunities offered by the responsible use of the new data and new technologies.

OTTOLINE LEYSER
The Plant Laboratory
Department of Biology
University of York
PO Box 373
York YO1 5YW
U.K.

Genetics of Sex Determination (Advances in Genome Biology, 4). Ram S. Verma (ed.). JAI Press Ltd., London. 1996. Pp. 368. Price £69.50 ($109.50), hardback. ISBN 1 55938 836 6.

The mammalian testis-determining gene *SRY* was isolated over six years ago, but still we remain ignorant of which genes are regulated by its protein product and whether this likely transcription factor activates downstream genes, represses them, or both. Fortunately, this collection of articles does not dwell on our ignorance, but reviews the wealth of data which exists concerning the genetics of sex determination and other related topics.

The book begins with an historical overview of the genetics of sex determination (Mittwoch) which offers some speculative hypotheses concerning the role of the Y chromosome in male development. It is Mittwoch's contention that the well-documented precocious growth of the mammalian testis is integral to its differentiation from the indifferent gonad *and* is a Y-linked genetic trait; an ovarian fate is the normal, growth-retarded gonadal alternative. Mittwoch suggests that a growth-rate/temporal threshold model helps to explain a number of problems, including that of XY^{Pos} or XYd sex reversal in the mouse. This phenomenon is discussed in detail in the excellent chapter on sex reversal in mammals by Nagamine. Briefly, when the *poschiavinus* Y chromosome is bred onto a C57Bl/6J background, males, females or hermaphrodites develop. The sex reversal, which becomes more prevalent after further backcrossing on to the C57Bl/6J background, is presumably the consequence of X-linked or autosomal modifiers of the Y^{Pos} sex-determining activity. The nature of these modifiers remains unknown and any number of processes may be affected in the hybrid genomic environment of the XYd foetus. With respect to Mittwoch's hypothesis, the fact that testicular cords form about 14 hours later in XYd foetuses does not imply that it is growth-rate which normally dictates the fate of the indifferent gonad. Two facts are relevant here: firstly, XY preimplantation embryos develop more quickly than their XX counterparts due to the accelerating properties of the Y chromosome; and secondly, XY embryos normally develop testes due to the expression of *Sry* in the developing gonad. However, there appears to be no compelling evidence that these two phenomena are related. *Sry* is not responsible for the first phenomenon, and the mechanism by which it results in Sertoli cell differentiation in the bipotential gonad, reviewed by O'Neill and Sinclair, may not be connected with growth-rate at all. Chromosomally female (XX) embryos transgenic for *Sry* can develop as males, and this would seem to relegate growth-rate as a sex-determining mechanism to a possible statistical phenomenon, perhaps tilting the balance, but not exerting a necessary or sufficient effect.

Several chapters discuss topics not strictly related to sex determination, including X-chromosome inactivation (Lyon), the pseudoautosomal regions of the human sex chromosomes (Rappold), mammalian spermatogenesis (Hale), the genetics of pseudohermaphroditism (Simpson) and sex chromosome aberrations (Anhalt and Neely). McElreavey offers a highly plausible model of mammalian sex determination based on the genetics of human sex reversal, particularly the frequency of *SRY*-negative XX males. This model describes a repressive function for *SRY*, suggesting that it acts as a negative-regulator of a negative-regulator of male-specific gene function. The consequence of this double negative is that *SRY* activity results in male differentiation. Candidates exist for the various players in this hypothetical drama; the X-linked locus *DSS* is a plausible repressor of male-specific gene activity, and the *SRY*-related gene *Sox9* is expressed in a male-specific fashion in the developing mouse gonad, suggesting it acts downstream of *SRY* activity. Interestingly, the male-specific expression pattern of *Sox9* in the gonad is conserved between mammals and chicken (a fact no doubt

established after the deadline for contributions to this volume), suggesting that it, and not the sex-determining gene *SRY*, may be an element of an ancient sex determining mechanism found throughout vertebrate species. Might this conservation extend beyond vertebrates to species utilising non-genotypic sex determining mechanisms? Coriat and Sharpe discuss species exhibiting temperature-dependent sex determination (TSD), and are alert to the potential role of *SOX* genes here, perhaps acting via a temperature-sensitive change in protein conformation. Thus, the scene is set for a genetic dissection of not only the mammalian sex determination pathway but also related pathways, perhaps radiating from well-conserved elements common to each. This collection describes many of the complicated issues in the genetics of (primarily mammalian) sex determination which form the frontier of the subject, and is highly recommended to undergraduates and researchers in allied fields.

ANDY GREENFIELD
MRC Mammalian Genetics Unit
Harwell
Didcot
Oxfordshire OX11 0RD
U.K.

Evolutionary Biology Vol. 29. Max K. Hecht, Ross J. MacIntyre and Michael T. Clegg (eds). Plenum Press, New York. 1996. Pp. 321. Price £63.60 ($79.50 in USA). ISBN 0 306 45230 8.

This is the latest addition to a series that aims to provide topical discussions that span a broad range within evolutionary biology. Despite the title it is the thirtieth volume in the series (apparently an unnumbered supplement accounts for the discrepancy). Should you read it? Yes — these are stimulating contributions from active researchers. Should you buy it? That depends: the book covers so many areas that only certain parts will appeal to any one reader and I suspect that the price will deter many would-be purchasers. Perhaps sales would be helped by a snappier title. Why not imitate the music industry's successful approach to compilations of 'hit singles' and try 'Now that's what I call evolutionary biology Volume 29'?

My personal favourite is the chapter by T. A. Markow on the evolution of *Drosophila* mating systems. She summarizes a wealth of information and demonstrates that it can be misleading to extrapolate from the 'standard' species (*D. melanogaster*). She emphasizes that interspecific variation in male reproductive characters is more extensive than in females and discusses the recent discovery in several *Drosophila* species of gigantic sperm in terms of the varying investment by different species in the ejaculates of their males.

Two other articles on very different topics display an unusual combination of clarity and interest. P. A. Parsons' discussion of stress and evolutionary change emphasizes his view that in the real world energy constraints will set limits to adaptation. The chapter is a useful distillation of his recent papers which deal with specific cases of this general argument. K. E. Holsinger is concerned with the factors that affect the evolution of plant mating systems. Most analyses have assigned a dominant role to inbreeding depression but here Holsinger makes a strong case for the importance of pollination biology (for example, the pattern of pollen transfer).

A pair of articles deal with evolution at the molecular level. Sequence comparisons are exploited by M. E. Baker who concentrates on the alcohol dehydrogenase (ADH) locus in a fascinating discussion of the possible physiological role of ADH other than that of the oxidation of ethanol. The comparisons show that ADH belongs to a functionally diverse protein superfamily that includes steroid and prostaglandin dehydrogenases (the unifying property of the substrates for the group is that they are secondary alcohols). The organization of eukaryotic genes is examined by G. Maroni via a comparison of the sizes of the component parts of genes (exons, introns, leader, and 3′ untranslated regions) in 5 representative species. He asks whether the sizes are distributed at random or are associated in a particular pattern. Lots of facts are provided but the general importance of the observed patterns is not addressed. The author seems uncertain and concedes that the problem is whether the samples of species and genes that are included in his analysis turn out to be typical ones.

For me, the least interesting contribution is an excessively long-winded one by H. T. Band which describes the author's work over the last few years on sympatry within the genus *Chymomyza* (Drosophilidae) and concludes that the data do not support Paterson's specific mate recognition concept of speciation. However, the text was laden with so much jargon that I found it difficult to follow the logic.

The concluding chapters deal with aspects of evolutionary developmental biology. The problem of the fin to limb transformation is discussed by E. Vorobyeva and R. Hinchcliffe. They draw together new data from a variety of disciplines (morphological, palaeontological and molecular) to consider the developmental basis of the character transition. They suggest that the argument about mechanism may be resolved by analysis of the expression patterns of homeotic genes. My problem with most recent attempts to explain evolutionary transformation in developmental terms is that they are opposed to neo-Darwinian explanations involving selection and adaptation. In a related field, B. K. Hall argues that there are very few basic types of animal body plan. His chapter is strong on the historical development of the concept of the *Bauplan* but weak on the merits of this approach. I'm unconvinced by the notion that natural selection works upon a restricted set of options provided by the 'laws of form'. The suggestion is that the basic developmental processes are not themselves the product of selection. To me this is unnecessary. The diversity achieved in nature by phenotypic evolution is readily explained by the neo-Dar-

© The Genetical Society of Great Britain,