enormous opportunities so clearly. Professor Weatherall has done us all a great service. This book is essential for medical students, doctors in postgraduate training (all of us), research workers, and indeed everyone concerned clinically, scientifically, or economically with medical care in developed and developing countries.

Rodney Harris

The Origin and Evolution of Sex

Sexual reproduction in eukaryotes is thought to have arisen about a thousand million years ago and that in prokaryotes two thousand million years earlier. While the origin of sex is shrouded in speculation, we are better informed on the origin of this book, which began as a workshop on ‘Molecular aspects of cellular diversity’ at the Marine Biological Laboratory at Woods Hole in 1984. Its aims were summarised by one of the editors as (1) to analyse the molecular basis of sex in bacteria and (2) to lay the foundations for a comparison of sex and sexuality in higher organisms.

With these aims in mind, the book has been subdivided into four sections: (1) Bacterial conjugation: beginning of sexuality in prokaryotes; (2) The DNA of sex in unicellular eukaryotes; (3) Evolutionary patterns in segregation of germ cells; (4) Sex determination and differentiation in vertebrates. Each section concludes with a summary of the discussion written by a discussion leader, whose task cannot have been an easy one. No-one is likely to be surprised that the hoped for evolutionary link between sexual mechanisms in prokaryotes and eukaryotes failed to be identified. Nevertheless, some interesting relationships were suggested.

In a chapter on ‘DNA repair and complementation: the major factors in the origin and maintenance of sex’, Bernstein et al develop their hypothesis that the necessity to repair genome damage provided the immediate selective force giving rise to one of the fundamental aspects of sexual reproduction, that is, genetic recombination due to breakage and exchange of DNA between homologous chromosomes. This idea is pursued from simple RNA protocells, faced with the problem of coping with damaged information at a low level of gene redundancy, to the evolution of outcrossing diploid organisms. By contrast, Scofield puts forward the view that the prime force leading to sexual reproduction was the challenge from microbial pathogens, which required increased variability in histoincompatibility systems. A third idea, suggested by Margulis et al, is that sex in higher animals is maintained not because of any genetic advantage of mixis, but because of an association of meiosis with morphogenesis. If in most vertebrates sex is inseparable from reproduction, mathematical descriptions of its cost become superfluous.

Eukaryotes also differ from prokaryotes in the possession of Bkm sequences, of which large amounts have been demonstrated on the W chromosomes of some snakes and the Y chromosome of the mouse. This topic is reviewed by Jones. However, there is no mention of the human Y, and the significance of these DNA sequences in relation to sex determination evidently remains to be established.

The section on ‘Sex determination and differentiation in vertebrates’ contains four chapters, of which the longest is on Drosophila! Of the remaining three, one is a comparative account of sexual differentiation in vertebrates by Segal, while two contributions, by Taketo et al and by McLaren, deal with the development and differentiation of the mammalian gonad. McLaren presents further evidence that the phenotypic sex of germ cells depends on the time of entry into meiosis, which in turn is determined by the tissue environment rather than the chromosome constitution of the germ cells themselves.

Significantly, an involvement of H-Y antigen in gonadal differentiation is no longer regarded as likely. This raises the question of why ambiguous data could bypass the peer review system and convert a hypothesis into apparent fact in both the scientific literature and in textbooks. The present book seems free of dogma and even though it does not deal specifically with human sexual development, it contains ideas that are relevant to the more general aspects of sexual reproduction.

Ursula Mittwoch