seem quite prepared to accept that principles derived from fruit-flies, peas and even micro-organisms should apply to them and their prospective patients. "Genetics for Medical Students" has changed too, no doubt, through several revisions and is clearly written in a timeless style. Yet the book and its intended audience have diverged, perhaps drifting apart as genetics became established in introductory medical courses. It is not suitable for an introductory course, despite its extremely lucid account of Mendelian factors and linkage and its reliance almost entirely on human examples. The hesitant claim that genes affect enzymes, based on a few inherited defects of human metabolic pathways, cannot substitute nowadays for the lack of a clear exposition of transcription and translation of the genetic code. This lack makes mutation, complementation and the multiple effects of single genes to be amazing deductions (which they originally were), whereas they are readily explicable in terms of molecular biology. Later chapters on human blood groups suffer from an excess of examples for a book which claims an adherence to principles, and, consequently, from a bewildering terminology. The emphasis on selection and polymorphism surely exceeds the professional interest of medical students. Their needs are better accommodated by other texts on genetics, most of which give less antiquated accounts of cell division.

Instead, I recommend this book to more advanced students. Not only medical students but those, including you perhaps, who can now find time to discover the essence of population genetics and to ponder on its implications for human beings. The commentaries on genetical aspects of racial differences, physical anthropology, eugenics, intelligence and education are brief but eminently reasonable. There is also sound advice for the younger generation, among whom random mating is reportedly prevalent, on selective breeding and the conduct of paternity suits. If these sections were expanded and illustrated, this volume should find more general appeal as "Genetics for the Single Girl".

H. WALLACE

Department of Genetics, University of Birmingham

CYTOTAXONOMY AND VERTEBRATE EVOLUTION. Edited by A. B. Chiarelli and E. Capanna. Academic Press, 1973. 783 pp., author and subject indices. £14-50.

Almost 25 years after the publication of "Les Chromosomes des Vertébrés", this volume is dedicated to Professor R. Matthey and records the continued application of the principles he developed. Its value lies in being a source of reference for a vast number of chromosome counts from all classes of chordates. Where practicable, the chromosomes are roughly classified as acrocentric or metacentric to allow the expression of a *nombre fondamentale* of chromosome arms which, in turn, permits a minimum estimate of the number of structural rearrangements required for two extant karyotypes to evolve from a presumed common ancestor. The occurrence of microchromosomes in most classes of chordates tends to undermine this scheme but it has proved useful, especially in studying the karyotype of mammals.

For strict taxonomy, similarity of karyotype can indicate affinity just as well as any other phenotypic character but with the advantage that the character is expressed in all eukaryotes. The karyotype is so constant in some groups as to be no help in distinguishing species, and in others shows even intraspecific variability; sometimes karyotypic analysis may prompt a reclassification and occasionally it is a blatantly misleading witness, as in the indian muntjac.

Chromosome rearrangements may be a more important factor in terms of evolution as the basis of an isolating mechanism for speciation. An ancestral karyotype must be deduced, usually by assuming a minimum change from the commonest known modern karyotype. There is the implicit further assumption, which Matthey himself states, that the karyotype is not subject to natural selection. One may easily argue to the contrary for the physical basis of linkage is surely subject to selection, besides noting that the same ambiguous arguments have since been applied to the evolution of proteins.

The editors of this volume evidently invited contributions from classical cytotaxonomists and capitulated to their whims, for several chapters largely repeat others and some have no bearing on the subject. The inevitable gaps are plugged by incompetent editorial reviews—I was amazed to learn that doubling of non-histone proteins and RNA takes place at metaphase, but that is irrelevant. The main systematic treatment, however, argues with considerable authority that there may have been an overall increase in chromosome number early in chordate evolution, followed by a progressive reduction in all main surviving vertebrate lines. This conclusion is largely reinforced by Romanini's review of nuclear DNA content. The mechanisms involved in such evolution are alluded to but not considered explicitly. Several authors state that the incidence of gene duplication has been exaggerated previously (and Ohno does not defend the concept here), while seeing no difficulty in the occurrence of polyploidy until sex chromosomes appeared in amniotes. This difficulty actually concerns the genetical determination of sex, which is known in enough modern fishes and amphibians to be presumed in their common ancestor. Polyploidy is found in some amphibians and can pervert sex determination. Some authors tacitly accept the ample evidence of terminal centromeres, permitting a reduction of chromosome number without loss of material; others still insist that such changes are only brought about by reciprocal translocation of chromosome arms. Only Morescalchi considers the frequency and distribution of chiasmata in an evolutionary context, for amphibia, but even here there are few results from hybrids. Mancino sacrificed the opportunity for such an analysis in order to pioneer a novel approach to scientific reporting—a trivial introduction with enough references for a do-it-yourself chapter on lampbrush chromosomes. That seems a pity, for it would be interesting to discover if vertebrate chromosomes recognise our karyotypic classification when they pair during meiosis.

Until such recognition is firmly established in hybrids one may suspect that the success of this cytotaxonomy depends on the crudity of its methods, treating chromosomes as virtually identical sausages. Chromosome banding patterns have revealed far more rearrangements in primates than classical karyotyping suggested. Nucleolar organisers seem to have performed an evolutionary minuet while conserving their function and much of their

structure. Such matters are not mentioned in this volume: if they are sign-posts to the future, then it is a mile-stone some way behind us and perhaps on a dead-end road.

H. WALLACE

Department of Genetics, University of Birmingham

A BIBLIOGRAPHY OF THEORETICAL POPULATION GENETICS. J. Felsenstein and B. Taylor. Report No. RLD-2225-5-18. National Technical Information Service, U.S. Department of Commerce, Springfield, Virginia 22151. 444 pp. \$10.50.

3749 references are listed in an author index in the first half of the book, and in a "keyword-in-context" index in the second half. The authors state that for inclusion a paper must have some theoretical or statistical context and must involve the segregation of different genes in a population. The coverage is indeed wide; the population may be natural, or F_1 and F_2 progenies, for example, obtained in crossing programmes; statistical human genetics, biometrical genetics, linkage estimations, analyses of plant and animal breeding data, and so on. Papers published in the first three-quarters of 1973 are included. The earliest references I could find were to two papers in 1903, one by Karl Pearson on "The law of ancestral heredity" and the other by W. E. Castle, "The laws of Galton and Mendel and some laws governing race improvement by selection".

"Genetics" is listed as a keyword about a thousand times, which is somewhat self-defeating. "Heritability" has about a hundred references; "diallel" has about seventy (earliest, 1953); "genotype-environment interaction", about twenty (1958). It is easy to think of a reference to a publication missing under each of the last two headings. *Nature*, *Nature-New Biology*, and *Science* were searched in 1972-1973 only. It is nevertheless a most useful and worthwhile compilation, of value to both long-term and short-term workers in the field. Some will also find interest in the chronological listing of papers of individual authors, particularly the more prolific, showing the developments which have occurred over the years.

A. DURRANT

Department of Agricultural Botany, University College of Wales, Aberystwyth

BOOKS RECEIVED

THE EVOLUTION OF SEX IN PLANTS. John Merle Coulter. Collier-Macmillan Publishers, London, 1973. Pp. 140. £3.50.

EYE COLOR, SEX AND RACE—KEYS TO HUMAN AND ANIMAL BEHAVIOUR. D. Morgan Worthy. Droke House/Hallus, America, 1974. Pp. 159. \$8.95.