terms of their germ-free, 'SPF', conventional or 'dirty' status, allows control of what may be called the internal environmental variation.

A book of this size is at least two years out of date when published—a few chapters are more so—but this is unavoidable; a corollary to this is that it will be useful in many aspects beyond the ten years or so when a fourth edition will no doubt be in demand. The book is a *must* for every research worker and technician, whether he be starting to use animals at all, or whether he be merely moving to a species unfamiliar to him. Its purpose is to promote the welfare and comfort of animals. Since the achievement of this inevitably results in experimental efficiency and economy, the new reader will benefit greatly, before studying the chapter relevant to his species, by perusal of the first general section: the legal protection of laboratory animals, the design of housing and equipment, handling, nutrition, anaesthesia, euthanasia, transport, and the training of technicians. Here the chapter on genetic aspects of breeding methods, a subject often mysterious to the uninitiated, is unequalled in clarity. Over three-quarters of the book is devoted to particular species or groups of species. These include all those in common use, and a number of unusual ones—over 50. The illustrations are good and the lay-out easy to use.

It would be too much to ask a handbook to cover more than the facts. But a treatise, under UFAW auspices, on the gaps in our knowledge (such as a means of measuring the sensibility of different species to different kinds of pain, or the duration of a given SPF status in a given conventional environment), and on techniques which still need improving (such as lessening stress during transport, or the design of cages based more on further ethology studies and less on expediency) would be an impetus to further inquiry for those developing this relatively new discipline: laboratory animal science.

M. E. WALLACE

An Atlas of Mammalian Chromosomes, Vol. 1.

By T. C. Hsu and Kurt Benirschke. (Pp. x+200; 50 plates+212 figures. Loose leaf boxed: DM 37.60; \$9.40.) Berlin, Heidelberg, New York: Springer-Verlag. 1967.

The ultimate value of this Atlas is difficult to judge after the appearance of only one volume, and it is perhaps a little unfair to review it at this stage. There are, however, a number of points of criticism, perhaps worth noting, and which can perhaps be rectified in the next volume.

The past 10 years has seen the development of simple techniques for the study of mammalian chromosomes, and as a direct result of this there has been a veritable explosion in the number of species in which the chromosome complements are known. This has resulted in difficulties in description and nomenclature, not to say taxonomy, which urgently require attention. This Atlas is a valiant attempt to sort out some of these problems

and as such is to be commended. There are, however, a number of specific points which require attention.

First, it is likely to be difficult to maintain uniform standards in a series of volumes appearing over many years, but I am sure that the authors recognize this difficulty and will take steps accordingly. Second, there are several specific shortcomings in Volume 1. One of the most important from the taxonomic point of view is the failure to give the authority and date for each specific and subspecific name, in conformity with the rules of zoological nomenclature. It is essential that this be done in subsequent issues so that specific descriptions can be checked with those of the author originally describing the species. It would also be useful to know the source of each specific identification, and in which museum, if at all, the skin and skull have been deposited. A more minor point, when domestic animals are being considered, it would also be useful to know the breed that was studied in a particular instance, because as the karyotypes of further individuals become available, differences between breeds may become apparent.

The authors should remember that in a work of this nature, accurate taxonomy is as important as accurate cytology, and that one is valueless without the other, and to evaluate a particular cytological description it is necessary to have a knowledge of the reliability of both the cytology and the taxonomy.

It is a pity that the terms used to describe chromosome morphology have not been clearly defined. For instance, the terms 'telocentric' and 'acrocentric' appear to be used synonymously, or do the authors in fact intend them to mean different things? Do they imply, for instance, that some species have truly telocentric chromosomes lacking short arms while others do not? If this is so, the evidence for the existence of a true telocentric chromosome is, to say the least, doubtful. The terms 'subtelocentric' and 'submetacentric' mean very little; for instance, at what stage does a submetacentric chromosome become subtelocentric or acrocentric? A paragraph or section at the beginning of the next volume defining the terms used would be of immense value in comparison of the different karyotypes. In the same way, the use of the adjectives to describe chromosome size, such as 'small', 'large', 'medium', 'relatively small', etc. are vague, and are not in every case used consistently.

The karyotypes used to illustrate the chromosomes of the various species must be of the highest quality, and this is not always evident in Volume 1. The use of karyotypes overlaid with autoradiographic grains is not to be recommended for these purposes. The karyotypes should also be arranged in as consistent a manner as possible, particularly within each group of species. This consistency of arrangement again is not evident throughout the present volume.

All these points are important, and it is hoped that the authors will take steps to rectify them where possible in Volume 2. Nobody is more aware than this reviewer of the difficulties and magnitude of the task that the authors have set themselves, and it is to be hoped that this critical review will be taken in the constructive spirit

which is intended. The authors are to be congratulated on attempting a task of this magnitude, which if carried to its conclusion will be of inestimable value to mammalian cytogenetics.

JOHN L. HAMERTON

Human Population Cytogenetics. By W. M. Court Brown. North-Holland Research Monographs. Frontiers of Biology, Vol. 5. (Pp. xii + 107; illustrated + tables. 40s.) Amsterdam: North-Holland Publishing Co. 1967.

It is not often that a series of lectures can be usefully transformed into a book, and it says much for the author of the present volume that he has succeeded in producing a useful as well as a highly readable monograph. This monograph is based on three lectures given by the author last year at the University of London, and summarizes a great deal of the work on population cytogenetics carried out by the author and his colleagues in Edinburgh during the past six years.

The book is divided into four chapters only, the first dealing with chromosome studies on the general population, the second with the identity of the chromatin-positive male, the third presenting data obtained largely by the Edinburgh group on the function, behaviour, and sex-determining role of the Y chromosome; and the final, and this is the most interesting, chapter deals with structural autosomal heterozygosity. A great deal of most useful and interesting data are packed into this volume and the author is to be congratulated on the clarity of his presentation. The book is to be recommended to anyone interested in problems of chromosome variation as seen among ordinary men and women. From this approach, far more than from a study of congenital malformation, are we likely to obtain a real idea of the load of chromosome anomalies carried in the general population.

JOHN L. HAMERTON

Sex Chromosomes. By Ursula Mittwoch. (Pp. ix + 306; illustrated. 112s; \$14.0.) New York, London: Academic Press. 1967.

This valuable monograph on the evolution and behaviour of sex chromosomes fulfils two needs. It provides an up-to-date review of sex chromosome mechanisms in different groups of plants and animals, and it places the recent findings on human sex chromosomes and their abnormalities in the correct historical perspective. This approach should increase the value of this book, particularly to investigators and students with little basic knowledge of cytogenetics, as this essential introduction is provided in the first two chapters.

The next three chapters cover the sex chromosomes in plants, drosophila, and lepidoptera. Aberrant sex chromosome mechanisms are covered in Chapter 6. Chapter 7 deals with fishes, amphibia, reptiles, and birds. Man is given a chapter to himself—Chapter 8, and here

all the recent findings on sex chromosome anomalies in man are summarized and reviewed. Chapter 9 deals with the remainder of the mammalian species, while the sex chromatin is considered in Chapter 10. Chapter 11 deals with the thorny problem of hetero-chromatin, and the final chapter deals with the function of the sex chromosomes, and the mechanisms involved in the development of sex differences in man, and experimental sex reversal in various groups.

The author covers an extensive range of subjects and in general does it clearly and concisely. The volume of the work which she has covered makes her approach the only possible one, dealing only with what she considers to be the works most relevant to her subject. The book is well illustrated and can confidently be recommended to students and research workers alike, requiring a critical review of our knowledge of the sex chromosome mechanisms in man and other species. There are, however, a number of minor errors which have crept through the proof-reading stage and which will no doubt be eliminated in the next edition. The production is, in general, of the high standard that we have come to expect from these publishers, and the price is not unreasonable.

JOHN L. HAMERTON

Human Chromosomes. An Illustrated Introduction to Human Cytogenetics. By Audrey Bishop and Patricia Cooke (Pp. 56; illustrated. 8s. 6d.) London: William Heinemann Medical Books. 1966.

Increasing awareness of the significance of the role of cytogenetics in medicine has stimulated a demand for some easily assimilated form of rudimentary knowledge on this subject. In this book Mrs. Bishop and Mrs. Cooke have attempted to answer such a demand. Within the space of 56 pages, which include a glossary and index, a quite astonishingly large amount of basic information is supplied without appearing to be uncomfortably condensed. In addition to simple descriptions of cell division, the identification of chromosomes, varieties of structural and numerical chromosomal anomalies, sex chromatin, and the X chromosome, space is somehow found for brief references to the main clinical features of the better known conditions associated with chromosomal abnormality, a mention of the use of radioactive isotopes and their incorporation in newly synthesized DNA, and numerous illustrations. The latter demonstrate the familiar difficulty of obtaining clear reproductions of secondary constrictions and satellites, and the description of the various stages of blood, bone-marrow, and skin culture without specific detail induces a slight sense of frustration. But such criticisms may be easily overlooked in a consideration of the total information presented to the reader in so small a space. This book will be of use to schools, medical students, and any who wish to obtain a rapid knowledge of the background of the subject.

J. BARTLETT