

taller than enlisted persons; by 0.93 cm in this population. The effects of clothing on female anthropometry is, as might be expected, substantial. Maximum abdomen circumference, for example, can be reduced by 7.4 cm or more by foundation garments in more obese women. Many women, however, at least in this relatively young and slender population, have their body dimensions increased by foundation garments. Again, we find that the best single body measurement, i.e., most highly correlated, for estimating age in women is strap length, or essentially the distance from nipple to nipple taken with the tape over the back of the neck.

There is a question concerning the extent to which the measured sample is representative of the overall population of Air Force women. Probability sampling was not used, and the sample was stratified to what appears to be only a limited extent. As a result we find that 44% of the enlisted women measured had medical occupational specialties as opposed to 19% of all Air Force women. While this may or may not be of any practical significance in regards to body size, the age distribution of the sample raises a potentially more troublesome question. The median age is only 21.0 years, the eightieth percentile is 25.8 years, and the ninety-ninth percentile is only 46.5 years. While the age distribution of the female Air Force population is not stated, it is undoubtedly somewhat higher than this sample, a factor that must be taken into account when these data are utilized for design purposes, especially in view of the known increase in female weights, and associated body dimensions, up to about age 60. More importantly these data cannot be extrapolated, without appropriate adjustments, to the general female civilian population who are on the average about 2.1 cm shorter and 5.8 kg heavier. This, of course, is neither the intent nor the responsibility of the authors, but experience tells us that despite all caveats the data are likely to be so used.

In summary, considering this report as a presentation of detailed anthropometric statistics on a specialized, well-defined population, the authors have succeeded admirably. Errors appear to be at a minimum, and the publication has been put together in a logical manner with clear

explanations of precisely what the data are, how they were taken, how they were processed, and even to some extent how they can be interpreted and utilized. Finally, the descriptions of the measuring techniques, and the discussions of the various statistical concepts and applications are exceedingly well done, and could be quite useful as an introduction to both anthropometric methods and statistics.

HOWARD W. STOUT
Michigan State University

SEXUAL SELECTION AND THE DESCENT OF MAN 1871-1971. By Bernard Campbell. x + 378 pp., figures, tables, bibliographies, index. Aldine-Atherton, Chicago. 1972. \$14.75 (cloth).

As Simpson says in his contribution to this volume, Darwin "did not miss much," and this book is a tribute to his remarkable prescience in many areas of evolutionary theory which are currently receiving much attention. Darwinian evolution has been popularly considered as "survival of the fittest" or "adaptation to the environment" where the environment is usually meant to be climatic stresses, predators, or food sources. Darwin himself emphasized these aspects of natural selection in his *Origin of Species* and showed how evolution would logically follow from the "struggle for existence." In the last few years the many kinds of behavior in addition to just "survival" which can affect evolution have begun to be explored in great detail, and this work has resulted in the recognition of the great importance of social behavior in evolutionary change. Darwin himself became aware of the incompleteness of his theoretical approach and developed the concept of sexual selection to remedy it. In many ways the current interest in the evolution of behavior or ethology is akin to Darwin's attempts to expand his theory with sexual selection.

In the models of population genetics evolution by natural selection is due to differences in fitness among genotypes, and fitness is defined simply as the relative contribution of the genotype to the next generation. Usually the effects of mortality on

fitness are distinguished from those due to fertility, and Crow has devised a popular index to measure the amounts of natural selection which can occur by either differential mortality or fertility. Darwin's concept of sexual selection is comparable to the effects of differential fertility, although it is not as inclusive. According to Darwin, sexual selection includes effects due to competition among one sex for mating opportunities with the other sex and those due to differences in attractiveness to the opposite sex. This is a rather restrictive usage, and most of the contributions to this volume employ a more general definition which in most cases approximates the differences in fitness due to fertility.

The first five chapters, by the editor and four elder statesmen of biology, are more general and tend to be concerned with the descent of man, while the next five emphasize sexual selection in relation to other evolutionary concepts or in particular groups of animals. The final chapter by Caspari is a summary of the preceding ones plus some inferences for the course of human evolution.

Eiseley's opening chapter is an historical review of the development by Darwin of his views on sexual selection. Next, Simpson has a general essay on the problems of human taxonomy and current ideas on the descent of man, and Dobzhansky discusses genetics and race. Mayr has a comprehensive critique of Darwin's definition of sexual selection and how it relates to modern concepts. According to Mayr, Darwin used the concept of fitness in a simple, uncomplicated way; he simply meant "well-adapted." Mayr contrasts this meaning of fitness with that of the geneticists and states that the latter's definition of fitness as reproductive advantage may lead to a population becoming less "well-adapted." This is a continuing controversy on the meaning of adaptation, but if one's problem is prediction of genetic change, the definition of reproductive advantage works. Other definitions invoke value judgments; I think Darwin would have been convinced of the utility of the genetic view and many of the other contributors, particularly Trivers, base their whole argument on this definition.

Campbell's chapter is an ecological interpretation of human evolution. His anal-

ysis assumes an actual sequence of events in hominid history which seems to me to be dubious although generally accepted. Both Campbell and Simpson consider *Ramapithecus* to be the first hominid, but I think it is possible that these fragmentary fossils have nothing to do with hominid evolution. According to Campbell, these finds "fulfill our expectations to a remarkable degree," but this only follows from his assumption that the early hominids' small size and small canines imply that they survived by "cunning and an effective escape route from predators," and this in turn results from his assumption that "there is no convincing evidence at this early stage of the use of weapons to kill game." Obviously this depends on what one considers "convincing evidence"; but the great number of stone tools which are now being found in association with the early hominids convinces me that they were hunters, and specifically the large number of spheroids, polyhedrals, and bifaces seem to most likely have been used as missiles.

Sexual selection receives its most intense examination in the five chapters which have a more specific focus. Ehrman's discussion of genetics and sexual selection is concerned for the most part with data from *Drosophila*; and there is good evidence for mate preference by the females of this organism. There may be human analogies, but Ehrman's data on marriages among deaf persons do not seem to be of great relevance to human evolution. Trivers' article relates sexual selection to parental investment and shows how net reproductive success is maximized under various kinds of "reproductive strategies." Thus, it utilizes reproductive success as the measure of natural selection or adaptation. His interpretation of various types of reproductive behavior is bolstered by data from a wide variety of organisms, which are interesting and useful for anthropologists, but his use of human examples leave much to be desired. The fact that adolescent females in United States tend to marry up the socio-economic scale, and this is correlated with attractiveness and inversely correlated with steady dating and petting, leads Trivers to the speculation that this "human" behavior shows females adjusting their reproductive strategies. The zoological perspective on human behavior has

contributed to our understanding, but it also has its excesses. The simple-minded "Darwinian" model which explains all human behavior in terms of maximizing by the individual of his reproductive success leads to absurdities as petting as a reproductive strategy. This is an inadequate explanation of this and most variations of adolescent behavior in human populations.

The reviews by Selander on sexual selection in birds and by Crook in primates are very detailed and in addition have many original ideas. Selander shows how much Darwin used data from birds in developing the concept of sexual selection. The many similarities between birds and primates in their habitats and social behavior make this chapter of great interest to anthropologists. There is great variation among primates in the amount of sexual dimorphism. Crook's paper is a comprehensive analysis of the correlation of sexual dimorphism and sexual behavior in the framework of sexual selection. There is considerable evidence for sexual selection in primates, and, as for birds, this seems to be related to the fact that the birth rate is the major controlling factor of their populations.

Although human evolution is considered in other chapters, Fox's contribution is the only one concerned primarily with sexual selection and human evolution. He has expanded Chance's hypothesis of the development of cortical control of sexual behavior as the major factor in the increase in the hominid brain. In a multi-male group with the dominant males controlling sexual access to the females, the sub-dominant males would have to control their sexual impulses, and this leads to the cortical control of sexual behavior. Fox extends this model to the incest taboo and the prescriptive marriage systems of primitive peoples which severely restrict marriage partners. His analysis, although I don't necessarily concur with it, is an excellent demonstration of the usefulness of anthropology as a field in its combination of biological and cultural data. Cultural behavior has certainly lead to genetic changes, but I am not sure prescriptive marriage systems were "inevitable" because of the antecedent genetic and social characteristics of the hominids.

This volume is highly recommended for

its re-opening of an old subject that has resulted in a new approach to many aspects of evolutionary theory. There is considerable data in the book which may be new to anthropologists, and there is much speculation. As Crook says, interpretations of social and sexual behavior at times resemble "just so" stories. I think the same charge could be leveled against many of the hypotheses in this book, but nevertheless the data and speculations herein cannot help but stimulate one's own speculations.

FRANK B. LIVINGSTONE
University of Michigan

THE EMERGENCE OF MAN. By John E. Pfeiffer, xxii + 550 pp., figures, bibliography, index. Harper & Row, New York. 1972. \$12.95 (cloth), \$5.95 (paper).

John Pfeiffer's *Emergence of Man* is one of the very best books that deals with the evidence for human origins in a way suitable for the nonprofessional. He writes clearly, factually, and interestingly. The book draws together an enormously broad area of study into one theme. It begins with an outline of the emergence of man, proceeds to the fossil evidence for primate and human evolution, integrating some of the primate field study data, follows the development of tools, behavior, and anatomy of man up to the present, and then reflects on studies of human and non-human primate society, individual development, and behavior.

Despite the enormous breadth of coverage, Pfeiffer rarely makes factual errors, perhaps because he wisely had each chapter reviewed by several specialists in the field. Students of mine who have read the book report very favorably and recommend it as a beginning text in introductory courses.

There are some interesting changes from the first to the second edition that reflect important trends in the study of human origins. Of course, new studies have been added such as plate tectonics, Jolly's seed-eating hypothesis, Sarich's biochemical evidence for late hominid divergence (al-