tic and Collectivistic types of State take on a militaristic configuration as a result of emergence to predominance of the military hierarchy" (p. 49). Such statements make much of what he says appear to be description rather than reasoned analysis.

While it is possible to pick out many details that offend both the specialist and the thoughtful nonspecialist, there are also instances of insight that are worth considering. For example, Ribeiro discusses the Salvationist Empires in contrast to Capitalistic Empires. The impetus for the former is religion while mercantile activities characterize the latter. Tracing these two forms of society historically one can see that the forms taken by modern states cannot be understood without reference to their unique historical development. When modern planners recognize that the rationale of today's states is deeply rooted in their histories, they must seriously consider how they can hope to impose quite different systems of values on, for example, emerging nations. The difficulty of the task is seen in the frustration of most aid programs.

The basic problem with this book is that it simply tries to do too much with an insufficient theoretical model. Ribeiro has chosen cultural evolution as his explanatory framework. In his view evolution consists of a series of stages which are "models of social life" that result from technological innovation and are rationalized through ideology. The difficulty with this approach is that one tends to become transfixed by the task of putting societies into their proper typological slots, to focus on stages as if they have some inherently interesting properties and to neglect the factors that cause them. Cultural evolution is a descriptive, not an explanatory, model. It is not clear that this model can lead to significant insight into the causes of behavior. It seems rather that the model is inappropriate to the task. Ribeiro wants to understand process, but he gives us generalized views in stop action—the antithesis of process. And the same criticism can be leveled against other such attempts.

Perhaps it would be better to view isolated phenomena rather than whole societies. For example, what effect do sheer numbers of people have on social organization and communication, or surplus, scarcity, and differential distribution of resources on the forms society may take? We might consider cultures as ongoing life systems that exist in cooperation and competition with other, similar systems and whose internal organization is the result of a complex interplay of decisions in response to a series of conflicting demands, pressures, and opportunities. By examining decision making in regard to certain common phenomena rather than results (that is, evolutionary stages) we might get closer to the causal factors that social scientists discuss at length but rarely succeed in identifying.

FRANK HOLE
Department of Anthropology, Rice University, Houston, Texas

Zymology

The Yeasts. Vol. 1, Biology of Yeasts. ANTHONY H. ROSE and J. S. HARRISON, Eds. Academic Press, New York, 1969. xiv + 510 pp., illus. $19.50.

The 14 authors and editors of this volume have performed a commendable service for persons interested in the relatively small but diversified group of fungi known as the yeasts. This book deals with taxonomy, habitat, pathogenicity, cytology, life cycles, sporulation, hybridization, and genetics (two later volumes will cover physiology and biochemistry and yeast technology). It is a well-written and abundantly illustrated review of current knowledge.

Recent studies of yeasts that live in association with plants, insects, mammals, and marine environments have revealed many new species. Improved taxonomic procedures have added new genera of basidiomycetous yeasts to the many previously known ascomycetous genera. The chapter on taxonomy by Kreger-van Rij anticipates generic diagnoses that will be set forth in the author's chapter in the second edition of *The Yeasts: A Taxonomic Study* (J. Lodder, Ed.), now in preparation.

Of the few yeasts causing disease in animals, *Candida albicans* and *Cryptococcus neoformans* receive the large attention they deserve. Species of lesser importance in *Candida, Torulopsis, Trichosporon, Rhodotorula,* and *Pityrosporum* are considered. Serological and therapeutic aspects are discussed by authors who evidently know patients as well as yeasts that infect them.

Cytological features of *Saccharomyces cerevisiae* and some of the ascosporogenous fission yeasts are amply illustrated by electron micrographs. Those produced by the freeze-etch procedure are notable for their three-dimensional appearance. The functions of cell wall, plasma membrane, the endoplasmic reticulum and related organelles, vacuoles, mitochondria, and other components of the cytoplasm are discussed. The cytologically refractory nucleus is found to be similar to hyphal nuclei of other simple species of Ascomycetes such as *Aspergillus nidulans* and *Ceratocystis.*

Factors involving success of the acetate sporulation media commonly used in genetic studies of *Saccharomyces* and sporulation processes in haploid and diploid species are presented in detail. The various aspects of heterothallism and homothallism as viewed by geneticists are explained. Functions and mechanisms of sexual agglutination and conjugation are described, as are the procedures involved in hybridization of yeasts. The last half of the book is largely oriented to genetics and reaches its climax in a chapter covering life cycles, methodology, linkages, gene action, mutant characterization, suppression, and cytoplasmic inheritance. A discussion of types of life cycles and their evolutionary significance terminates the book.

LYNFERD J. WICKERHAM
Northern Regional Research Laboratory, U.S. Department of Agriculture, Peoria, Illinois

Ancient Maladies

Palaeopathology. Diseases and Injuries of Prehistoric Man. PAUL A. JANSSENS. Translated by Ida Dequeecker. Baker, London, and Humanities Press, New York, 1970. xiv + 170 pp. + plates. $8.50.

It is safe to say that scarcely a single English-speaking student of ancient diseases, except Calvin Wells in England, has been aware of the author of this little book and his wide-ranging medico-historical interests. Even the publisher is secretive on this score, revealing only that Janssens "is an industrial medical officer of the City of Antwerp and collaborator of the board of the Belgium National Service of Archaeological [*sic*] Excavations." However, his 20 listed publications (mainly in Dutch, French, and Spanish) indicate that he became interested initially (1957) in prehistoric representations of human hands and other anatomical details, perhaps as a result of having excavated in the caves around Santander, Spain, where there are some fine cave paintings. Subsequently he seems to have concentrated

on ancient human burials and cremations in Belgium with a view especially to the presence of pathological processes. One of the main results was a publication entitled *La Race de Furfooz: Son Age, Sa Pathologie* (1963), which Wells has cited.

In the present book the author makes only limited effort to supplement his personal observations (many of them more cultural than medical) with broad geographical comparisons and modern interpretations. Nearly 80 percent of the cited references (many names bear no references) date before 1960, and only one is as recent as 1965. Actually, the most up-to-date statements are those attributed to Wells. And there is no American paleopathology other than that of MacCurdy (1923) and Moodie (1923).

Because of these shortcomings, the book's main value is as an indication of the kind of work being done on the ancient diseases of western Europe. Yet in this limited respect, too, the book is neither comprehensive nor up to date. There is no mention, for instance, of the work of Møller-Christensen of Copenhagen on leprosy or that of Hamperl of Bonn on hyperostosis spongiosa (Janssens does not seem to know that this name has replaced "symmetrical osteoporosis"), and only passing mention of the work of Hackett, formerly of Geneva, on the treponematoses.

T. D. STEWART
Department of Anthropology,
Smithsonian Institution,
Washington, D.C.

Quantitative Genetics

Population Genetics in Animal Breeding. FRANZ PIRCHNER. Translated from the German edition (Hamburg, 1964) by Franz Pirchner and Max von Krosigk. Freeman, San Francisco, 1969. xiv + 274 pp., illus. $8. Agricultural Science Series.

This book begins with a succinct introduction to the basic concepts of Mendelian genetics and statistics. This is followed by chapters on the genetic structure of populations, forces changing gene frequencies, inbreeding, the genetics of quantitative variation, and several chapters on the theory and methodology of animal breeding. The book is similar to Falconer's *Introduction to Quantitative Genetics* (the best book available to date in this field) but has a more comprehensive treatment of animal breeding topics and a more complete coverage of animal breeding literature (especially of European work) and gives examples from domestic animals whenever possible (students should be particularly appreciative of this).

The book is well written, the translation is well done, and the book is easy to read. The coverage of the subject is excellent. The author's use of biological data to introduce and discuss topics is particularly successful. The most serious defect of the book is the atrocious referencing. There are numerous inaccuracies in text references and in the bibliography, and several references are missing from the bibliography. In a few cases wide coverage of topics is achieved at the expense of clarity; I found the description of linear heritability estimation unintelligible, for example. I was unhappy with the treatment of the importance of gene interaction effects in quantitative inheritance and the question of the number of genes controlling the observed variability for quantitative traits. The author does not mention epistasis as a possible cause of heterosis even though the critical experiments by Robertson and Reeve showed gene interaction effects to be involved, and states that "most or all economic traits are influenced by many genes, with many meaning dozens or even hundreds" without mentioning the evidence from Thoday's group at Cambridge that for the traits they have studied selection response is due predominantly to few genes. The expectations of the sire-daughter and dam-son covariances for sex-linked genes are given (p. 110) as $V(A)/2$ but should be $V(A)/\sqrt{2}$, this being an error in the source reference. The statement "Homozygotes of one kind were superior during the early period while homozygotes of the other kind survived better in the laying house. This caused both kinds of genes to be maintained" (p. 220) could be interpreted to mean that polymorphism can be maintained by selection in different directions at different stages of the life cycle, whereas this is true only when the overall effects of selection lead to heterozygote superiority in fitness.

This book is recommended for courses in quantitative genetics and animal breeding and as a useful source book of domestic animal data for use in population genetics courses.

RICHARD FRANKHAM
Department of Biology,
University of Chicago, Chicago, Illinois

Mutagens and Mutants

Mutation as Cellular Process. A Ciba Foundation Symposium, London, Feb. 1969. G. E. W. WOLSTENHOLME and MAEVE O'CONNOR, Eds. Churchill, London, 1969. xii + 244 pp., illus. $9.

The dazzling success of molecular biology in elucidating the basic features of replication, coding, transcription, and translation has extended to the nature of mutation. Thus, the single base substitution involved in missense mutations, the proof of the brilliant proposal of frame shift changes, the use of mutagen specificity in assigning base changes in tobacco mosaic virus and nonsense triplets in T4 phage, the molecular basis for dominance in phages and *E. coli*, and the demonstration of an enzyme system for removal of chemical and radiation-induced lesions from DNA all have contributed to our understanding of mutation. The book *Mutation as Cellular Process* is a reflection, in the words of R. F. Kimball, of the view that "mutation is not just an isolated event, a quantum event, or a simple chemical reaction, but a process in which cellular functions are intimately involved." The papers in the book reflect the immensity of the jump from the application of a mutagen and the fixed alteration in DNA.

Most of the studies of mutation involve the application of an input (mutagen) to a black box (cell or organism) from which an output (mutation frequency) may be determined. By altering factors impinging on (environmental) or within (genotypic) the black box, the output may be modified and some inferences made about the contents of the black box. While studies in vitro permit a more direct measure of the lesions induced in genetic material, the participants in this symposium have amassed a great quantity of data showing that models based on a direct interaction of a mutagen with the genetic material are too simple. The difference in output induced by irradiation of phages extra- and intracellularly (Kaplan, Lohr, and Brendel), by post-irradiation treatment (Clarke; Witkin and Farquharson), by genotypic and environmental differences (Kilbey), by allelic differences (Auerbach), by pairing and recombination (Magni and Sora), and by fractionating the doses and time of administration of radiation (Russell) all impress this fact upon us.

On the other hand, the direct measurement of the effects of ultraviolet irradiation and hydroxylamine (Grossman