Gourhan's rubrics and otherwise exposes the superficial objectivity of the former work. But this is not the principal aim of Grand's book. Unfortunately, it pretends to survey the field of Paleolithic art while the text is subordinated to pictures to an extent which takes it out of the class of the two books reviewed above. The reasonableness and nuance of Grand's critical discussion surpass by far the superficiality of the rest of the text and make one wish Grand would publish on a more professional level. As it stands, her *Prehistoric Art* is an addition not to the library of scholarship but to that of gift picture books.

MORTON H. LEVINE
Department of Anthropology, Brooklyn College of the City University of New York, New York City

Single-Cell Technique

The Radiobiology of Cultured Mammalian Cells. MORTIMER M. ELKIND and GORDON F. WHITMORE. Prepared under the direction of the American Institute of Biological Sciences for the U.S. Atomic Energy Commission. Gordon and Breach, New York, 1967. xvi + 615 pp., illus. $13.50; to libraries, $32.

A few years ago a distinguished high-energy physicist had the opportunity to attend a major international meeting in radiation research. It seemed to him that radiobiology was in a state of confusion and that extracting order from the chaos would indeed be a difficult task. This attitude on the part of scientists from other disciplines is understandable. Radiobiology has been bedeviled by a plethora of only partly related facts, and many such facts are still accumulating. Unifying concepts and general models have been disappointingly few. One reason for this has been the difficulty of understanding radiation effects in whole animals. Systems more appropriate for quantitative study, single-cell organisms of a wide variety of types, have seemed not to satisfy the need for data that can be applied to man.

This situation has undergone a significant change in the past decade, a major factor being the development by Puck and Marcus of a quantitative technique with single mammalian cells in culture, paralleling techniques in use with microorganisms. The enthusiastic acceptance of these techniques and their further development have been of importance in biology generally, and of paramount importance in radiobiology. A fundamental link now exists between studies in single cells and studies in intact mammals. Although, as Elkind and Whitmore fully recognize, single-cell studies cannot tell the whole story for the complex mammal, understanding of the performance of cells in compartments in vivo and of their importance to the survival of the whole organism has received great impetus because of studies in single cells.

This important subject has, however, lacked an authoritative text. This book, written by two men who have themselves contributed much to the development of the field, should fill this need.

The book contains chapters on survival-curve theory, in vitro and in vivo survival curves, the influence of chemical and physical factors on survival, recovery from radiation damage, effects on division and growth, chromosome damage, and biochemical effects. A useful appendix and a much-needed glossary are also included. After laying a background in survival-curve theory, the authors discuss cell culture experiments critically and in considerable detail. The coverage of the literature is excellent for the most part, and most of the important techniques and procedures and the results obtained with them are described *in extenso*. Considering the rapidity with which this field is moving and the time required for publication, the book is well up to date in most of its chapters. Careful attention has been paid to the definition of terms, and some of these, such as "recovery" and "repair," have been clarified.

Considerable emphasis is placed on the importance of synchrony techniques, the development of which has contributed so much to our present understanding of the kinetics of irradiated populations, and on the effect of variations in age on response to irradiation. The authors predict (correctly, in my opinion) that synchrony techniques will have an even larger part to play in the future.

The material is presented in such detail that its contents will be appreciated most by the serious student and the specialist. However, there is much important material here for anyone concerned with the quantitative aspects of radiobiology. Although the chapter on survival-curve theory, for example, will not be easily understood by biologists lacking a physical background, and the authors suggest that it can be omitted by some readers, it is to be hoped that just those readers will study it carefully. It contains important principles that should be appreciated by more workers in this field.

The book has a logical beginning but, like radiobiology itself, no definable end. Its contents should serve to interest and guide others who may provide future contributions to our understanding in this field.

W. K. SINCLAIR
Division of Biological and Medical Research, Argonne National Laboratory, Argonne, Illinois

Parasites

Plant Nematology. W. R. JENKINS and D. P. TAYLOR. Reinhold, New York, 1967. xviii + 270 pp., illus. $12.50.

The authors designed this brief text primarily for general courses in plant nematology but also with an eye toward "plant pathologists, soil microbiologists, county agents, extension specialists and others concerned with plant production." Rather an ambitious goal.

An introductory text in nematology should, above all, interest the reader by placing the specialized subject in a frame of reference to the rest of soil and plant biology. It should also provide him with some tools and information he can use. On these criteria, the book falls short of being a satisfactory introductory text. The largest part of the text (62 percent) is an encyclopedia of important parasitic genera. By page count, the introduction and section on morphology comprise 16 percent, control takes 10 percent, and the chapter on damage to plants is a scant 6 percent. Illustrations are prominent, consisting of photographs of symptoms and bold, stylized diagrams of diagnostic features of each genus.

The discussion of the zoological position of nematodes is weak, there is no comprehensive treatment of nematode ecology or of the ecology of disease, and there is very little nematode physiology. The role of nematodes in the general biology of the soil is poorly presented. The text does not treat the larger aspects of the subject.

Another limitation is the lack of discussion of techniques. From this book the neophyte will gain no information on methods of collecting and handling nematodes, of preservation,

slide preparation, or inoculation procedures; nor will he learn any of the pitfalls of field plot work or greenhouse tests.

He will, however, find a succinct discussion of each of the genera known to contain species parasitic on plants. Each chapter begins with a brief history of the genus, a general description of its morphology with emphasis on diagnostic characters, a review of publications on the biology and host-parasite relations, and a recommendation for control. The chapter ends with a brief list of references.

As a text for college work in nematology, this book invites comparison with Christie's *Plant Nematodes: Their Bionomics and Control* (1959) and Thorne's *Principles of Nematology* (1961). Christie's book is heavily inclined to plant pathology and Thorne's to nematode taxonomy. Each reflects the experience of a lifetime of work in the field at a time when the nematologist ranged over the entire vast territory of his subject. Neither book is a satisfactory elementary text. Jenkins and Taylor have succeeded in assembling a brief, simple review of some aspects of the subject written in a straightforward manner. It is a useful, but not a sufficient introduction to plant nematology.

V. H. DROPKIN
Plant Industry Station,
U.S. Department of Agriculture,
Beltsville, Maryland

Boron Compounds

Polyhedral Boranes. EARL L. MUETTERTIES and WALTER H. KNOTH. Dekker, New York, 1968. viii + 197 pp., illus. $13.50.

The existence of complete series of polyhedral borane anions and carboranes was not apparent at the beginning of the present decade. A thorough review of this subject has not recently been attempted in a single volume, and consequently this book will be of more than passing interest to research workers in all fields of chemistry. One very strong point in its favor is the emphasis placed upon the many exciting and unsolved problems inherent in the field of polyhedral boranes and carboranes. As extreme examples, the imaginative physical-organic chemist will certainly see the probable utilization of polyhedral borane and carborane substituents as probes for the elucidation of organic reaction mechanisms, and those interested in the structure of electrolyte solutions will find a complete shopping list of novel anions available for further experimentation. In addition, this book could amply serve as a textbook in a short special-topics course for graduate students in inorganic chemistry.

The authors have expounded their own views on reaction mechanisms and the thermodynamic properties of the best-characterized polyhedral species. This is fitting, since a good deal of the original work was carried out in their own laboratory. Their attempt to bring the reader up to date is illustrated by the inclusion of a final chapter which deals with research carried out while the manuscript was in preparation. An underlying theme is the necessary comparison of polyhedral borane structures with the structures of transition metal coordination compounds and the thermal rearrangement of the former species. Synthesis methods are succinctly described.

The book is completely documented, and amply illustrated. Certain drawings have been somewhat stylized or otherwise distorted, but the serious reader will find no objection to them. The style and organization of this little volume should allow the uninitiated to develop a good understanding of this very new topic with a minimum of frustration. If this indeed proves to be the case we may expect to see the profitable application of polyhedral boranes to many other fields of chemical science.

M. F. HAWTHORNE
Department of Chemistry,
University of California, Riverside

A Problem in Theoretical Physics

The Many-Body Problem in Quantum Mechanics. N. H. MARCH, W. H. YOUNG, and S. SAMPANTHAR. Cambridge University Press, New York, 1967. x + 459 pp., illus. $14.50.

Several different branches of theoretical physics can claim significant advances in the past decade and a half as a result of the development of powerful and sophisticated methods of treating the quantum-mechanical many-body problem. But aside from the common difficulty in treating a system of many interacting particles, the form and even the statement of the problem are different in different areas. Nuclear physicists are usually interested in the energy of a particular state, and their problems have to do with the complicated forces and large degeneracies. Atomic physicists know the forces, but have to deal with degeneracies and a relatively small system. Solid-state physicists, on the other hand, are frequently less interested in ground-state energies than in the spectrum of the elementary excitations and in the temperature-dependent response of a large system to external stimuli. Naturally enough, then, most books on many-body theory either have been primarily concerned with formalism or with treating in depth only one branch of the problem, or have combined a discussion of formalism with a collection of reprints of important papers dealing with specific problems.

The present work attempts to include all the areas of physics in which substantial progress has been made on the many-body problem. The authors' intent is "to provide, for the reader who [wants] to learn about the many-body problem, an account both of the methods used and the physics which emerges, within a single cover," and there are chapters on single-particle approximations, atoms and molecules, second quantization, many-body perturbation theory, Fermi fluids, nuclear matter, superconductivity, many-boson systems, grand partition functions, and Green functions, together with ten appendices. There are several problems provided with each chapter and a serviceable index at the end.

This treatment would probably be rather difficult for a student with no previous knowledge of many-body theory. Everything is here, but because of the large scope of the book the introductory chapters are necessarily brief and the discussion of basic concepts tends to be a bit superficial. However, the book is highly recommended for a physicist who has some knowledge of the formalism or for one who has worked in one area and wants to learn of techniques used in others. For such a reader, the chapters are self-contained and the notation is standard. A typical section contains a brief discussion of the physical picture, an outline of the appropriate calculation with important references given directly in the text, and a presentation of the results. There are strong sections on Fermi fluids and many-boson systems. Perhaps the weakest chapters are those on atoms and on nuclear matter, in