

comb, *Rock Art of the American Indian* is an enormously fascinating work, containing a very large number of illustrations in black-and-white and in color, and both line drawings and photographs. These are unnumbered and I have not tried to count them. The coverage includes both pictographs (paintings) and petroglyphs (produced by carving or pecking or both) in many parts of North America north of Mexico, and some from the northern Mexican states. Middle America, Central America, and all of South America are excluded; hence the title of the book is somewhat misleading. Still, the coverage is about all that one can expect in a single book kept to a reasonable price.

No one can really treat so vast a subject as the rock art even of "North America" in a single book. Grant himself estimates that there are "possibly some 15,000 sites" in the areas treated, and I would guess that there are at least that many. Therefore one must select some of the more spectacular ones, as Grant has done, and further, select some of those in the most immediate danger of destruction by weathering or vandalism.

Grant is one of those artists, few in number and of intense dedication, who have spent untold labor in copying this form of American Indian art and religious symbolism, in the face of increasing vandalism in the age of the jeep and motorbike. Unlike Kirkland, he has reproduced many figurations in brilliant color against a neutral background of gold or brownish gold instead of the natural rock colors of the caves and rock-shelters. One can hardly argue about this, however, so long as the actual figurations are done with complete accuracy in dimensions and form: immediate *salvage*, in the form of artist's reproductions and photographs, is the main thing; interpretation (if possible, which is not often) can wait.

One thing puzzles me greatly. Grant, in his survey, mentions a few of the thousands of pictographs in Texas, but his selections are all from protohistoric or historic times (including men on horseback) and he has none whatever from the incredibly rich material, several thousand years old, to be found in the Rio Grande-Pecos River junction area. His selections show only some clumsy drawings characteristic of the latest style in west central and western (Trans-Pecos) sections, probably done by Lipan and Comanche wan-

derers. Conversely, Newcomb discusses rock art on several continents but says nothing about the very rich material in Santa Barbara and Ventura counties in California. It is as though neither man is aware of the most fabulous rock art in another part of North America. There are some very close resemblances in symbolism between the art of the Santa Barbara and the Pecos River areas that need to be studied. (I do not know why the art of these two areas, about a thousand miles apart and with nothing similar in the intervening area, shows such similarities; this is a prime problem for students of pictographic art.) One last point is that in the book under review Grant pays very little attention to the art of the Santa Barbara-Ventura area, which he calls "Chumash" after the historic inhabitants of the area. He has treated this in other publications (listed in the bibliography he provides), and I would suggest that the reader see *Natural History* (June-July 1964) as a convenient source for this "Chumash" art, especially that at Painted Cave in the hills behind Santa Barbara. The deficiencies I have mentioned do not detract too much from the overall excellence of the books, both of which are absolutely necessary for any serious student of pictographic art.

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Cell Transplantation

Radiation Chimaeras. D. W. VAN BEKKUM and M. J. DE VRIES. Academic Press, New York, 1967. x + 277 pp., illus. \$20.

The term "radiation chimera" was proposed by C. E. Ford and collaborators to designate an individual whose blood-forming tissue contains cells that differ genotypically from the individual's own cells. The chimeric state is established by injecting hemopoietic cells, for example, bone marrow, from a genetically dissimilar donor into an irradiated recipient; and the transplanted foreign cells are able to proliferate because the recipient's immune system has been depressed by irradiation. Before most investigators accepted that a chimeric state could be achieved experimentally, the mechanism by which injected hemopoietic cells prevented acute deaths from whole-body ionizing irradiation was vigorously debated. The vigor of this debate

was exceeded only by that of arguments that followed about the cause of secondary disease, a syndrome from which many animals subsequently die as a result of the foreign hemopoietic graft.

The authors of *Radiation Chimaeras* have, with their colleagues in Rijswijk, The Netherlands, contributed a significant quantity of valuable experimental data which have helped direct and solidify current thinking in the field they review in this book. *Radiation Chimaeras* is, however, more than a critical review, because it includes many data obtained by the Rijswijk group that have not appeared in the open literature. This is especially evident in a chapter on pathology of radiation chimeras which presents an excellent description, together with photomicrographs, of tissue changes associated with hemopoietic-cell grafting, and particularly of changes occurring during the course of secondary disease.

Although primarily directed to the specialist, the book will also be useful to the nonspecialist because it includes a sufficient amount of clearly presented background information. The introductory historical resumé is reasonably complete, but perhaps shows too much concern for who did what first. Literature coverage extends into early 1965 and is purportedly selective so as to include primarily those reports which provide clearly interpretable results and give satisfactory proof of chimerism. These restrictions, while certainly warranted, are in some cases influenced by what an investigator considers interpretable results and satisfactory proof. Readers relatively unfamiliar with the subject will appreciate the reinforcement through repetition of well-established observations and their cross-references among chapters. Although the repetition may hamper those familiar with the field, there is no difficulty finding sections that describe controversial areas of research, about which the authors clearly state their personal opinions.

In general, each subject related to conditions under which chimerism can be established is treated comparatively, progressing phylogenetically from rodent to man. The authors attempt to bridge the gap between these two species by way of the monkey, in which they have studied bone-marrow transplantation and secondary disease rather extensively during the past few years.

Results of animal experiments are evaluated in terms of their relevance

to hemopoietic-cell transplantation in humans. The concluding chapter presents examples and problems of bone-marrow transplantation in man, and emphasizes that many failures occurred because insufficient animal data were available, particularly with regard to the number of injected cells, donor-host compatibility, and radiation exposure. The authors believe that the wealth of experimental data and techniques now available, together with the acquisition of additional information on subhuman primates, should provide a more rational clinical basis for successful transplantation of hemopoietic cells and for control of secondary disease.

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The Use of Geostatistics

Scientific Method in Analysis of Sediments. JOHN C. GRIFFITHS. McGraw-Hill, New York, 1967. xii + 508 pp., illus. \$17.50. International Series in the Earth and Planetary Sciences.

This attractively produced volume presents a synthesis of the experience of one of the foremost pioneers in the application of statistical methods to sedimentology. The rise of mathematical procedures in geology has been painfully slow, and even though Charles Lyell made a fundamentally important contribution over a hundred years ago, geologists have been tardy in perceiving the need for a quantitative grounding for their science.

A large proportion of the geologists of the world have entered the subject as a result of following the course of least mathematical resistance, and this is clearly not a state of affairs conducive to the spread of quantitative procedures within the field. Notwithstanding the general condition, an increasing interest in geostatistics is developing, and an *ad hoc* committee for an Association of Mathematical Geologists has now been formed. One of the reasons for the catalyzation of activity on this front is clearly to be found in the growing availability of electronic computers. Griffiths's book, with its wedding of statistics and descriptive sedimentology, is therefore a timely arrival.

Although the treatment of geostatistics forms the main part of the text, considerable coverage is given analyti-

cal procedures in sedimentology, and there is a discussion of sampling techniques in sedimentary rocks; the book contains a wealth of information on various aspects of the analysis of sediments, and there is much sound advice on the planning of analyses. The complexity of the statistics used is about that reached in an introductory course in applied statistics.

The quantitative approach to the expression of the properties of sedimentary rocks is reviewed and the subject of the measurement of grain size and grain shape receives a well-worked-through treatment. The measurement of grain fabric and grain packing is treated informatively, as are also modal analysis and mineral composition. Mostly, the treatment is in terms of the methods of univariate statistical analysis; these methods are dealt with in an authoritative and instructive manner. The analysis of two or more variables is presented in some haste in only the final two chapters, and this part of the book tends to fall short of the sound development of the main part of the volume. In a few places the text would have profited from a little more editorial attention. This volume will be a very useful accessory to a course on sedimentologic techniques and may be recommended as a university text.

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Vertebrate Zoology

Structure and Habit in Vertebrate Evolution. G. S. CARTER. University of Washington Press, Seattle, 1967. xvi + 520 pp., illus. \$9.50.

This is the American edition of a volume in the British "Biology Series," issued at first hand by Sidgwick and Jackson, London, and edited successively by Julian Huxley, Munro Fox, and Phillips Dales. Previous volumes by Carter are *A General Zoology of the Invertebrates* (1940) and *Animal Evolution* (1951). Books in this series have been always competent and sometimes excellent texts on biological specialties. The author intends the present volume not to be "a full text-book of vertebrate zoology" but "to be read in parallel with one of the usual text-books." Questions will arise as to the usefulness of so detailed and lengthy a tome as merely supplementary reading.

The author is concerned not with ra-

diations within major groups of vertebrates but with the origins and basic adaptations of each major group, mostly the classes of Vertebrata. In each case paleontology, morphology, physiology, and overall ecology are excellently reviewed on the basis of the technical literature. As this book depends heavily on A. S. Romer's *Vertebrate Paleontology* and is, indeed, suggested as a supplement to that work, it is unfortunate that only the 1945 edition was available to Carter. Romer's 1966 edition is greatly modified and makes some of Carter's book obsolete from the start. Carter's work can nevertheless be recommended for students of the characteristics of major grades in vertebrate evolution.

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Books Received

Advances in Enzyme Regulation. Vol. 5. Proceedings of the 5th symposium on Regulation of Enzyme Activity and Synthesis in Normal and Neoplastic Tissues, Indianapolis, Ind., October 1966. George Weber and Catherine E. Forrest Weber, Eds. Pergamon, New York, 1967. xiv + 469 pp., illus. \$20.

Advances in Heat Transfer. Vol. 4. James P. Hartnett and Thomas F. Irvine, Jr., Eds. Academic Press, New York, 1967. xii + 458 pp., illus. \$19.

Analytical Chemistry of Cobalt. I. V. Pyatnitskii. Translated from the Russian edition (Moscow, 1965) by N. Kaner. D. Slutzkin, Ed. Israel Program for Scientific Translations, Jerusalem, 1966; Davey, New York, 1967. xvi + 224 pp., illus. \$14. Analytical Chemistry of Elements Series.

Behavior-Genetic Analysis. Jerry Hirsch, Ed. McGraw-Hill, New York, 1967. xviii + 552 pp., illus. \$12.50. McGraw-Hill Series in Psychology.

Bertrand Russell: Philosopher of the Century. Essays in His Honour. Ralph Schoenman, Ed. Atlantic Monthly Press (Little, Brown), Boston, 1967. iv + 326 pp. \$7.95.

Biomedical Aspects of the Laser. The Introduction of Laser Applications into Biology and Medicine. Leon Goldman. Springer-Verlag, New York, 1967. viii + 232 pp., illus. \$11.40.

The Birds. Roger Tory Peterson and the Editors of Time-Life Books. Time, New York, 1967. 128 pp., illus. \$3.95. Young Readers Edition, Life Nature Library.

Catalytic Hydrogenation over Platinum Metals. Paul N. Rylander. Academic Press, New York, 1967. xiv + 550 pp., illus. \$22.50.

Computer Simulation of Competitive Market Response. Arnold E. Amstutz.