might be expected; cultural diversity also extended into many facets of social and ceremonial life.

The evidence presented reinforces the current anthropological view that there is no single "Eskimo culture" spread across the vast North American continent. Rather, there are numerous "cultures" of Eskimo peoples which share some traits because of geographical or historical similarities or both and which simultaneously diverge to reflect individual local traditions.

The book merits scholarly attention and should also attract a wide audience among public administrators, teachers, and others working in Alaska generally.

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Rocks from Earth's Interior

Ultramafic and Related Rocks. P. J. WYLLIE, Ed. Wiley, New York, 1967. xviii + 464 pp., illus. $22.50.

The aim of petrology is to study the "beginning," development, alteration, intergradation, and reconstruction of rocks. According to modern views based upon experimental and theoretical thermodynamic data, geophysical measurements, and geological observation and interpretation, the ultrabasic (=ultramafic) rocks should yield new information on the nature of the deep crust of the earth. These rocks have therefore recently come into the glare of geological publicity.

The ultramafics are chemically characterized by relatively low contents of O, Si, Al, alkalis, and high Fe, Mg, Ca. Mineralogically this is reflected by absence of quartz and (most) feldspars, and by high concentrations of olivine, pyroxene, and sometimes garnet and hornblende, which are relatively heavy minerals (close-packed silicate lattices). In all respects the ultramafics form the antipole of the granitic rocks, which are high in quartz and feldspars, are specifically light, and reside in shallow depths (because they are forced upward by the gravitational field). The ultramafics abide at much deeper levels (indeed, they may, at least in part, derive from the earth's mantle) and only occasionally appear in the upper parts of the crust. As meteors are obvious messengers from outer space, the ultramafics are, on this theory, messengers from inner space, that is, from the interior of the earth. How and why these heavy rocks manage to migrate against the gravity gradient is a moot question. Are they carried upward by floating continents emerging from the depths? Or do they come from dispersed molecules and atoms slowly migrating through preexisting rock masses perhaps attached to some "carriers" (Mg-metasomatism)?

The account of ultramafic rocks presented in this book is divided into 43 chapters written by 37 authors. The many expert authors have produced variety, but also have introduced problems by overlap and gaps in the coverage. The editor has smoothed the discontinuities in several ways, particularly by writing a special introduction for each chapter which attempts to coordinate and relate the chapter to other chapters and to furnish cross references.

The large number of known natural occurrences are classified and divided into categories, and the fundamental problems are discussed. Among the diversified and complicated questions treated are the intricate relations of the layered intrusions, the minor intrusions, and the zoned complexes. Much room is given to the Alpine-type ultramafic associations. The problems are multiplied by including kimberlites and carbonatites. There is a very useful compilation of the worldwide distribution of kimberlite, until recently the only primary terrestrial source of diamonds. No satisfactory hypothesis for the origin of kimberlite can be offered; some kimberlites may have developed from fluidization systems which followed the explosion of deep, gas-charged magma.

The mafic and ultramafic small nodules, constantly found in kimberlite but also in basalt and other basic igneous rock, promise to reveal the chemical and mineralogical composition of the earth's mantle, and have been intensively studied. They are variously interpreted as representative of the primary basaltic magma formed as bottom cumulates in temporary reservoirs or formed marginally during upward flow. But eclogites, except in the form of nodules, are not treated.

There are special chapters on the geochemistry and on the petrogenesis of the ultramafic rocks. Experiments in the system CaO-MgO-SiO_2-CO_2-H_2O pertinent to the relations between kimberlite and carbonatite are explained and discussed.

A review of 12 pages on petrogenesis, on the significance of the geochemical results, and on the relations of ultramafic rocks to the upper mantle completes the text. There are about 1000 references, an author index, and a subject index.

The book is stimulating, full of facts, and extremely useful. In this short review a list of the 37 authors and the titles of the 43 chapters would have taken one fourth of the space available. I can therefore just summarily compliment each author on his logical and authoritative presentation, reliability, and clear and easy style of writing. The book is very readable, and is a must to every geologist who studies and wants to understand how defined geoprocesses may give birth to these fascinating rock products.

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Instrumental Optics

Interferometry. W. H. STEEL. Cambridge University Press, New York, 1967. x + 271 pp., illus. $11.50.

The wavelength of light is about half a micron, or one 20-millionth of an inch. It is the ideal tool for measuring small thicknesses, surface finish, or movements down almost to atomic dimensions, and the technique ordinarily used is interferometry. W. H. Steel of the National Standards Laboratory in Sydney, Australia, has now written an authoritative, concise, contemporary survey of this important field. To do so, he has had to draw heavily on coherence theory and Fourier transform relationships. Indeed, chapters 2 through 4, only 43 pages, manage to cover most of the fundamentals of modern instrumental optics, and the reader must read and understand them well, for the concepts and terminology developed there are used without further explanation in the rest of the book.

Chapter 5, on two-beam interferometers, is similarly basic, for in it the author defines significant concepts not previously sharply distinguished, even by experts: tilt, shift, shear, delay, and lead. Shear may be lateral, rotational, or radial. Using this rich and compact conceptual framework, Steel can then economically unify things which are as seemingly diverse as spectroscopy, radio astronomy, holograms, and the familiar optical interferometers. This of course means that the tricks used in each are seen to be applicable to the others.

The generality of the treatment will lead the careful reader to a deep under-

standing, but will leave the casual reader confounded, and the book is not a handbook or users' guide for interferometers. Many of the most important practical devices are described very briefly. The bibliography relieves this problem, and many of the 400 references are as recent as 1966.

Interferometers need coherence, and many people have supposed that the laser would replace all less coherent sources for interferometers. Steel does not share this belief; he points out cautiously the disadvantages that arise, as well as the important advantages, but does not really survey this new side of interferometry.

On the other hand, he gives major emphasis to the application of interferometry to spectroscopy. The interferogram of a source is, within the limits of the "instrument function," the Fourier transform of the source spectrum. If it is recorded by sampling and digitizing, the spectrum can be determined by calculation, although a big computer is needed. Steel has made fundamental contributions to this field, and he gives a very clear description with many practical considerations reflected in his treatment.

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Polymerization Mechanisms

The Stereochemistry of Macromolecules. Vols. 1 and 2. A. D. KETLEY, Ed. Dekker, New York, 1967. Vol. 1, xii + 412 pp., illus., $19.50; vol. 2, xiv + 383 pp., illus., $18.75.

These are the first two volumes of a three-volume monograph designed to present a survey of polymerization mechanisms, in which a high degree of steric control is possible during the chain growth, in concert with a discussion of the analytical methods by which the steric structure of polymers can be explored. It is perhaps appropriate to note here that since this latter objective is not met until volume 3, the first two volumes dealing exclusively with polymerization procedures and mechanisms, the title of this series might be considered to be somewhat misleading.

Volume 1 is devoted to discussion of the polymerization of olefins and diolefins actuated by catalysts of the Ziegler-Natta type. The definition followed in this volume for this class of catalysts is the generally accepted one, that is, a Ziegler-Natta catalyst is one that is the product of a reaction between compounds of the transition elements of groups IV to VIII and compounds such as alkyls, aryls, or hydrides of metals from groups I and IV. Thus both heterogeneous and homogeneous systems are covered. The first volume, rather than attempting to be encyclopedic in scope, has focused on what may rightly be considered to be some of the more salient features of Ziegler-Natta polymerizations. Neither the theoretical nor the experimental aspects of these systems have been neglected. The volume contains six chapters, and all are uniformly successful. Several chapters are definitive reviews in areas in which previous presentations have been rendered partially obsolete by recent findings. The lucid chapter by Cossee on the quantum-chemical aspects of the mechanism of polymerization may be cited as a particularly fine example.

Volume 2 is somewhat broader in scope in that it covers both ionic and free-radical systems where polymerizations are induced by catalysts other than those of the Ziegler-Natta type. As in its companion volume, the major emphasis is placed upon the mechanism of polymerization. In the main the presentations are up-to-date and quite comprehensive.

In summary, although a number of authors are represented in these two volumes, the style throughout is generally uniform. It was particularly gratifying to find that in this coverage many of the speculative mechanisms are impartially evaluated. For those familiar with the field, this feature will make these volumes of value; the newcomer will find a unified (particularly in the case of volume 1) and useful survey of this area of polymer science.

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Particle Systems

Topics in Several Particle Dynamics. K. M. WATSON and J. NUTTALL, with a chapter by J. S. R. CHISHOLM. Holden-Day, San Francisco, 1967. x + 121 pp., illus. $7.50. Advanced Physics Monographs.

This rather unusual little book touches many bases of recent activity in nonrelativistic quantum mechanics. Its main emphasis is on the three-body problem, but multichannel two-particle systems are also treated. (The "several" of the title seems a slight inflation.) It discusses both the formal development in these subjects and some of the recent calculations. In the three-body problem the Faddeev equations and their variants are described. Their use with separable interactions is presented along with some results on the three-nucleon system. Multichannel two-body scattering theory is sketched and is then used as a framework for discussing variational principles. Results of application of these methods to atomic systems are given. Most of this is done in the modern framework of integral equations and functional analysis, and some of the analysis is developed along the way. Even many-body theory is described, so that it can be compared with the three-body problem and the difficulty of disconnected diagrams.

All this is done on 117 not overly large pages. Therein lies the major attraction or major shortcoming of this book. To do so much in so little space the authors must be very selective as well as very telegraphic. Their selectivity, to which the "topics" of the title refers, is not only in subject but also in chronological emphasis. Very little of the "classical" work on any of the chosen topics is discussed. That is not necessarily a fault in a little book intended as a guide to the recent literature. One exception to the emphasis on recent work is a welcome clarification of the relationship of the earlier Watson multiple-scattering theory to the work of Faddeev. More serious perhaps than the selection of topics is the terseness of presentation. Within any chosen topic the authors leave little of importance unmentioned, but often mention is all a problem gets. Thus the book is certainly not a textbook, nor is it one of those sets of published lectures which so often substitute for texts (although we are told that the book grew out of lectures Watson gave at Texas A. and M.). To follow the book, the reader must bring to it a considerable knowledge of scattering theory and some idea of what the problems are for which the authors are describing solutions. With this equipment he should find the book a useful guide to the literature. Perhaps not one with the thoroughness and completeness of a "Guide Michelin," but one which should help him find the points of interest and keep him on the road. This is probably enough for most travelers.

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