

ment. The author devotes somewhat more than 10 percent of his book to a detailed revelation of the project from its whimsical beginning as an offshoot of the activities of the American Miscellaneous Society, through early progress, complex and contentious troubles, and final collapse. For one wishing to prove that the "government of science" is not without its imperfections, a more devastating story could not have been chosen, and no opportunity was lost in this telling.

The next two chapters, together making up just under 20 percent of the book, might have been one, since they really tell one story. Their titles, "High energy politics" and "MURA's last stand," indicate the subject. They examine how the questions of what and where have been resolved in the field of high energy physics in the past several years, presenting details of the story of the partnership of the Midwestern Universities Research Association and the Congressional delegations from its region, aimed at saving their plans for a very large installation. Included is a highly intimate and revealing scene in the White House.

The book ends with a chapter entitled "The new politics of science." Using as case studies the increasingly restrictive conditions being placed on recipients of NIH grants by pressure from Congress, and the events leading to the decision to place at Weston, Illinois, the 200-Bev accelerator designed by the Lawrence Radiation Laboratory at Berkeley, the author describes the new atmosphere developing in federal support of science. This climate is one in which emphasis is placed on greater relevance to national goals and practical needs, tighter controls by the government on detailed accountability of expenditures, more concentration in full-time government employees of the power of detailed selection of research activities and objectives, and increased attention to the distribution of the funds throughout the nation.

At the close Greenberg asks a question: "In a world plagued by misery, is it decent for fine minds and great wealth to be dedicated to the interior of the atom and the mysteries of the planets? Or, as the ideologists of pure science would contend, does the unfettered spirit of inquiry provide the surest way to knowledge and salvation?" The gist of the book is that a simple "yes" in response to both parts of this question would merely demon-

strate the responder's "chauvinism, xenophobia, and evangelism."

The reviewer finds it difficult to give an overall description of the book. It is not a very careful history which avoids presumptive interpretation. Neither is it a deeply penetrating and constructive critical essay. Perhaps it might be best described as a historical novel, written in the reportorial style, with titillating tidbits liberally dispersed among important facts. The cast is drawn from the roster of prominent men in the councils of science. Not only are the actions of the characters chronicled, but they are given the opportunity, here and there, to place their wit before their wisdom. By implication they are also provided with emotions and motivations. All this lends the book a lively and interesting readability. But assessing motives on the basis of actions is a hazardous business at best, and the reviewer found himself disturbed by a style that seemed to suggest the least generous interpretation. For example, the author uses the term "machinations" repeatedly to describe the successful advocacy of a presumably worthy cause. It must be assumed that he is aware that the word connotes crafty planning of evil schemes. The overall effect is to demean, and few men or institutions went into this book but came out poorer.

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## Pacific Anthropology

**Polynesian Culture History.** Essays in Honor of Kenneth P. Emory. GENEVIEVE A. HIGHLAND, ROLAND W. FORCE, ALAN HOWARD, MARION KELLY, and YOSHIKO H. SINOTO, Eds. Bishop Museum Press, Honolulu, Hawaii, 1967. xx + 594 pp., illus. \$16.50. Bernice P. Bishop Museum Special Publication No. 56.

The essays collected in this festschrift address a very wide variety of subjects in the general topical area of Polynesian anthropology and display a range of methodological approaches. There is a certain broad uniformity of outlook as a result of the fact that the contributors represent a kind of general grouping in Polynesianist circles, holding in common a collection of general attitudes on a number of points of theory and interpretation. Many distinguished academic

Polynesianists are not to be found among the contributors.

The organizational scheme of the volume utilizes two major but not mutually exclusive principles: one set of papers is grouped according to anthropological subdisciplines (linguistics and archeology), and the remainder according to the geographical subdivision of Polynesia to which they refer (General, East, West, Hawaii, and Outliers). While this scheme reflects the disciplinary interests and the geographical areas in which K. P. Emory has worked, it does not facilitate use of the volume.

The majority of papers are of a descriptive or analytic nature, dealing with narrowly defined aspects of specific Polynesian cultures or pan-Polynesian traits. For example, there are a discussion of the bird-man motif in Polynesian material culture by Barrow, one of sea creatures and spirits in Tikopia by R. Firth, and a well-written survey of Polynesian-origin theories by Howard. These are contributions of the type normally found in the *Journal of the Polynesian Society* or similar regionally oriented publications.

Contributions possessing clear implications for anthropological method and theory are the all-too-brief paper by Finney on Polynesian navigation and the linguistic papers by Elbert, Grace, and White. Finney's field experiments on Polynesian navigation techniques are a welcome indication of unorthodox and highly practical thinking in an area of specialization not noted for innovation. His work has produced the best data yet on a subject that has suffered from repeated rehash of the same tired historical material. The test analyses presented by Elbert and Grace, and White's study of the word *tabu*, clearly illustrate the hazards involved in utilizing quantitative linguistic techniques.

Other contributions are light-weight, low-powered, or misleading. Mead's impressionistic piece on hypertrophy and heterogeneity in Polynesian culture might have been stimulating 30 years ago. Sinoto, perhaps Emory's closest associate, has contributed an archeological article on fishhooks that contains little information he has not presented in better form and detail elsewhere. Those familiar with the literature on Polynesian origins will note, in Green's article on that subject, that concepts and theories, initially anathematized, become suddenly attractive once they can be credited to the right people.

The ever-present personal wrangles which are an important part of the field of Polynesian studies are incompletely camouflaged. Perhaps the most remarkable example is Danielsson's statement, in his biographical sketch of Emory, that the well-known Emory-Stimson controversy was based completely upon scholarly disagreement and was finally settled with Emory's complete vindication. The origins of this unfortunate controversy are to be sought mainly in areas other than scholarship. There is no right or wrong in this matter, nor will there be any one-sided vindication when Stimson's voluminous writings and correspondence are adequately published at last.

In summary, Kenneth P. Emory's lengthy, diversified, and productive career might well have received a more fitting monument than that represented by this volume.

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## Matter in Space

**Interstellar Grains.** N. C. WICKRAMASINGHE. Chapman and Hall, London, 1967 (distributed in the U.S. by Barnes and Noble, New York). x + 154 pp., illus. \$11.75. International Astrophysics Series, vol. 9.

Although it is now well established that an appreciable amount of matter in the form of gas and solid particles exists between the stars, as recently as 40 years ago it was still an open question whether dark markings in the Milky Way were holes between the stars or were due to obscuring matter. The discovery of interstellar polarization by Hall and Hiltner in 1949 raised further questions concerning the grains and galactic structure. According to present theories, polarization is produced by aligned grains, the alignment presumably being due to extensive but certainly quite small ( $B \approx 10^{-5}$  gauss) galactic magnetic fields. An investigation of grain growth by condensation out of the interstellar gas made by J. H. Oort and H. C. van de Hulst in 1946, following the suggestion of B. Lindblad, led to the general acceptance of a theory of "dirty ice" grains thought to consist primarily of frozen water, methane, and ammonia with impurities of the common metallic elements (Fe, for example). Qualitative theoretical considerations of polarization led to the proposal by Cayrel and

Schatzman in 1954 that there may exist graphite flakes as one of the components in interstellar space. Subsequently, Hoyle and Wickramasinghe in 1962 took up the theory of graphite grains and described a mechanism which could explain their origin in the atmospheres of certain types of stars. This work has been pursued by Wickramasinghe and others, and a complete summary of the theories of graphite as a basis for explaining the optical manifestations of interstellar grains is now presented by Wickramasinghe in *Interstellar Grains*.

Approximately one-third of the book is devoted to a collation of the main observational characteristics of the interstellar grains, namely, interstellar extinction, interstellar polarization, reflection nebulae, and diffuse galactic light. Curiously, however, there is no mention of the unexplained diffuse interstellar lines which most astronomers believe to be intimately associated with the grains.

The five main types of models considered in the book are (a) iron particles, (b) dirty ice grains, (c) large complex molecules (proposed by Platt), (d) graphite grains, and (e) graphite core-ice mantle grains with emphasis on (e), (d), and (b) in that order. All presently proposed models have some uncertainties associated with their general acceptance. Where the theories are not well supported or are approximate, it is critical that their limitations be clearly stated. From the standpoint of a balanced presentation the book falls far short of this scientific mission. Furthermore, there are several serious inconsistencies and errors in the theoretical analysis, some of which are mentioned here.

One of the key criteria used to determine the acceptability of a particular grain model is whether the required magnetic field for orientation is so large ( $B \approx 10^{-4}$  gauss) as to be inconsistent with considerations of galactic dynamics. The author has made a fundamental error in the direction of favoring the orientability of graphite. He is apparently unaware of the fact that there are two sources of its magnetic susceptibility, and he calculates (on p. 139) the out-of-phase component incorrectly by combining the relaxation of the paramagnetic electron spin system with the diamagnetic electron orbital part.

The author has applied the Davis-Greenstein theory of magnetic orientation in its original form. However, the more recent work of R. V. Jones and

L. Spitzer, Jr., extending this theory, is actually more pertinent to the orientation of dirty ice grains and to the graphite core plus ice mantle grains, the latter being suggested by the author as the most likely candidate for representing interstellar grains. The Spitzer-Jones theory is appropriate to problems involving intermediate degrees of orientation as well as to nearly complete and nearly incomplete orientation. In application to the core-mantle and dirty ice particles it gives results which are quite at variance with those of the author.

Wickramasinghe should have made clear that the uncertainties in his approximate theoretical calculation of polarization by graphite and by graphite core plus dielectric mantle grains are considerably greater than the uncertainties in the observations of the wavelength dependence of polarization with which they are compared. The calculations of extinction by spherical grain models both homogeneous (Mie theory) and core-mantle (Guttler theory) are carefully performed and conveniently tabulated in appendices. There is nevertheless an important objection which may be raised regarding the interpretation of extinction by the core-mantle particles. Whereas the optical properties of graphite are studied in considerable detail, the optical properties of the dirty ice are perfunctorily described by a constant index of refraction over the spectral range from the infrared to the rock-et ultraviolet. Since the author correctly lays much stress on the importance of recent astronomical investigations in the ultraviolet, this is a serious omission, particularly in view of the fact that the use of published measurements on the absorptivities of frozen water, methane, and ammonia in the ultraviolet would lead to a considerable revision in the comparison between theory and observation presented in chapter 10 (particularly figure 10.17).

There is real merit in the research Wickramasinghe has done on some of the important problems of interstellar grains. He has delved into the very difficult problems of nucleation and growth of grains and brought forth a number of interesting and new thoughts on physical interactions. On the whole, however, the book does not fulfill its function as a comprehensive and up-to-date survey of interstellar grains.

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