the writing was theological in nature; the basic problem was to explain how the children of the ark reached the new continents that were unconnected to the Eurasiatic land mass. Most of the scholars who considered the question were from Mediterranean countries, but it was an English poet, John Rastell, who, in 1520, first posed the question of American Indian origins.

By 1535 G. F. de Oviedo suggested Carthaginian (Phoenician) origins, a theory ultimately going back to Aristotle. This theory persisted for centuries, although Oviedo himself, for political reasons, favored an ancient Spanish origin.

Francisco López de Gómara, who despised the Indians, was first to invoke Atlantis as their possible place of origin; this theory was picked up by Agustín de Zárate by 1555 and was developed by many later writers. At least two Portuguese writers—Antonio Galvão and Pero de Magalhães—by 1575 had suggested the Chinese as probable ancestors of the Indians.

By 1567, however, the Hebrew-tribes theory had been clearly enunciated and touched off a whole new series of largely theological debates. Apparently it should be credited to Joannes Fredericus Lumnius and Peralta, although it was soon confused with the Canaanite theory, which involves the curse upon Ham, not the Hebrew children. In many versions the Jewish-origin theory is viable today, but it developed much later than is generally believed.

By 1570, then, most of the theories (including some not mentioned above) were developed. All relied on authority, cultural comparisons, and some empirical data. It remained for Acosta in 1590 to utilize available evidence—"experience is more reliable than philosophy." Using valid cultural arguments against the comparisons of the earlier writers, and dismissing Atlantis and the Jewish theories, Acosta insisted on continuous close land connection between the Old and New Worlds and a separate culture history for the Americas. His argument rested in part on the distribution of animal species other than man. (Acosta's argument still had a theological base, in that he accepted as a controlling factor man's restriction to the Old World because that was where the ark landed.) According to Huddleston, Acosta's views draw most of their importance from the suggestion of a culture history and origin independent of Europe and in providing a set of logical ground rules for study of the problem.

Soon after Acosta came García (1607), whose aim, according to Huddleston, was to identify all possible origins for the Indians—and he evidently believed all of them to be possible. His techniques for argument seem to have obscured the fact that he supported all theories. The Acosta tradition is contrasted with García's because the latter reverted to, and reinforced, the comparative method.

Acosta had great influence in shaping thought among scholars in the northern European countries, while Spanish thought on the problem stagnated, García having essentially exhausted the possibilities for debate. Therefore during the 17th century the arena of argument shifted to northern Europe. Here the names of Grotius, de Laet, and Horn are well known. Using Acosta's zoological and distributional approach, de Laet and Horn had before 1700 concluded that Siberia was the ancestral home of the Indians.

There are many good things in this book, more than can be summarized here. Suffice it to say that its thoroughness and scholarship make it a contribution to both the literature of ideas and that of anthropology. The author shows great restraint in five short pages of general conclusion as he demonstrates that several respected Americanist authors have perpetuated mistakes (as did the Mediterranean writers), overlooking most of the primary material so carefully dealt with in this volume. Huddleston, understandably, does remind us that the Acostan tradition persists in modern anthropological thought, which is rereaching conclusions already widely supported during the 17th century.

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A Study of a Primate Society

Social Organization of Hamadryas Baboons. A Field Study. HANS KUMMER. University of Chicago Press, Chicago, 1968. x + 189 pp., illus. $8.95.

This document is based upon a year's observation by the author and Fred Kurt of wild *Papio hamadryas* (Cercopithecidae) in their native habitat in Ethiopia. It is the first field study of this arid-land baboon. It was largely upon the behavior of members of this species in the London Zoo that Zuckerman based a theory of primate sociality which engendered a 30-year controversy over the role of mating bonds in the organization of social groupings of primates. Observations by other workers on other species in which the "harems" seen by Zuckerman were not prominent cast doubt upon his assumption that sexual attraction between adults was the primary basis of primate social organization. Some workers even doubted the validity of Zuckerman's observations, or attributed his results entirely to the crowded conditions of the zoo colony.

Kummer studied the ethology of hamadryas baboons in a colony in the Zurich Zoo before proceeding to the field and confirmed Zuckerman's observations that adult males collected and maintained exclusive groups of females. The field observations also revealed the existence of these groupings of one male with several females, but showed that they were merely the smallest units in a complex hierarchy of social units within the hamadryas population. The field study gave indications that the one-male units originate in the maternal behavior of adult males toward kidnapped juvenile females and that only later do sexual motivations become manifest. This finding adds a fascinating twist to hypotheses about the processes of social organization, and should warn against mono-causal explanations for complex social phenomena. The history of speculations about the social organization of hamadryas baboons, which have been finally resolved by the current study, shows the absolute necessity of placing observations within the context of the natural population living in an unrestricted habitat if they are to be understood.

Kummer's field study illustrates a particular concern with such context. Although much attention is given to the details of the one-male unit, the stated purpose of the study was to survey the entire system of social organization within the population. Accordingly the study began with an extensive survey, then narrowed down to increasingly intensive observations of smaller units. The picture that emerges of one-male units combining into two-male teams, which are themselves integrated

by coordinated travel and mutual defense into bands, which meet at sleeping cliffs and there form troops, and the abundant numerical, sociogrammatic, and descriptive data illustrating each statement should be the delight of the system theorist wishing to apply his models to factual material, as well as enlightening material for the serious student of animal behavior. The indications that females within a one-male unit show breeding synchrony whereas females from different units are asynchronous offer a potential rich source of problems for collaborators from the physiological and behavioral sciences.

The study of primate social behavior has been marked in the past by much intuition and little technique. Kummer's book describes a number of ingenious yet simple techniques, such as the nearest-neighbor sample, which could be of great value to other workers on various species. This study could be used as a guidebook on how to study a primate society. In clarity of description and in the precision with which each statement is supported by factual material the book must also stand as a model of scientific reporting.

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Properties of Materials

Ferroelectricity. ENNIO FATUZZO and WALTER J. MERZ. North-Holland, Amsterdam; Interscience (Wiley), New York, 1967. x + 289 pp., illus. $11.25. Selected Topics in Solid State Physics.

So few books or extended review articles have been devoted to the subject of ferroelectricity that any such contribution is welcome in one way or another. The present volume purports to give a picture of ferroelectric phenomena with special emphasis on the most recent developments such as those related to switching properties, microwave and far infrared properties, and lattice dynamics theory. After a brief introduction describing the plan of the book, the authors discuss various properties of different ferroelectric materials in chapter 2. The emphasis in this chapter is descriptive, and the discussion should be useful to the uninitiated in the field by providing an idea of the properties of ferroelectric materials and the kinds of materials that exhibit these properties. The final part of chapter 2 briefly describes the results of certain microwave and infrared studies and the implications of the infrared studies with respect to recent lattice dynamical theories of ferroelectricity. It is unfortunate that these more recent developments have not been treated in a more complete manner, with inclusion and discussion of certain interesting and pertinent work omitted from the present volume. Chapter 3 is devoted to the thermodynamic description of a number of the ferroelectric properties illustrated in the previous chapter. The treatment is kept simple and direct, and as a result one can appreciate the unification that thermodynamic theory provides by explaining and relating a number of the measured quantities. Chapters 4 and 5 are devoted to Cochran's lattice dynamical theory, the Slater theories of KH_2PO_4 and $BaTiO_3$, and the inelastic neutron scattering results of Cowley. Most of this work has been taken more or less directly from the original papers. In the few places where the authors have supplied their own discussion and interpretation they are guilty of certain inaccuracies· for example, in the first paragraph of chapter 4, they state, "if, for one particular mode of vibration, these long range forces have the same magnitude but opposite sign as the short range forces, the crystal becomes unstable for this mode." As might be expected from the authors' previous contributions to the field, chapters 6, 7, and 8 are devoted to a thorough and up-to-date description of ferroelectric domains and domain switching. The remainder of the book includes brief statements on miscellaneous topics such as radiation damage, second harmonic generation, semiconducting properties, thermal conductivity, and applications of ferroelectrics. Chapter 10 includes a short, interesting discussion of the measurement of a true coercive field and mentions two materials which possibly exhibit this property.

Although this book can in no sense be considered comprehensive or definitive, its length, general organization, and style of writing make it a useful introduction to the subject of ferroelectric phenomena. It can also be used as a reference supplement to existing literature.

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Vapors

The Characterization of High-Temperature Vapors. JOHN L. MARGRAVE, Ed. Wiley, New York, 1967. x + 555 pp., illus. $24.95.

Vaporization and sublimation, the processes in which liquids and solids, respectively, are converted into vapor, are important concepts in science and technology. The long-term trend has been toward use and control of higher and higher temperatures. In many cases the practical upper limit of temperature is set by the rate at which the condensed phase is converted into vapor. A classical example of such a limiting case is the tungsten filament in the incandescent light bulb. It is also important to have information about the structure of the particles comprising the vapor. Such information can, by the use of statistical mechanics, be made to yield knowledge of the thermodynamic properties of the vapor. This information is necessary in the understanding of the stability of refractories at high temperatures, of the combustion process, and of the properties of extremely high-temperature plasmas.

The characterization of high-temperature vapors is currently a subject of active research. However, there is a need for a better and more widespread understanding of vaporization and of the properties of vapors. This book appears to be a step toward this goal. The editor has put together the contributions from 28 authors, each a noted specialist in a particular aspect of the vaporization process, into a well-integrated and readable text.

The techniques used in the measurement of the vapor pressure and in the characterization of these vapors are covered from both theoretical and experimental viewpoints. The applicability and limitations of the several experimental methods are discussed. This is particularly helpful to the researcher in the selection of experimental methods for the solution of a research problem. The discussions of the experimental techniques are in general complemented by drawings of sufficient detail to guide the experimentalist in the construction of the apparatus. Just as important, the theoretical discussions offer guidance in the treatment of data.

The book also contains chapters on the kinetics and mechanism of the vaporization process and appendices giving vapor-pressure data for the ele-