tions of the magnetic pole through geologic eras, as these changes are indicated by analyses of the magnetic properties of rocks from the several continents. The results indicate that polar positions have wandered widely and that curves through these changing positions, based on evidence in Europe and in North America, are generally parallel but consistently far apart. This suggests that these landmasses were separated fairly late in geologic time.

Paleoclimatic evidence for drift, used effectively by Wegener, is reviewed and brought up-to-date. Climatic conditions are reflected in floras and faunas, and also in certain types of sedimentary deposits such as evaporites, bauxites, glacial materials, and bioherms. Convincing evidence for widespread glaciation late in the Paleozoic Era, at present-day low latitudes in South America, Africa, Australia, and India, continues to be one of the most potent arguments for the concept of continental drift.

Large lateral movement has occurred on the San Andreas, the Alpine, and other active strike-slip faults. Seismologists report that, for a large majority of recorded earthquakes, the first motion has an important lateral component. Recent surveys of magnetic intensity in the northeastern Pacific Ocean reveal evidence of large-scale strike-slip faults in the ocean floor. What mechanism may account for such movements, for the major deformation in mountain belts, and for the shifting of whole continents? Some of the authors favor the concept of gigantic convection cells in the earth's mantle, with movements as slow as a centimeter per year. One author cites the recently reported worldwide rift in the ocean's floor and suggests that slow expansion of the earth may account for separation of the continents. These profound problems invite free speculation.

Authors of the scientific essays are H. Benioff, P. Chadwick, T. Chamalaun, R. S. Dietz, T. F. Gaskell, B. C. Heezen, J. H. Hodgson, F. A. Vening Meinesz, N. D. Opdyke, P. H. Roberts, S. K. Runcorn, and V. Vacquier. In the concluding paper, J. Georgi presents an effective testimonial to the ability and staunch character of Alfred Wegener, once Georgi's teacher and field companion, who was last seen on his 50th birthday when he started by sledge from a station on the Greenland ice cap and was lost in an arctic storm.

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## Animal Behavior

**Behavioral Aspects of Ecology**. Peter H. Klopfer. Prentice-Hall, Englewood Cliffs, N.J., 1962. xv + 173 pp. Illus. Trade ed., $5.25; text ed., $3.95.

In this brief account of many segments of animal behavior, Klopfer provides a focus that is rather different from the more common treatments of the subject. His material is organized around five primarily ecological and evolutionary problems: predation, interspecies competition, species diversity and maintenance, and the integration of animal societies. Within this framework, he records a variety of ethological and less readily classified observations and experiments, many of them on birds, in which the author is especially interested, and with which much beautiful work has been done.

Much of the book is openly speculative, and the author warns explicitly against uncritical acceptance of certain lightly supported hypotheses. Armed with such warnings the student is not likely to go too far astray. However, on a number of occasions, ecological assumptions, made rather offhandedly, may cause the psychologist to consider these as proven facts, and one has the impression that Klopfer's grasp of the ecological literature is not quite adequate to the task he has set himself. To the extent that his expressed objective is to stimulate experimental work in behavior, Klopfer's book should be highly successful. Both the approach and his intelligent reasoning are clearly designed for such a purpose.

The rest of Klopfer's intention is to make clear the relevance of behavioral studies to ecological problems. Part of my reaction to this was to rebel. Perhaps this is unreasonable, but one is almost forced to the conclusion that, since at least three of the problems posed by the author exist among plants as well as among animals, behavior may well be primarily an obstacle to their investigation. Moreover, the other two problems—why predators do not overeat their prey, and how communities are organized—quickly assume such a restricted meaning in the context of this book that, were they to be solved, ecologists should still have to ask the same questions in a broader sense. The worthy attempt to promote a closer relationship between ecology and behavior loses some of its force by seeming to be, in part, an attempt at promotion. Where it is successful, as in the chapter on species diversity, this is the result of evidence of a relationship rather than of hyperbole. The book would have profited from explicit recognition of the role of behavior as one component of the nexus called adaptation.

A number of mistakes, and reference to an "accompanying figure" that is nowhere to be found (p. 54), attest to hasty preparation, perhaps dictated by tight publication schedules. These defects are partly compensated by the bibliography, which is remarkably up-to-date, with a median age of citations of less than five years. The author also notes a number of personal communications from various more or less illustrious friends. After reading one such sequence, I was unable to restrain the thought that, had there been just one more of these, the book might have been truly inspired.

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## Africans without Masks

**The Human Factor in Changing Africa**. Melville J. Herskovits. Knopf, New York, 1962. 569 pp. Illus. $6.95.

Any reader drawn to this volume by the exotic native masks staring from its jacket is due to see aboriginal Africa fade before his eyes. In its place will arise a land of Africans born to a mixed Afro-European tradition which they take for granted and accept as theirs. As a scholar, Melville Herskovits probes these historic origins with a lifelong conviction that to understand change one must also recognize the continuities of culture.

Some may find it unnecessary to trace these roots into the Paleolithic in order to understand the present, but Herskovits, the teacher, could not resist the opportunity to open with an attack on current notions that aboriginal Africa is without its own history and prehistory. His justification lies in the fact that this book is not for the specialist in African anthropology, despite the footnotes on most of the pages, which declare the pedigree of his statements. It is a work for the intelligent reader, attracted neither by masks nor footnotes but by a desire to interpret the tumult of today's Africa in terms of reasonable human reactions. Despite Herskovits' strong personal feelings about African affairs, he writes with

exemplary objectivity of the social forces generated by colonialism, nationalism, and even apartheid.

The heart of what Herskovits has to say follows an introductory survey of the aboriginal culture areas of Africa south of the Sahara. In this connection, he considers how and why it is that Africans with agricultural traditions now control the dynamic forces about which he writes. The ensuing pages of *The Human Factor* bring a truly fresh approach to the literature on Africa. Even the well-read will find both new material and new insights into what they already know. In basic design, successive chapters set the scene of human relations within which a series of dramas of culture change takes place. Thus one chapter, "The land," covers the aboriginal meaning of the native earth. Starting with these values, we are led through a still incomplete series of adjustments to pressures on the land, first by Europeans and now by Africans themselves.

Some areas of knowledge about Africa, which were heretofore the domain of a few specialists, achieve just recognition. The chapter entitled "The Book" is an unusual anthropological discussion of Islam and Christianity, through their varying fortunes down to their implications for the present. In "The school" another stepchild of the anthropologist is treated in such a way that enrollment figures are subordinated to the fundamental problems of adapting European educational institutions to the divergent motivations and needs of new Africa.

In the same vein, the focus shifts to other situations and institutions within which traditional lifeways are being reshaped as the old colonies drive toward self-fulfillment. But the politics of nationalism is not handled as a matter of political parties and governmental structures. It is a story of new values, their struggle for expression, and the distinctively African form they achieve. Even economic change is not seen in terms of new industries and gross national products, but is dealt with in terms of working people—labor incentives, work rhythms, and trade unions hybridized in transplantation.

The text is true to its title; the pages deal with people facing problems rooted in African culture and African experience. To read the book is to grow in understanding.

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## Bone-Seeking Elements

**Radioisotopes and Bone.** A symposium organized by the Council for International Organizations for Medical Sciences. Franklin C. McLean, Pierre LaCroix, and Ann M. Budy, Eds. Davis, Philadelphia, 1962. xxiii + 522 pp. Illus. $15.

The evolution of bone, some 400 million years ago, gave the vertebrates physical and biochemical superiority over the other animals, but in our time mineralized tissue can be a serious liability. Bone tissue removes harmful radioactive substances from the tissue fluid and circulating blood and concentrates them in the center of the body around the organs of blood formation. Bone is the storage element for a servo or closed-cycle system composed of highly specialized connective tissue cells that are subject to radiation damage and malignant degeneration. But there is a happy side to the subject, and that is all recounted in this book.

Radioisotopes are responsible for many important advances in our knowledge of the normal and pathological physiology of the skeletal system. This book, *Radioisotopes and Bone,* is primarily designed for active investigators working in the fields of physiology and biochemistry. Between 29 August and 2 September 1960, 47 scientists met (at Princeton, New Jersey) to pool information on and discuss terminology or theory of bone-seeking elements. The book consists of 26 scientific reports including valuable tables of data and many new illustrations. The 15-page bibliography, at the end of the book, lists nearly all of the original literature published during the past 25 years.

The rate at which scientists are working on bone exceeds the present rate at which research findings are published between hard covers. Within a very short time, some articles are superseded by additional work, but some of those in this book are original contributions not published elsewhere.

Four chapters cover the kinetics of calcium metabolism, the mechanisms of calcium homeostasis in experimental animals, and patients with various disorders of bone. Ten chapters deal with the morphology and histophysiology of bone, observed with the aid of autoradiographical techniques. There are single articles on the use of $C^{14}$-proline for observing the synthesis of protein of bone matrix; $H^3$-thymidine for labeling the nuclei of cartilage and bone cells; $C^{14}$-labeled vitamins and hormones for studying intermediary metabolism; $S^{35}$ for the biosynthesis of sulfated mucopolysaccharides of the ground substance of connective tissues. The sodium in the mineral of bone is described both by the transformation of $Na^{23}$ and $Na^{24}$ in undecalcified sections by exposure to a neutron flux and by injections of $Na^{22}$. The relations of radiation dose to radiation injury with $Sr^{90}$ and the production of bone tumors with $P^{32}$ is dealt with in sufficient detail. The application of radioisotopes to the problems of teeth is also covered in a comprehensive way. Four articles present experimental studies on citrate metabolism, vascular tissue, aging, and ultrastructure of bone.

Pierre LaCroix recognized the need to consolidate the research on the metabolism of radioisotopes in skeletal tissue; thus, thanks to LaCroix and all 47 of the conferees, as well as to the sponsor, the Council for the International Organizations of Medical Sciences, the editors, Franklin C. McLean and Ann M. Budy, were destined to create a very useful volume.

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## Engineering Education

**Introduction to Chemical Engineering.** L. B. Andersen and L. A. Wenzel. McGraw-Hill, New York, 1961. xii + 364 pp. Illus. $9.50.

This volume is one of a series that has been published in an attempt to give undergraduate students of chemical engineering a bird's-eye view of just what chemical engineering is and, at the same time, to give them a grounding in the quantitative principles of the energy-mass balance. The authors also briefly cover a multitude of other physical topics, including phase and chemical equilibria, chemical kinetics, and mathematical methods. A section on digital computer techniques emphasizes the logic of employing flow sheets for a given problem rather than the routine mechanics of computer programming. Some descriptive material which, a decade or two ago, comprised a typical course in industrial chemistry is included under these topics: the chemical process industry; inorganic and organic chemistry; and petroleum and petrochemicals.