gous not with zoological or botanical but with ecological or community classifications in biology, are even less satisfactory. An analytical technique (cumulative graphs of artifact types) attacked in one chapter but even more strongly defended in others is downright absurd. The conference finally recommended a "cultural stratigraphic nomenclature" which, as is elsewhere pointed out in this volume, is misnamed and which is unlikely to stand up. It suffers not only from mixed and inadequately defined criteria but also from confusions of concept (for example, between a hierarchy of nested sets and one of levels of abstraction) and of terminology (for example, between "horizon" as a point in time, as a physical plane, and as a unit of association).

It is not an adverse criticism but a recommendation in the present state of knowledge that this book raises more questions than it settles. It brings together a great body of data and of erudition. Always by implication and often explicitly it indicates deficiencies and likely points of attack. It is a tired cliché to say, "This book is a must for anyone interested in . . ." whatever it may be, but that is true of this book for anyone professionally concerned with any phase of African prehistory.

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Light Transmitters

Fiber Optics. Principles and Applications. N. S. KAPANY. Academic Press, New York, 1967. 447 pp., illus. $17.50.

Technological progress in fiber optics, especially during the past ten years, has given the engineer an important additional tool for transferring information by means of light. The medical investigator can use a bundle of flexible fibers both to illuminate internal parts of a living body and to return an image or other analytical information. Fibers assembled in the form of plates are surfaced with flat or curved faces for use in photographic or other optical systems or, when fused vacuum-tight, in photoelectronic systems such as cathode ray tubes, image converters, and image intensifiers. The initial flexibility of the fibers is advantageous for producing image dissectors and scramblers. Fibers made of luminescent or lasing materials and excited to produce their own radiation are highly efficient in collecting and relaying this light. Simplified, the mechanism underlying the propagation of an image through a fiber is the entrapment of energy by total internal reflection. Ray tracing is quite adequate to describe image formation by a fiber several wavelengths or larger in diameter. Wave theory accounts for the propagation of light through fibers of small diameter, as well as for coupling between fibers, certain radiation effects, and coherence. A sufficiently small fiber becomes a dielectric wave guide capable of sustaining predictable modes. Each fiber in a packed bundle should be clad with a material of lower refractive index to help minimize leakage of light across fiber walls. Fiber bundles result in space-variant imagery and are converted to space-invariant systems by such means as spatial filtering and dynamic scanning.

The author of the present monograph is a pioneer in the field. He has relied heavily on his own contributions and has added sufficient material to form a comprehensive treatment. The book will be especially helpful to the optical engineer with some undergraduate training and certainly of interest to those who may have an application for fiber optics. Fundamental phenomena, methods of analysis, results of calculations or experiments, and applications are discussed and illustrated. Obviously, detailed considerations of complicated shapes and assemblies could not be included. In some areas the book has a quality more often found in a first book concerning a new technology, namely, catalog-type photographs of the exteriors of instruments and allusions to further possible developments and to what might be done to improve procedures or equipment.

Three additional scientists contribute appendices. Two of these add to the analysis of image transmission and space-variant imagery of fiber bundles. The third writes about vision, comparing the retina to a bundle of fibers. The visual receptors of mammals are nonhomogeneous, nonisotropic, photosensitive cells that exhibit waveguide properties, and visual properties such as directional sensitivity, color detection and resolution are reviewed in the light of what is known about fiber optics.

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Irreversible Processes

Statistical Mechanical Theories of Transport Processes. ROBERT M. MAZO. Pergamon, New York, 1967. 180 pp., illus. $9.50. International Encyclopedia of Physical Chemistry and Chemical Physics, vol. 9, part 1.

Our understanding of the molecular basis of irreversible processes has undergone vigorous development in recent years. However, aside from a scattering of review articles in archival journals and some introductory material in textbooks (for example, in F. Reif's *Fundamentals of Statistical and Thermal Physics*), little of this development is easily accessible to the student. Mazo's book provides an excellent introduction to some recent developments.

Attention is focused on a rather limited area, the phenomena of fluid flow, heat flow, and diffusion in simple fluids. The systems discussed most are those composed of spherically symmetric molecules interacting by means of pairwise additive potentials, in classical mechanics. Even in this limited area of the theory of irreversible processes some fundamental work is omitted, in particular the remarkably successful approach followed by Henry Eyring and his collaborators; for various reasons this seems to be not regarded as sufficiently well founded to be generally accepted.

The main lines of development discussed here are associated with the names Boltzmann, Enskog, Bogolyubov, Choh and Uhlenbeck, Kirkwood, and Rice and Allnatt. Except for Boltzmann's kinetic theory of dilute gases, which is known to be correct and well substantiated by experiment, all the other theories leave something to be desired. They suffer either from obscure difficulties of principle or from practical difficulties in application; and agreement with experiment is often no better than within factors of 2 or 3. The difficulties are discussed carefully and candidly by Mazo.

The book ends with two chapters that supply a bridge to currently active areas of research; they deal with the use of time-correlation functions to calculate transport coefficients, and with the use of perturbative techniques (both diagrammatic and operational) in classical many-body systems.

Even a quick scanning of this book will give a student a good feeling for what has been going on during the last few decades and will bring him up