Vision and Value Series

The many contributors to these richly illustrated volumes—**Structure in Art and in Science** (197 pp.); **Education of Vision** (240 pp.); and **The Nature and Art of Motion** (207 pp.)*—are scientists, artists, engineers, and linguists. The editor, Gyorgy Kepes, is professor of visual design at Massachusetts Institute of Technology. The contributions are essays, approximately 13 in each of the three books, that treat in broad perspective "visual formulations of our awareness of contemporary problems." The improvement of interdisciplinary understanding and communication is the goal toward which these essays are oriented. The larger problems of our times, says the editor, demand wider perspective, and the visual sense promises to support, on a common base, an appreciation of the structure and the flux of man's relations with his environment.

Each volume has a looseness of organization that permits it to be self-contained and at the same time overlap with others of the series. This is realistically defended as an aid to communication, since readers will be more at home with the language of certain of the essays than with that in others. *Science* readers will find contributions by artists and architects wordy and vague. We must realize that this is, at least in part, attributable to our unfamiliarity with connotations that are peculiar to the specialties. The excellent illustrations help, but not always sufficiently, and since color is not used some of the meanings are lost.

It is perhaps quite significant that the majority of the essayists are European, though not overwhelmingly so. From three to six contributors to each volume are American-born. Kepes, born in Hungary in 1906, came to the Institute of Design in Chicago in 1937 after working as a design artist for 6 years in Berlin and London. He sees modern technology too often violating the unifying forces and structural organization of nature. In the introduction to *Education and Vision* he writes, "If the primal sanities of nature can be absorbed through his [man's] vision, if man is led to see them, he can reproduce them in the world he shapes for himself." He speaks of our dishonest environment and the reciprocal relations between it and our impoverished visual sensibilities. One to three psychologists contribute to each of the volumes. With some differences in relative emphasis, Richard Held, James J. Gibson, and Hans Wallach document the general proposition that seeing effectively cannot be identified with simple projections of light rays upon the retina and faithful transmission of the resulting information through the central nervous system. Interactional and transactional organizing processes are as much a part of seeing the world as are such processes integral in the nature of that world under study by physicists.

Psychologists will quickly recognize the differences between the psychophysics of Gibson and the stress on organismic processes by Held and by Wallach. From the perspective of these three volumes, the reader can appreciate these differences as supplementary rather than as contradictory. Visual direction, the perception of slant and distance, and the integration of these into awareness (discrimination) of movement are neither piecemeal in any adequate physical equation nor purely external (or internal) from the biological-psychological viewpoint. Europeans have been quicker to see this and more insistent upon our dealing with it than American experimentalists. But now the experiments are paying off. The essays cannot do justice to the empirical base that research of the past 30 years has provided. Bibliographic documentation in these essays is fair to good and will guide some readers to the evidence.

This series is not a plea for achieving unity at the expense of diversity. It is rather excellent support for an increase in each. Physicist Gerald Holton, in describing the history of man's ability to describe and predict motion, points out that each stage "represented a stripping away of anthropomorphic and other subjective associations from the definition of motion."

Although the volumes suffer from repetitiousness, both within and between the separate covers, one also reads them with the strongly increasing impression that much has been left out. One doubts that the essayists understand each other. While many participated in ongoing seminars held at Massachusetts Institute of Technology during the past decade and a half, they have only now and then referred to each other's contributions. Perhaps the students who attended could fill in the gaps better than the experts themselves. Solving puzzles can be an exciting experience. The reader of these volumes has such in store for him, because Kepes is quite accurate in saying, "The essays have in common their implicit acceptance of the complementary unities inherent in their respective areas."

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Cloud Physics

Elements of Cloud Physics. Horace Robert Byers. University of Chicago Press, Chicago, 1965. x + 191 pp. Illus. $7.50.

The study of clouds in the atmosphere can be divided, unfortunately perhaps, into two fields that overlap relatively little—the macrophysics of cloud development, air motion, and mixing, on the one hand, and the microphysics of condensation and freezing and the behavior of populations of water droplets and ice crystals, on the other. One day a book will be written which effectively links together these two fields and every point, as happens in nature. At present, it seems, our understanding of processes in the atmosphere is too incomplete to make this possible.

The present book, despite a final chapter on cloud dynamics, is devoted almost entirely to microphysical questions. In discussing these the emphasis

* The books, published by George Braziller, New York, 1965, are $12.50 each.

is on physical principles, and the treatment throughout is mathematical—where this is appropriate—rather than simply descriptive.

In his preface the author directs the book to students of meteorology, rather than to physicists or chemists, and to this end he includes a chapter on the thermodynamics of phase equilibrium to provide necessary background material. At the same time, there is an introductory chapter on the thermodynamics of moist air; although meteorologists might be expected to be familiar with this topic, the chapter gives a convenient summary for those whose training is in pure physics.

After these introductory chapters the book follows a familiar and logical pattern. A treatment of nucleation processes is given, which is well balanced between oversimplification and the complexity of a thoroughgoing mathematical discussion. Having established the importance of soluble particles in condensation and of insoluble solid particles in ice crystal formation, the book goes on to examine the sources, distribution, and behavior of these particles in the atmosphere.

The next two chapters discuss the growth of droplet populations and of ice crystals in clouds and the way in which the droplet size distribution is modified by collision and coalescence. It is in the development of precipitation that the interaction between macro- and microphysical processes becomes of prime importance, but the discussion here is confined to the microphysical scale.

The final chapter on cloud dynamics is a brief, self-contained survey of some important models for convective clouds. This is useful material, but the treatment is very brief and no indication is given of the success of these models in describing real clouds.

Topics purposely omitted by the author are cloud electricity and radar studies. Some may be surprised to find no more than passing reference to cloud modification, but the present confused situation in this field justifies its omission from this relatively short book.

Byers has produced an authoritative and readable account of his subject, which should prove a very useful textbook for courses in meterology and cloud physics. The book itself is attractively presented, with numerous figures, an adequate index, and a useful set of up-to-date references.

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Meyrick's Microlepidoptera

Catalogue of the Type Specimens of Microlepidoptera in the British Museum (Natural History), Described by Edward Meyrick: vol. 5, Timyridae, Hyponomeutidae, Ethmiidae, Metachandridae, Cosmopterigidae, Walshiidae, Blastodacnidae and Scythridae (British Museum, London, 1965. 581 pp. Plates. £15), by J. F. Gates Clarke, continues the publication of Clarke's study of the enormous Meyrick Collection, and the material from which Meyrick named thousands of species of microlepidoptera, chiefly from the tropical regions of the Old and the New World. Meyrick used external taxonomic characters exclusively, paying little, if any, attention to the genitalia, which are now known to be almost all-important. During Meyrick's time, moreover, different and varying rules of nomenclature were followed. This made subsequent study such as that carried out by Clarke imperative to avoid complete chaos in the classification of these large, worldwide groups. Type specimens are fixed, where necessary, and other type material listed. Dissections of the genitalia (whenever possible of the type) are figured, as well as the pattern and, in many instances, the head, palpi, and venation. The type species of Meyrick's genera are given. Some generic synonomy is given where Meyrick species fall into other genera, or are junior synonyms of other authors' species. With Clarke's studies the way is cleared for taxonomic work on the groups; without it, such work would be gravely handicapped. The present volume covers about 163 genera and 653 species. The majority are Ethiopian, Indo-Australian, and Neotropical, only a small number being Nearctic. Future volumes will complete the series; the final volume is to include an all-important index.

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Medicine

Studies in Epidemiology: Selected Papers of Morris Greenberg. Fred B. Rogers, Ed. Putnam, New York, 1965. xxviii + 418 pp. Illus. $8.50.

The collection of papers here presented is a splendid tribute to the remarkable ability exhibited by Morris Greenberg, long-time epidemiologist and director of the Bureau of Preventable Diseases of the New York City Department of Health. This teeming city of many races and many cultures constituted an unlimited source of pathogenic influences and disease. Greenberg's purpose was to reduce that potential by identifying the mechanisms at play and applying corrective or specific, preventive measures. As practicing epidemiologists, Greenberg and his colleagues were perforce committed to the investigation of outbreaks of many kinds, illustrated by the now famous 11 blue men with sodium nitrite poisoning, by food infections, and others. One series of unusual cases led to the initial recognition of rickettsialpox, a mite-borne disease almost unique to apartment life in New York City. The excellent system of reporting disease and of diagnostic confirmation in the city provided unusual opportunity for Greenberg's inquiring mind. He hewed to the mainline problems of infectious disease, polio, hepatitis, measles, and rubella, studying trends, modes of spread, and effects of preventive measures.

Greenberg's other career as a clinical pediatrician clearly influenced his epidemiological studies, with attention centered on the effect, on the fetus and infant, of maternal disease during pregnancy. Many of these efforts were to clarify moot points raised by inadequate observations. He designed and prosecuted the studies with careful attention to the biases and the numerical difficulties. Smallpox vaccine did not affect the outcome of pregnancy; poliomyelitis in early pregnancy was associated with evidence of increased fetal death; repeated studies of improving design were conducted to obtain acceptable data on the frequency of rubella effects, supporting a conclusion that the influence was generally limited to early pregnancy with the total of congenital anomalies more nearly 10 to 15 percent than the widely bruited 90 percent. (It is of interest that the data were difficult to