captured by R. L. Gregory in **Eye and Brain: The Psychology of Seeing** (McGraw-Hill, New York, 1966. 254 pp., illus. Paper, $2.45). Gregory treats most of the biological foundations for seeing in his five early chapters, and that leaves him eight chapters for dealing with the complex problems of color vision, seeing movement, inadequacies and errors of seeing, how the artist through history learned to portray visual reality, and other fascinating principles and applications, including in the final chapter a discussion of why vision is likely to pose problems in the exploration of extraterrestrial space.

The two longest chapters of this book deal with illusions and with the question: Do we have to learn how to see? Since the answer to this question is both "no" and "yes," Gregory obviously has to rephrase it into a series of additional questions that take roughly the form: Does the individual (animal, child, adult) require certain experiences before his vision serves him in a given task, appreciation, or perception? Clearly the evidence is not yet all in, says Gregory, and the pursuit of it is one of the current areas of active investigation. (The authors of the book and of this review are among the participants.) Gregory is very effective in his review of conclusions that are drawn from studies of prism adaptation and recovery from congenital cataract. He is equally careful about generalizing from animal to infant vision or from visual behavior in the human infant to the much more highly discriminating older child or adult.

Eye and Brain is a part of the World University Library series, designed "to provide authoritative introductory books for university students which will be of interest also to the general reader," and its format and style of writing are appropriate to this purpose. It is exceedingly well illustrated, with color used effectively both to illustrate principles in color vision and to add realism to the photographs and diagrams of the eye and the brain. Gregory has referred to important sources both generously and in a most useful chapter organization. The bibliography is briefly annotated, and contains original as well as secondary sources suitable for further reading by student or general reader. Even the expert will find challenges in some of the restatements and documentations that Gregory provides on lively issues.

As an attempt to encompass much in relatively few pages, the book is highly successful, although sometimes the reader has to bring knowledge or educated guesses to bear on some paragraphs or quotations. For example, it is not clear why Polyak is saying in one of the intriguing quotations that 100 microns correspond to 20 feet or one-third of a degree of arc, and the curious reader must search the original for Polyak's analogy. Some of the references brought into the text are not to be found in the bibliography, or, as in the case of Hess's study of prism displacement in the chick, are attributed to the wrong author. But such errors are few enough not to mar seriously this exceptionally broad and appealing introduction to current knowledge.

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Blokhintsev's Textbook in Translation

Apparently D. I. Blokhintsev's classic Russian textbook, first published in 1944 during the days of Stalin, has not been much revised even in the fourth edition from which the present English translation, **Quantum Mechanics** (Reidel, Dordrecht; Gordon and Breach, New York, 1964. 551 pp., illus. $17.50), is made. The author restricts himself to nonrelativistic theories, but still could do better by discussing the Wigner symbols, nuclear shell models, Hartree-Fock method, and such developments that took place after "the Copenhagen epoch." In fact the main aim of the book seems to be to emphasize the materialistic view in contrast to the idealistic or positivistic view taken by "the bourgeois physicists" in "capitalistic countries." In looking at the references in this book it is amusing to find Engels next to Einstein and Lenin between Landau and Lorentz. The age of the book can also be seen in the references by finding older editions of Beth's and Heitler's books, for example. Such philoso-physical attitude, on the other hand, makes the book strong and valuable in discussing the physical meaning of some fundamental points such as the uncertainty relations (section 16), tunnel effect (section 97), and manybody problems. These discussions are clear and unique. Also the explanations of the classical limit ($\hbar \to 0$), uncertainty relations between energy and time, and Pauli matrices would help beginning students better than most other textbooks.

As a textbook for beginners, however, the book has a few drawbacks in addition to the fact that some materials are old: There are no exercise problems, and some definitions and notations are inconvenient. As an example of the last point: the author defines the spherical harmonics in the same way as Schiff did in his textbook. The definition differs from that given in Condon and Shortley, Landau and Lifshitz, Messiah, and most of the other standard books. Another example is that the book uses black letters for operators and matrices but not for vectors. Also I do not understand why the bracket notation is not used for the commutators. (Such notation is used only for commutators with the Hamiltonian.) If such points are supplemented by other books or by instructors, this book can be a good textbook in the beginning quantum mechanics course.

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Methods in Biochemistry

Biochemistry Laboratory Techniques (Wiley, New York, 1966. 177 pp., illus. $5.95), by Sterling Chaykin, was intended as a laboratory manual for beginning graduate students. It was, it is said, designed to provide "a basic working knowledge of a wide variety of laboratory techniques currently in use in biochemical research." Indeed, it does touch on buffers, methods of protein determination, preparation and properties of yeast alcohol dehydrogenase, the isolation of rabbit muscle aldolase, Sephadex in gel filtration, criteria of protein purity, structure of aldolase, radioisotopes, characterization of glycogen, glycolysis, enzymology of polysaccharide biosynthesis, oxidative phosphorylation, bacterial genetics, and glass blowing. However, it seems to do little more than touch on these subjects; procedures are only sketched in, and the discussions of principles are meager. The reason given for this

is that "The student is expected to recognize the need for information, to become acquainted with the biochemical literature, and to search out his own answers." To this end, he is given a bit of help; a few references are appended to each section, and occasionally in notes throughout the text he is urged to refer to published papers: "If this does not work, analysis of the precipitate by the method of Robinson and Hogben [*J. Biol. Chem.* **135**, 707 (1940)] should be investigated."

It is obvious that the author believes in self-teaching. One wonders, however, if this is not going too far. There are possible dangers involved when a novice undertakes to use (for instance) bacteria or radioisotopes as tools. These dangers are not emphasized in the book. Instead, in the case of experiments involving the use of carbon-14, the attitude is surprisingly nonchalant; the student is merely admonished as follows: "If your hands are contaminated, use soap and water. Handling a planchet with contaminated hands usually leads to a contaminated counter, and whoever contaminates a gas-flow counter is obligated to clean it."

The overall impression given by the book is not favorable. The author indicates what biochemical techniques he considers important but he does not provide the necessary details so that a student can proceed without much help.

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Index to Bacteria

Index Bergeyana (Robert E. Buchanan, John G. Holt, and Erwin F. Lessel, Jr., Eds. Williams and Wilkins, Baltimore, 1966. 1486 pp., illus. $25) consists of three sections: an introduction; an alphabetical index to over 28,900 names of taxa and specific epithets for bacteria, which have been retrieved from a long and careful search of the literature; and a bibliography of about 6800 references.

The *Index* will be of great value to every scientist who has problems relating to the naming of bacteria, and it is a fitting companion volume to *Bergey's Manual of Determinative Bacteriology*. Answers may be found in the book to many perplexing nomenclatural questions such as the following: How many and what kinds of names have been proposed for bacteria? By whom, when, and where was each taxon published? What species has been designated as the type species of each genus? What names of taxa of bacteria have been conserved by international agreement? What names have been rejected as having no standing under the rules of the *International Code of Nomenclature of the Bacteria*? What names should be avoided in naming newly described taxa because of prior use? This is a great reference book, and it should be readily available to every microbiologist.

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Man in His Environment

The excellent collection of articles brought together by Jack B. Bresler in **Human Ecology: Collected Readings** (Addison-Wesley, Reading, Mass., 1966. 480 pp., illus. $9.75) ranges in coverage from the history of the earth's climate, the ecology of prehistoric man, and land and early food production to man in space, and includes discussion of contemporary problems such as population and stress and radiation and air pollution. A particularly interesting group of articles covers the controversy over the application of Bergman's and Allen's rules to human evolution and serves to illustrate the tentative nature of theory in human ecology, just as the entire collection demonstrates the cross-disciplinary nature of this growing subject.

In line with current controversies, I should have liked to see Ferdon's critique of Meggers accompanying her "Environmental limitations on the development of culture." In addition, Livingstone's classic paper on sickle-cell anemia in West Africa would have enhanced the section on land and disease patterns. A synthesizing introduction would have been welcome, for some kind of overview would have been advantageous. The editor has thoughtfully left the bibliography to each article intact, a practice becoming rare in such collections. In addition, he has added helpful lists of supplementary reading at the beginning of each section.

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Inorganic Substitution Reaction

Cooper H. Langford and Harry B. Gray are two of the most productive young workers in the exciting and expanding field of inorganic reaction mechanics. They have combined their talents in a small but comprehensive volume entitled **Ligand Substitution Processes** (Benjamin, New York, 1965. 119 pp., illus. $8.50). They have done a remarkable job of summing up in a few pages the extent of our considerable knowledge of one of chemistry's most fundamental reactions: the generalized acid-base substitution reaction for the case when the generalized acid is a metal ion.

The authors have not been content to repeat the ideas of others. Instead they present an entire new classification scheme for substitution reactions. They suggest three categories of mechanism, distinguishable operationally by kinetic tests.

1) Dissociative (D): intermediate of reduced coordination number, which may be detected by its selective reactivity.

2) Associative (A): intermediate of increased coordination number formed, which may be detected by departure of the rate equation from simple second-order.

3) Interchange (I): no kinetically detectable intermediates. This category is further subdivided into I_a, where the rate is sensitive to the nature of the entering group, and I_d, where it is not.

The new classification bears much resemblance to the older Hughes-Ingold system for organic substitution reactions. Thus we can identify D with S_N1 (lim), A with S_N2 (lim), I_a with S_N2, and I_d with S_N1. Nevertheless, the new scheme has shades of meaning which make it more appropriate for inorganic systems, particularly metal complexes.

There are only three chapters, including an introduction which sets up the new mechanistic classification. The other two chapters are on square planar substitution (Gray's specialty) and octahedral substitution (Langford's specialty). An attempt is made to use molecular orbital theory as a guide whenever possible. Although this meets with mixed success, the overall result is novel and stimulating.

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