may be so gross that even lactose can project a substantial image. Animals, on the other hand, can be subjected to a long and precise training so that the salient features of the situation when the drug is given can be known. In terms of the mirror analogy, the effects of the drug are seen in a mirror whose contours can be mapped and sources of distortion identified. Knowledge of the effects of the drug in such favorable circumstances will make it possible to devise experiments in human subjects that will minimize, or permit identification of, the distortions due to individual characteristics.

It is not that one does not need to study man; it is that studies in man require background information that can be permissibly obtained only in animals. To study only man is to ensure that psychopharmacology will progress mainly in the number of new drugs of whose effects we are largely ignorant, while for the older drugs we remain unable to improve on the descriptions of Shakespeare, De Quincey, and Huxley.

PETER DEWS
Department of Psychiatry, Harvard Medical School, Boston, Massachusetts

Compendium

Handbook of Physics. E. U. CONDON and HUGH ODISHAW, Eds. Second edition. McGraw-Hill, New York, 1967. xxxii + 1626 pp., illus. $32.50.

Let us be clear what this book is: 93 chapters designed to cover almost every topic of physics. If you like, here is the poor (but not insolvent) man's one-volume condensation of the immense *Encyclopedia of Physics*. It bears testimony to the great effort put forth by the editors—especially Condon—in attempting to collect at once all that is meaningful in physics. About such compendia, we may ask: (i) Are such things useful, and in what way are they useful? (ii) Is this one useful?

Questioning usefulness categorically is a delicate matter. What do I read such handbooks for? Usually, it is not for anything in my own area of expertise—plasma physics—because I have more material in my mind or at hand, organized to suit. Usually, it is not in areas where I wish to gain additional real working knowledge—vacuum technique, or electronic circuits, for instance —because I discover that I would learn that way some dangerously obsolete arts. Rather, I should consult my colleagues, or do some work in the library. Usually, it is not in completely strange areas, because there is more news in a handbook than I can stand. Yet a handbook is useful: sometimes for numbers, if I have some feel for what is there; sometimes for basic ideas, even if I know that I must go elsewhere to be up to date; but mostly to give me some feel for what the topic is all about, in an interesting way, without committing me either to being an expert or to an institution. For example, in this handbook there is a delightful new chapter on glass. Surely it contains much less archival information than the old one in the first edition, and would be held in derision by some; but for me it is just right. All too often these real requirements of such a book—which differ from those of a text, or a review article—are not understood by contributing authors.

How does Condon and Odishaw fare, now revised, now ten years after publication of the first edition? I count 25 chapters totally unchanged, 29 slightly changed, 15 substantially so, and 24 fully modified or rewritten. Too many are unrevised. It must always be so in a book such as this, for original authors cannot or will not take on the unlively task of rewriting their old work; and others cannot be found to do the rewriting. Thus, in spite of Job's wish (19:23,24), the wisdom of an age dies in its original form, and to be most useful must rise quite anew.

All this is to say that the magnificent collection is starting to show its age, and hence to lose its value, in spite of the revisions. Some of the presumably more stable areas are well revised—for example, mathematical topics and nuclear physics. But many really fast-changing areas are out of date: mechanical control mechanisms; fluid mechanics, including waves therein; and so forth. Where are to be found modern electronics or transistor circuits, signal-to-noise concepts that are so important in many physics experiments, enough on fuel cells, new vacuum techniques, high-intensity optical sources, lasers, image reconstruction, recent applications for x-ray techniques? Nevertheless, these represent a minority of the topics, and the book is valuable for several years yet as a reference.

D. J. ROSE
Oak Ridge National Laboratory, Oak Ridge, Tennessee

Luminescence of Biopolymers

Fluorescence and Phosphorescence of Proteins and Nucleic Acids. SERGEI V. KONEV. Translated from the Russian edition (Minsk, 1965). Sidney Udenfriend, Translation Ed. Plenum, New York, 1967. x + 204 pp., illus. $9.50.

During the last ten years the continuing progress in optics and electronics has made it possible to study the fluorescence and phosphorescence of proteins and nucleic acids with increasing accuracy and with better spectral resolution. With the improved knowledge of the structure of macromolecules these spectroscopic methods have come into their own, for they provide some of the most sensitive and refined techniques that we possess for the observation of these molecules in solution. A book containing an exposition of the spectroscopic foundations and a critical survey of the vast and often unreliable experimental material is greatly to be desired.

Konev's book is a summary of the contributions of the Russian school to this topic, together with less emphatic consideration of the work done outside the Soviet Union. The first 50 pages, dealing with the excited states of tryptophan and tyrosine, provide a very good introduction to the subject. Unfortunately the succeeding chapters on fluorescence of proteins, energy migration, luminescence of nucleic acids, and luminescence of living tissues are of much smaller value. The author attempts to settle too many controversial matters on which a decision is not possible because of present-day technical shortcomings, to the detriment of honest exposition of the experimental material and its physical fundamentals. Very little is made of the heterogeneous origin of the fluorescence of proteins, which necessitates detailed consideration of each particular case on its own merits. Konev prefers to rely on easy and often erroneous generalizations. Thus by a demonstration of the constancy of the fluorescence spectrum of chymotrypsinogen with exciting wavelengths (p. 70 and fig. 28) he purports to show that in proteins containing tryptophan and tyrosine the fluorescence of the latter is not detectable. This general conclusion is contradicted —as it should be—when by the very same method the fluorescence of tyrosine is demonstrated in human serum albumin (p. 98 and fig. 34).

In general each succeeding chapter

is weaker than the previous one, and the last three devoted to the luminescence of living tissues would hardly be suspected to originate from the same hand that wrote chapter 1. The author, who shows himself capable of critical discrimination in dealing with the problem of the molecular oscillators in tryptophan, abandons any such strict criteria in dealing with the far more intricate problem of the luminescence of living tissues. The climax is reached when Gurwitch mitogenetic radiation—which for very good reasons has been relegated to oblivion—is dusted off and put into circulation once more with the help of experiments and interpretations open to the gravest doubts. Konev's proposal of a mechanism of action which consists of cooperative changes in protein conformation extending over indefinitely large numbers of molecules following a single photon absorption by one of them is contrary to all the foundations of this field, some of them, paradoxically enough, due to Konev himself.

In summary: this is a readable account of protein luminescence that starts well and ends badly. If the reader can skip over Konev's opinionated conclusions and concentrate on the experimental material described he will find profit in this book. The opposite—which could easily happen to the enthusiastic beginner—might be disastrous.

G. WEBER
Department of Chemistry and Chemical Engineering, University of Illinois, Urbana

Primates

Progress in Primatology. First Congress of the International Primatological Society, Frankfurt, July 1966. D. STARCK, R. SCHNEIDER, and H.-J. KUHN, Eds. Fischer, Stuttgart, 1967 (distributed in the U.S. by Abel, Portland, Ore.). viii + 446 pp., illus. $21.40.

In 1953, at a symposium in Boston devoted to the nonhuman primates, I noted the then-current decline of research in primatology. Recent years, however, have witnessed a most remarkable revival of interest in the nonhuman primates. This involves not only the classic fields of comparative morphology and paleontology but also the application of such newer approaches as those of molecular biology and physiology. Also included in this revival is a tremendous expansion of behavioral studies, especially of primates in their native habitats. Nor should the relatively recent great increase in use of nonhuman primates in medical research be overlooked. This is providing not only valuable information for the medical sciences but also primate material for other studies.

The symposium here reviewed clearly reflects this revival and expansion, which is truly international in scope. Hence it should prove of interest to anyone concerned with the nonhuman members of his order. Although the majority of the 57 papers were presented by scientists working in the United States and West Germany, researchers from Great Britain, Holland, Belgium, France, Italy, Switzerland, Canada, Japan, and Central Africa are also represented. Of the papers, 43 are written in English, 12 in German, and 2 in French.

As Dietrich Starck noted in his opening address to the congress, "primatology" is best defined as a very heterogeneous discipline including in its scope those scientists interested in and working with members of the order Primates, the order to which man belongs.

The papers in the present volume are presented, as at the congress itself, in sections reflecting the various interests of the participants. The part entitled General Paleontology, Systematics, Evolution consists of six papers, dealing respectively with the work of Ernst Haeckel (one paper), catarrhine paleontology (two), taxonomy of Old World monkeys (one) and of chimpanzees (one), and primatological research in Central Africa (one). Morphology, Embryology, Functional Anatomy comprises 12 papers, treating aspects of reproduction (two papers), locomotion (one), teeth (one), skeleton (two), musculature (three), and brain (three).

The seven presentations under the heading Karyology are concerned with the ear-bones of catarrhines (one paper; why placed here?), chromosomal morphology of various primates (four), DNA in anthropoid-ape lymphocytes (one), and nuclear appendices of anthropoid-ape polymorphonuclear leucocytes (one).

By far the largest section, Ecology, Ethology, includes 20 papers. Twelve of these deal with various aspects of behavior, chiefly in the wild state, of a number of simian primates (*Callithrix, Saimiri, Cebus, Macaca, Colobus, Pan*); one is concerned with the effects of group density on social behavior in normal, autistic, and brain-damaged human children; three with learning responses in simian primates (*Saimiri, Macaca, Hylobates, Pongo, Pan, Gorilla*); two with visual (in *Macaca* and other genera) and one with auditory discrimination (in *Papio*); and one with nocturnal activity in lorisine lemurs. The final group of 12 papers, Primates in Medical Research, Serology, Hematology, covers a range of topics—use of nonhuman primates in medical research (seven papers), hemoglobins (two), blood groups (two), and immunoglobulin G (one).

WILLIAM L. STRAUS, JR.
Department of Anatomy, Johns Hopkins University, Baltimore, Maryland

A Medium for Life

Soil Biochemistry. A. DOUGLAS MCLAREN and GEORGE H. PETERSON, Eds. Dekker, New York, 1967. xiv + 509 pp., illus. $22.75.

Soil-Plant Relationships. C. A. BLACK. Second edition. Wiley, New York, 1968. viii + 792 pp., illus. $19.95.

Although from their titles one might expect these two books to have much in common, such is not the case. They are written at about the same level, but they serve quite different interests. McLaren and Peterson's *Soil Biochemistry* is a volume of 17 chapters by 25 authors who take up a diversity of topics, without continuity. It is indeed a collection of essays held together loosely by the title. Black's *Soil-Plant Relationships,* on the other hand, is the work of one author who in nine chapters builds a coherent account of the characteristics of soils which affect their capacity to sustain plant growth. The Black volume is meticulously addressed to the subject of its title and is a solid scholarly achievement.

Among the chapters in *Soil Biochemistry* deserving special notice one should mention that by C. Steelink and G. Tollin, in which they discuss, in some 20 pages, the subject of free radicals in soil, with particular reference to humic fractions. Their speculations on the possible role of radicals in soils are novel and stimulating. Another is the chapter by J. J. Skujins on the origin and state of free enzymes in soil, a topic to which