

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 Gurwitsch 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.

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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 leukocytes (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 (*Calli-*

thrix, *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 loriseine 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).

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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

McLaren has himself made significant contributions.

There is extended treatment of "biochemicals" in soil, their isolation and characterization. This is followed by some excellent reviews of certain metabolic processes involving these biochemicals and some alien chemicals that may find their way into soils. A general chapter by C. C. Delwiche entitled "Energy relationships in soil biochemistry" serves as an admirable introduction to this topic. However, among the groups of compounds discussed there are some that do not relate closely to normal soil processes. S. Dagley reviews the microbial metabolism of phenols, particularly dihydroxy-phenols, and other aromatic compounds. The biodegradability of surface-active-agent detergents is examined in some detail by R. L. Huddleston and R. C. Allred. More relevant to events in soils is a concise, effective analysis by P. C. Kearney, D. D. Kaufman, and M. Alexander of the biochemistry of herbicide decomposition, which includes discussion of all the major chemical groups of herbicides. In this the authors touch briefly on the perplexing problem of the development by organisms in the soil population of the capacity to degrade organic compounds believed to be alien in structure to known soil constituents.

At the heart of soil-plant relationships are the events, physical, biochemical, and microbiological, that occur on the surfaces of roots and in their immediate vicinity within the rhizosphere. There has been insufficient recognition of the inhomogeneity of soil as a medium for plant growth and of the fact that the presence of roots introduces effects not easily ascertained by gross chemical studies. A. D. Rovira and B. M. McDougall review this topic in considerable detail. Somewhat surprisingly, Black, in his book, while portraying with clarity the ion-uptake system of roots, forms of absorption, and the carrier theory of transport and accumulation, touches only lightly on the rhizosphere environment or the implications of the presence of a zone of microbial activity surrounding roots and rootlets. Measurements of soil properties or analyses of soil constituents as yet provide little useful information about the immediate root environment.

An excellent feature of Black's book is the generous use of tables taken from original papers to illustrate points being made. Furthermore, each chapter is followed by a listing of citations com-

plete with titles. Both the tabular examples and the bibliographies contain many entries published in the last decade, though the structure of the first edition (published in 1957) has not been changed. Essentially this is first to treat soil as a medium—soil water and soil aeration, water availability, and other factors that affect physical conditions influencing plant growth—and then to discuss the capacity of the soil to supply nutrient elements—exchangeable bases, cation exchange, soil acidity and nutrient availability, salinity and alkalinity. Finally, in three substantial chapters, the soil-plant interactions of the major nutrient elements, nitrogen, phosphorus, and potassium, are treated.

It would be easy to point to other topics that might have been included—there is no mention of the forms and availability of lesser nutrient elements, for example—but this does not seriously detract from the value of the volume, whose usefulness lies in the solid and authoritative treatment of the basic essentials of soil-plant relationships.

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Fossil Plants

Traité de Paleobotanique. Vol. 2, Bryophyta (S. Jovet-Ast), Psilophyta (O. A. Høeg), Lycophyta (W. G. Chaloner, with the collaboration of E. Boureau). EDOUARD BOUREAU, Ed. Masson, Paris, 1967. 845 pp., illus. 340 F.

This cumbersome and expensive volume is an essential reference work on fossil plants. The general impression it gives is one of conscientious and intelligent compilation by all authors. Omissions and errors are few and are of minor importance.

Jovet-Ast, a distinguished student of Recent hepatics, deserves special compliment for her foray into an area where the methodology is largely alien. In many elementary texts the comments on the fossil record of bryophytes are mainly disparaging, but this summary shows a substantial mass of records is accumulating, even if it is one that is largely deficient in sporophytes. Most students of Recent bryophytes will regret that this useful section of the volume was not issued separately. If Jovet-Ast is to be chided, it is on two points only: the exasperation that the specialist will experience in tracking down records where she gives no direct references (on pp. 102–03 for example), and

the excessive tolerance she shows by including Greguss's presumed Ordovician genera *Musciphyton* and *Hepaticaeophyton* so prominently. Examine the illustrations of these genera in the light of the opinion held by many prominent paleobotanists that these "fossils" are root fragments of Recent vegetation. It seems such an eminently sensible point of view. Greguss's spirited denial [*Acta Univ. Szeged. Acta Biol.* 7, (1962)] of this interpretation is unconvincing and serves mainly to lend a greater eloquence to its probability.

As a result of renewed interest in Devonian plants we now know more about the early vegetation of the land. Relevant aspects of this knowledge are summarized effectively in Høeg's contribution. The difficulties of classification in a group of plants where significant new information is accumulating rapidly are notorious, and it casts no reflection on Høeg to suggest that it is as well to read this section of the book in conjunction with recent important abstracts by Banks and by Bierhorst [*Amer. J. Bot.* 54, 651 (1967)]. That we may expect the Psilophytes to provide new advances of fundamental morphological importance is clear. Take, for example, *Sporogonites*, a plant of obvious interest but so little known that here in the space of one volume Høeg considers it in the Psilophyta and Jovet-Ast in the Bryophyta.

Few persons can have envied Chaloner his task of summarizing the information on fossil lycopods. They were prominent Carboniferous plants, and a large number of taxa have been described in a widely scattered literature. Some idea of the frustration involved can be gained from the observation that approximately half the genera are so poorly understood that they cannot be classified precisely within the Lycophyta. Chaloner's achievement sets a high standard for subsequent contributions to this series.

For added measure a few Sphenophytes omitted from volume 3 and the obscure genus *Crocalophyton* are also treated in this volume (by Boureau). *Crocalophyton* is placed after the bryophytes and before the psilophytes, on the assumption that it may be a genus significant in the story of vascular plant evolution. Surely the much more prosaic interpretation of these specimens as lumps of crotch wood deserves consideration.

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