

new, having been published, *in toto* or in part, elsewhere. Other papers are literature reviews. Although some of the topics have already received much attention in earlier published works, emphasis has been placed not only on additional new data but—what is perhaps even more important—on attempts to correlate structure and function through the use of a wide variety of experimental techniques. Among the methods employed by the various investigators were x-ray diffraction, electron microscopy, light microscopy, histochemistry, biochemistry, pharmacology, and electrophysiology. In most instances the investigators employed more than one experimental method. This approach has yielded a clearer understanding of the topics under consideration. Moreover, it presents the most recent morphological, biochemical, and physiological data in relation to current thought and research trends in certain areas of cellular neurobiology.

In addition to the papers dealing with nervous structure and function, four studies are included in the collected papers of the symposium which are of peripheral but, nonetheless, current interest. The high level of the papers is punctuated by an amusing addendum to one of the studies.

This book will be of value chiefly to those investigators whose interests lie in similar research areas. It should also be of value to cellular and comparative biologists with adequate backgrounds in the field of neurobiology, but it will not be easy going for the casual reader.

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The Biological Way of Thought. Morton Beckner. Columbia University Press, New York, 1959. 200 pp. \$6.

The biologist today is a curiously nervous fellow. He is beset by an ever-increasing need for physicochemical techniques and at the same time is alone in the task of reassembling the extracted parts into the living organism. Latter-day mechanists consider biology to be merely a complex extrapolation of physics and chemistry, while the modern heirs to vitalism, the "organismic biologists," vehemently reassert that the whole is greater than the sum of the parts. Reductionism versus emergence is still being argued.

Morton Beckner's book is a useful clarification of the position that biology is a unique and autonomous discipline which requires its own techniques of theory formation despite its use of physicochemical data. To this end, he restates the philosophic basis of organismic

biology and examines the qualities of organization, directiveness, and historicity which are attributed to living things alone. In effect, Beckner concludes that in our present state of ignorance the biologist has, perforce, to develop a methodology and a philosophic approach which is far removed from the physical and chemical mechanisms underlying the behavior of biologic material. This is best illustrated in such areas as taxonomy, evolution, and selection theory and genetics, where the New Systematics may be successful in resolving many problems of classification. Of more general interest is the closely reasoned case for the utility of model explanation and the teleological explanation in approximating biologic "truth."

Unfortunately, the working biologist is likely to be overwhelmed by the tortuous terminology used. Furthermore, a more immediate problem confronting the biologist is not the need to rise above the physical sciences but, rather, the need for enough training in physics and chemistry to put the enzymes back into the cells. One must agree in substance with Beckner that the traditional approach of the biochemist will not resolve the question of what is life, but neither will the New Systematics.

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Mineral Nutrition and the Balance of Life. Frank A. Gilbert. University of Oklahoma Press, Norman, 1957. xv + 350 pp. Illus. \$5.95.

The book is a critical review of 1177 books and articles on the mineral elements necessary to life on earth. The following essential elements are discussed: phosphorus, calcium, magnesium, iron, potassium, sulfur, copper, manganese, zinc, iodine, boron, molybdenum, aluminum, silicon, sodium, chlorine, fluorine, arsenic, lead, selenium, and vanadium. Each element is treated separately with respect to its relation to plants and animals, its essentiality, and its occurrence in water, soil, and living tissues. The deficiency areas and deficiency symptoms in plants and animals and the connection of some of these elements with enzymes, vitamins, and hormones are shown. The final chapter deals with the relation of soil and fertilizer to mineral metabolism in plants and animals, with human nutrition, and with national health. This chapter, which consists of only eight pages, is much too short to convey even a most elementary understanding of such complex and difficult subjects.

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Die Haustiere Afrikas. Ihre Herkunft, Bedeutung und Aussichten bei der weiteren wirtschaftlichen Erschliessung des Kontinents. Caesar R. Boettger. Fischer, Jena, Germany, 1958. x + 314 pp. DM 31.20.

This remarkable book is probably the most complete, the most up-to-date, and the most critical account in existence of our knowledge of the origin, evolution, and distribution of domestic animals, of their value to man, and their influence on the development of cultural patterns. Although relatively few of the animals under domestication have their origin in Africa, most of the others have been introduced into this continent since prehistoric times, and, therefore, this book deals with almost all of them, even with bees, silk moths, and cochineal insects. The only domestic species not introduced, and therefore not discussed, are the reindeer, the three South and High Asiatic species of cattle—that is, the gayal, banting, and yak—and the South American llama and alpaca.

In contrast to widely prevailing views, it is pointed out that nomadic life is not the precursor of sedentary agricultural culture but that random food gathering, including hunting and fishing, preceded planting, that regular agriculture became possible only after suitable domestic animals had become available, and that the modern nomadic life is a secondary development brought on by the necessity of feeding too many livestock.

It is shown that the dog is the oldest domestic animal, that the pig is next in line, and that it was replaced in the Near East by cattle, sheep and goats. The origin of all these domestic animals is in the fertile crescent of anterior Asia, although later on related subspecies of the same forms were tamed, and frequently crossed, with the original stock in other parts of Asia, as in India, Malaysia, and China.

Whereas most species were domesticated for reasons of utility, cattle and the cat originally were taken on for cultic reasons. The same applies to the jackal in Egypt, which is no longer associated with man.

African origin is accepted for the donkey, cat, ferret, rabbit, pigeon, dove, guinea hen, and some breeds of bees. However, other species were temporarily kept in Egypt, such as the jungle cat (*Felis chaus*) (for cultic reasons), the striped hyena, three species of antelope, the Nile goose (*Alopochen aegyptiaca*), and the African elephant (in North Africa). Some of the introductions from Asia, the distribution of which is more restricted, are the horse, the water buffalo, and the dromedary. The latter is considered to be derived from a wild species different from the wild ancestor of the Asiatic two-humped camel.