

work in carrying out these objectives. In general, the applications and the limitations of the various methods are clearly and concisely discussed. The recommended methods are very well presented, and possible sources of error and areas where caution must be observed are pointed out.

This volume is an improvement over the previous volume in that an attempt has been made to discuss methods for related topics in the same volume. For example, about a third of volume III is devoted to methods for polysaccharides, while another third is devoted to the determination of metal complexes and metallic ions.

The group of methods of general interest includes the determination of organic phosphorus compounds, assay of thioctic acid, the determination of histamine, and spectrophotometric methods for the determination of uric acid, hypoxanthine, adenine, and xanthopterin.

The group of subjects related to carbohydrate structure includes the use of periodate oxidations, end-groups analysis of polysaccharides, and the use of infrared analysis in the determination of carbohydrate structure.

The remaining third of the volume is devoted to the measurement of complex ion stability by the use of ion-exchange resins, analysis of metal-protein complexes, application of metal buffers and metal indicators, determination of zinc and flame photometry, and spectrometry.

This volume is an excellent addition to the series on biochemical methodology. It should be of considerable value to the research biochemist.

JAMES R. GILLETTE

Laboratory of Chemical Pharmacology,
National Heart Institute,
National Institutes of Health

Studies of the Psychology and Behavior of Captive Animals in Zoos and Circuses. H. Hediger. Translated by Geoffrey Sircom. Butterworths, London, 1955. vii + 166 pp. Plates. 30s.

H. Hediger, director of the Zoological Gardens at Zurich and professor of animal psychology at the University of Zurich, says: "To me, the animal psychologist seems like a cave explorer, who, making his way through impressive tunnels, finds himself groping at the threshold of some lofty cavern, access to which will some day be granted to his astonished gaze." Hediger has traveled in Europe, the United States, Africa, and the South Pacific islands, always observing the behavior of animals both in captivity and in their native wilds. He has followed his former book, *Wild Animals*

in Captivity, with this one, which treats of the psychology of animals.

This is a comprehensive book and attacks many problems. The animals' flight reaction, for instance, is the distance at which an animal becomes alarmed by man or by an enemy, and at which it runs away. Hediger has actually measured the number of feet at which an African buffalo in the wilds will take alarm, and compared it with the distance that alarms a buffalo on a reserve where he has learned that he is safe. The "need to escape" is a greater drive with animals than sex or hunger.

A study of animal tracks, both in the zoo and in the wild, shows that animals, like man, tend to follow certain paths. Of freedom, he says, "It has two aspects; one for the predator that is lucky enough to find a particularly tasty victim; and another for the victim that is lucky enough to escape from a particularly dangerous enemy."

He has not confined his studies to the big, showy zoo animals, but has an interesting chapter on the so-called "hypnosis" exercised by snakes, and a study of "fascinating organs" used by some snakes to decoy their prey.

The social relationships among animals are discussed all through the book—even the social significance of antlers in deer. When different species live together, one is always dominant. There are fascinating accounts of fighting ceremonies and of mating ceremonies, though Hediger says that too little is known about preliminary courtship rituals except in the case of some birds.

The relations of male animals to the young, of females to their young, and of the young to each other are studied. Begging among zoo animals is said to be not only a request for food but for companionship.

The psychology of circus animals differs from that of zoo animals because of their much closer contact with trainers, grooms, and in some cases with the public.

Descriptions of animals at play include accounts of his visits to the famous trained animals at the St. Louis Zoo and the porpoises at Marineland.

The book is full of interesting information—for example, that the giant sloth of Patagonia was probably kept as a sort of domestic animal by the aborigines; that the Watussi cattle are kept ceremonially, and are not butchered, milked, or bled (their only use is to furnish dung for fuel and urine for bathing purposes); and that, if a dog bites a man, it may be because he regards the man as a social rival.

There are informative notes on the birth of a giraffe and the birth of a kangaroo, and on the sleeping habits of elephants.

The book is divided into 11 chapters, such as "The animal's expression," "Animal psychology in the circus," "Wild and domestic animals," "Mother and child," and "Animals among themselves." The photographic illustrations are unusually good.

This is a book that provides worthwhile reading which nature lovers may read with interest and enjoyment and then put in a nearby file as an excellent reference book. A bibliography of 197 titles is included.

W. M. MANN

National Zoological Park

Précis de Géologie. Leon Moret. Masson, Paris, ed. 2, 1955. ix + 669 pp.

It is very helpful for the American teacher of geology to learn how his subject is presented in other parts of the world. This book by Leon Moret of the Ecole Nationale Supérieure d'Hydraulique at Grenoble, gives an excellent survey of the science of geology as it is taught in French institutions of learning.

One need have no worry concerning the geologic background of our French colleagues, if we can assume that they are familiar with all the information in Moret's book. The book covers both physical and historical geology, and although the organization may differ from most American textbooks, the over-all coverage is about equal to that presented to our geology majors in a first-year course.

The first part of the book, after an introduction in which some general principles of geology are discussed, is mostly concerned with the various rocks and minerals that make up the surface of the earth. The discussion on the classification of minerals and crystals is especially well written.

This book goes on to discuss fossils and the various principles of stratigraphy. There is an abbreviated summary of classification as well as a brief résumé of the main faunal and floral elements of the different major periods.

The third part concerns tectonics, and while this part may be a little more thorough than that given in most comparable American textbooks, the section should be of considerable interest to the somewhat more advanced student.

The fourth part consists of an excellent survey of historical geology, with special emphasis on events in France and elsewhere in Europe. This section leans heavily on the work of Gignoux, to whom suitable credit is given. This section should be very useful to American students who wish to learn more details, especially concerning events in Europe, than are given in the average American