is it mentioned in the supplements that have since been published. Cope says:

> This species ranges the Austroriparian region east of the Mississippi River, and the Carolinian district of the Eastern, not, however, entering New Jersey.

It appears, however, from the above record that there is at least one colony of corn snakes to be found in the pine barrens of New Jersey.

NEW BRIGHTON, WM. T. DAVIS
STATEN ISLAND, N. Y.

FUNDULUS AND FRESH WATER

THE notes which have recently appeared in SCIENCE in regard to the capacity of salt-water minnows to survive being transferred to fresh water, remind me that the experiment has been, and I suppose still is tried, on what I may call a commercial scale, in south-eastern Massachusetts. "Mummichugs" (*Fundulus* spp.) are the favorite, practically the only, bait for winter pickerel fishing through the ice, and it was a very common practise to catch them in large quantities in salt water in the late fall, and keep them in running fresh water all winter.

When I lived on a farm in Middleboro, Mass., in 1892–96, one of my neighbors always had them for sale, during the pickerel season. He used to catch them in Buzzard's Bay, some fifteen miles away, and kept them in a perforated box, placed in a running brook. I have more than once bought "Mummichugs" from him, and, if my memory does not play me false, have kept them alive for some time in a boxed-in spring on my farm. They must have been in confinement at least a month, but seemed in perfect health and were very vigorous and active. Had there been any serious mortality among them, it certainly would not have paid him to keep them for sale.

As a matter of fact, I believe that live *Fundulus* for bait are to be had regularly in the Boston fish markets every winter, and my impression is that they are kept in tanks fed with ordinary tap water.

I may add that I use a good many "Mummichugs" for live bait every summer, and find them remarkably tenacious of life. If covered with wet seaweed, they keep lively for several hours even in hot weather.

JOHN MURDOCH
PUBLIC LIBRARY,
BOSTON, MASS.

SCIENTIFIC BOOKS

Vergleichende Physiologie. By AUGUST PÜTTER. Jena, G. Fischer. 1911. Pp. 721; illustrations 174.

The title of this book, "Comparative Physiology," is misleading and the author, who is a professor at Bonn, endeavors to justify it in his introduction. The task of general physiology, he says, is the investigation of the general problems of life; comparative physiology is a method, the object of which is to enable one to comprehend the fundamental physiological similarities of organisms. The book therefore does not rehearse the physiological differences of species or larger groups, but deals with general physiology. "Allgemeine Physiologie" would have been a better title, had it not conflicted with that of his master Verworn's book. The facts are drawn chiefly from invertebrate animals and plants, a helpful list of which, with both scientific and common names, family, order and class, is given at the end. There are ten chapters, most of them long, rambling, and clumsily subdivided. In one case, the same heading is used for two distinct and separate sections. The index is wretchedly incomplete. Notwithstanding these technical defects, the book is a valuable addition to the growing literature of general physiology. It is very modern: most of its references to literature belong to the last decade; but again the great bulk of American physiology is unnoticed.

The morphological substratum of vital processes is passed over very briefly, only a few facts being presented regarding colloids, adsorption compounds, membranes, alveolar structure, and the chemical constituents of living substance. The term "living substance" is an abstraction; several kinds of

living substance are always combined to form a living system. The simplest living system is the cell, which comprises at least three structural substances, plasm, nucleus and membrane. More than one quarter of the text is devoted to metabolism. Here the author's tendency to avoid the conventional, which is evident throughout the book, is at once illustrated by his sharp separation between "Baustoffwechsel," and "Betriebstoffwechsel," comprising respectively the metabolic processes involved in the building of body substance and those not so involved. The actions on metabolism of such conditions as temperature, light, altered concentration of food stuffs, hunger, absence of oxygen, and accumulated metabolic products are discussed. In a subsequent chapter on nutrition, the author presents with experimental evidence his theory that many aquatic animals are nourished by organic food dissolved in the surrounding water, and maintains that this has now been proved for many cœlenterates, entomostracans, tunicates and some fishes. Resorption is discussed from the modern standpoint. The chapter headed "Exchange of Matter," allows a modern treatment of such general physiological topics as the resorption of oxygen and of solid substances in solution, the exchange of water, excretion, secretion, and the distribution of matter in plants and animals. Here many of the facts and principles of respiration, excretion and circulation are introduced, but there is no attempt to treat these topics along the conventional lines of vertebrate physiology. The chapter on the conditions of life ends with a discussion of the problem of the duration of life, with references to the work of Calkins and of Woodruff.

A separate chapter is devoted to transformations of energy and includes mechanical and chemical energy, light, electricity and heat. The author accepts Hürthle's ideas regarding the structure of muscle and, following Koltzoff's general conception of the relations of plasm and fibrillæ, believes the fibrillar rods to be elastic bodies which are under tension when the muscle is at rest. In contraction there occurs a sudden change in the osmotic relations of the sarcoplasm and the isotropic disk, either a decrease of osmotic pressure in the former, or an increase in the latter; the membrane between the two undergoes an increase in permeability; water passes from the sarcoplasm to the isotropic substance; and the elastic tension of the fibrillar rods is released. Fröhlich's view of tonus is followed, according to which tonus represents a slight tendency to continuous contraction of a relatively small number of the fibers of a highly irritable muscle, resulting from the action of very feeble stimuli coming from nerve tissue. Contracture, on the other hand, is a purely muscular condition present in fatigued, narcotized and asphyxiated muscle, and represents a partial inability of all the muscle fibers to extend their elastic elements. The cilium, like the muscle fiber, contains an elastic and a plasmic constituent, and the interactions of the two result in the ciliary movement. Amœboid movement is probably similar in principle, the elastic element perhaps being represented by the superficial layer of the amœboid cell. The increase in the permeability of the plasmic membrane that occurs during contraction is associated with a reversible coagulation resulting from the action of the stimulus on metabolic processes.

Under the general heading of responses to stimuli the author discusses many of the current topics of general physiology, such as irritability, the law of the threshold of stimulation, the all-or-nothing law, conduction, the latent period, fatigue, the treppe, the refractory period, spontaneity, taxis and tropism, tonus, rhythm and the question of its myogenic or neurogenic origin, and the relation between irritability and metabolism. In many of these the author shows himself to be under the influence of the school of general physiology that is headed by Verworn. Sense organs are treated in a broad manner, attention being given not only to the various special senses of animals, but to analogous mechanisms in plants, such as the ocelli in leaves and the static relations of starch grains. In discussing the possibility of hearing by fishes a

warning is pronounced against a too wide generalization of the fact that a few species of fishes have been proved to react to tones. Sections are devoted to the chemical senses, with special reference to investigations on invertebrates, and to unknown senses.

It is in the treatment of the nervous system that the author breaks farthest away from conventional paths and takes a partisan stand on debatable ground. The neurone theory is not accepted, but throughout the whole nervous system there is a complete continuity of living substance. Neurofibrillæ are merely the skeleton of the nerve cell; the neuroplasm is the conducting part. Poisons have revealed the presence of at least six different kinds of living substance in the nervous system: the irritability of the end-organs of cross-striated muscle, of the end-organs of glands, the cardiac branches of the vagus nerve and of smooth muscle, and of sympathetic ganglion cells being depressed by curare, atropin and nicotin, respectively; the irritability of motor cells, intercalated cells and sense cells being augmented respectively by phenol, by strychnine and by neither phenol nor strychnine. Motor differ from non-motor cells in possessing less fatiguability, less need of oxygen and less sensitiveness toward narcotics. The central type of nerve substance is sharply differentiated from the peripheral type by various characteristics, such as its power of summation, certain peculiarities of its conductivity, its greater tendency toward fatigue and its greater need of oxygen—all of these differences, however, being quantitative and capable of being overcome by experimental devices. The author discusses the "adequate," or normal, stimuli for the successive nerve elements that partake in a reflex action, and raises the question whether internal secretions may not constitute the adequate stimuli for the cells of the sympathetic system. Reflex actions are discussed and numerous examples are cited to illustrate their principles. Brief sections are devoted to tonus, to inhibition, as to the theory of which no definite stand is taken, and to instincts; and the chapter ends with a discussion of the motor reactions of animals, which cites Yerkes's work. The final chapter deals with a comparison of organisms.

FREDERIC S. LEE
COLUMBIA UNIVERSITY

Star Lore of All Ages. By WILLIAM TYLER OLCOTT. G. P. Putnam's Sons. 1911. Pp. xxii + 453, illustrated.

The star groups or constellations, so fantastically figured in the ancient maps, are of unknown antiquity; they are found described in the earliest writers of the Greeks, and upon the tablets of Babylon. Around each group has collected a vast number of traditions, myths and legends; and these traditions Mr. Olcott has traced to their sources, the legends and myths he has collated, and has put all into a very readable form. The book is most attractively printed and illustrated and should be of interest to all who like to watch the stars.

CHARLES LANE POOR
COLUMBIA UNIVERSITY

SCIENTIFIC JOURNALS AND ARTICLES

THE opening (January) number of volume 13 of the *Transactions of the American Mathematical Society* contains the following papers:

E. Landau: "Ueber eine idealtheoretische Funktion."

R. G. D. Richardson: "Theorems of oscillation for two linear differential equations of the second order with two parameters."

E. J. Miles: "The absolute minimum of a definite integral in a special field."

E. G. Bill: "An existence theorem for a problem of the calculus of variations in space."

L. E. Dickson: "Linear algebras."

R. L. Moore: "A note concerning Veblen's axioms for geometry."

Joseph Lipke: "Natural families of curves in a general curved space of n dimensions."

F. R. Moulton: "A class of periodic orbits of superior planets."

O. D. Kellogg: "Harmonic functions and Green's integral."

THE February number (volume 18, number 5) of the *Bulletin of the American Mathe-*