

LITERARY NOTICES.

Loeb, Jacques. *Studies in General Physiology.* Chicago, *The University of Chicago Press*, 1905. Part I. xiii + 423, Part II. xi + 425-782.

These volumes contain a series of thirty-eight of the author's papers, all of which are reprinted and most of which originally appeared in German. Within the field of comparative neurology and psychology we note the following papers of the series: "The Heliotropism of Animals and its Identity with the Heliotropism of Plants; Further Investigations on the Heliotropism of Animals and its Identity with the Heliotropism of Plants; On Instinct and Will in Animals; Geotropism in Animals; The Artificial Transformation of Positively Heliotropic Animals into Negatively Heliotropic and *vice versa*; Contributions to the Brain Physiology of Worms; Has the Central Nervous System Any Influence upon the Metamorphosis of Larvae?; On the Theory of Geotropism."

Since the various papers of these volumes received review notice when first published it will suffice, while announcing the fact that they are now available in English, to call attention to the author's scientific life-purpose and the relation which these papers bear to it. From the preface we quote, "a single leading idea permeates all the papers of this collection, namely, that it is possible to get the life-phenomena under our control, and that such a control and nothing else is the aim of biology." According to their method of approach to this goal of research the papers fall into three groups: first, those which are concerned with the control of movement; second, those which deal with the control of regeneration and the determination of organ-formation; third, those which concern the control of the development of the egg.

It is needless to say that Professor LOEB has made great strides toward the accomplishment of his scientific purpose. His work is of great importance; indeed, even when it has followed wrong paths, it has been of value for its stimulating and research-impelling influence.

R. M. Y.

Herrick, C. Judson, The Organ and Sense of Taste in Fishes. *U. S. Fish Commission Bulletin* for 1902, pp. 237-272, 1904.

The sense of taste in fishes is subserved by a portion of the communis system of neurones. The sensory organs of this gustatory system are either 'taste buds' situated in the mouth and on the lips, or else terminal buds or end buds (*Endknospen*, *Becherorgane*) situated on the outer surface of the head and body and on the fins. These organs have a general resemblance to one another, and are histologically distinguishable from the neuromasts (*Nervenhügel*) of the lateral-line system. The outer surface of the body is further provided with sense organs of touch having their own distinct innervation. It has been asserted and denied that the end buds or *Becherorgane*, found in the outer skin of the body and fins, serve the sense of taste rather than of touch; but this paper seems to establish conclusively that they are organs of taste.

The proof is as follows. The cat-fish (*Ameiurus nebulosus*) normally makes very little use of its eyes in getting food, but wanders about waving its barblets gently back and forth or trailing them on the bottom, and darting instantly at any game that they happen to touch. The fish darts in just the same way at a piece of meat (on the end of a wire) that is brought in contact with the barblets or any part of the head or body; and the reaction is quite independent of the animal's seeing or not seeing the food. Now if cotton is substituted for the meat, the animal will respond in the same way for five or six times, but will then no longer respond to cotton although it will at once respond again to meat. In other words, after a very brief training *Ameiurus* responds to taste but not to touch. That the response is really to taste and not to different qualities of touch is proved by the fact that while plain cotton remains unnoticed, cotton soaked in meat juice is snapped up instantly. "These experiments seem to show that in the reaction to meat, both from the barblet and from the skin of the body, the senses of taste and touch both participate. This is in accord with the known innervation of the skin and barblets, for all parts of the body surface receive general cutaneous (tactile) nerves, and all parts are plentifully provided with terminal buds (taste buds) which are innervated by communis (gustatory) nerves." The described reaction does not take place unless the stimulus is actually in contact with the skin, and yet the fish becomes somewhat restless in near proximity to the stimulus, specially if the latter is a piece of meat that has become stale. In order to explain this Professor HERRICK suggests a 'sense of smell', meaning by this a stimulation of sensory

organs in or about the nostrils of the fish, although he himself elsewhere admits in a similar case the possibility of a slight and widely diffused stimulation of end buds on the barblets and body. Further experimentation showed that there are two well defined types of reflex, the gustatory and the tactile.

Similar experiments on three types of gadoids, the pollock (*Pollachius virens*) hake (*Urophycis tenuis*) and tomcod (*Microgadus tomcod*), gave entirely consonant results. In the tomcod the olfactory organs of several individuals were extirpated, but the gustatory reflexes seemed absolutely unmodified by the operation. The sea-robin (*Prionotus carolinus*) finds its food largely by the sense of vision, but also uses not a little its pectoral fin. Now this fin has neither end buds nor communis nerve fibers, and, quite as was to be expected, it shows absolutely no gustatory sensitiveness; the last observation is confirmed by MORRILL. The paper concludes with further interesting observations on the feeding habits of these and other fishes and with interesting general comparative-physiological and comparative-psychological conclusions.

E. B. H.

Carlson, A. J. Further Evidence of the Nervous Origin of the Heart-Beat in *Limulus*. *Amer. Jour. Physiol.*, 1905, **12**, 471-489.

This is another important contribution, by Dr. CARLSON, to the study of the relation of the nervous system to heart-beat. The author makes clear that nerve elements are demonstrable anatomically as well as physiologically in the hearts of many invertebrates which are generally supposed to lack them.

Among the striking facts in this paper we note: (1) The ganglion cells of the posterior or venous end of the heart of *Limulus* are more numerous and exhibit greater automatism than those of the anterior end. (2) The nerve cord on the dorsal side of the heart is a reflex centre, but there is no evidence of a local inhibitory reflex mechanism.

(3) Hearts with nerve cord intact vary less in their beating in response to different intensities of stimulation than do those without neural connections. (4) Mechanical stimuli of various kinds produce or augment the rhythmic contractions of the heart with nerve cord, but after extirpation of the ganglion no contractions result from such stimuli.

R. M. Y.

Kendall, W. C. Habits of Some of the Commercial Cat-fishes. *Bull. U. S. Fish Commission* for 1902, 399-409, 1904.

This paper brings together the most important published and otherwise available facts on this subject. Habitat, food, feeding and breeding habits are the chief topics considered.

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