LITERARY NOTICES.

Margaret Floy Washburn. *The Animal Mind*. New York, *The Macmillan Co.*, 1908. Pp. x+333. \$1.60. (Second volume of the Animal Behavior Series, edited by R. M. YERKES.).

During the past few years the problems of animal behavior have attracted the attention of numerous zoölogists and psychologists. The older "anecdotal" school has finally given place to a school of strictly experimental investigators. The result of a decade of experimentation is an accumulation of data which seems destined to provide a secure foundation for a science of comparative psychology; but as yet these data are, in many instances at least, so fragmentary and so ill-organized that writers wholly fail to agree upon their interpretation. Several obstacles are encountered by the reader who attempts to keep in touch with the work which is being done in this field. The investigations have been concerned, in the main, with circumscribed and isolated problems; and no thorough-going attempt has ever been made to correlate the various groups of experimental findings, or to present a systematic *résumé* and interpretation. Then, too, the data are scattered through a great number of psychological and biological periodicals which are not readily accessible. Moreover, with the advance of scientific achievement in this field there has been developed a refinement of technic and of method which must, of course, be mastered before one can hope to evaluate the results or discover their significance. And, it may be added, the literature is replete with controversial clashes between opposing factions, who advocate a more mechanical or a more anthropomorphic interpretation of observations upon animal behavior.

This, in brief, is the situation which confronted Professor Washburn when she undertook to prepare a volume on "The Animal Mind." In her attempt to clear up the situation she summarizes numerous investigations, evaluates their results in the light of the experimental methods employed, and she discusses the bearing of these results upon the general question: What must be the characteristics of the animal mind,—granting that such a mind exists." The magnitude of the author's task may be inferred from the fact that she cites 476 references from the literature; and her presentation of the results of other investigators is but a small fraction of this exceedingly valuable contribution to the science of comparative psychology.

After an introductory discussion dealing with the difficulties and the methods of comparative psychology (pp. 1-26), and with the evidences of mind (pp. 27-36), she proceeds to the specific question of the protozoan mind (pp. 37-57). The author's attitude toward her problem is illustrated by the following quotation (pp. 36-7): "We know not where consciousness begins in the animal world. We know where it surely resides—in ourselves; we know where it exists beyond a reasonable doubt—in those animals of structure resembling ours which readily adapt themselves to the lessons of experience. Beyond this point, for all we know, it may exist in simpler and simpler forms until we

reach the very lowest of living beings. * * * No one can prove the absence of consciousness in even the simplest forms of living beings. It is therefore perfectly allowable to speculate as to what may be the nature of such consciousness, provided that the primitive organisms concerned possess it." She does not present the arguments which may be advanced for and against the ascription of mental processes to the lower animals; nor does she indicate how probable or how plausible is her assumption that the lower animals possess a consciousness. This may or may not be a serious omission,—probably many readers who have followed the discussions will agree that it is not. But it does seem paradoxical enough that an author should devote whole chapters to the description of something which, in the opinion of many reputable scientists, does not exist; and whose existence the author herself is not willing to vouch for.

An examination of the motor reactions of ameba and paramecium is believed to warrant the inference that the hypothetical protozoan mind differs from the human mind in certain essential and clearly definable features. The mental stock-in-trade of the protozoan probably amounts to not more than three or four qualitatively different sensations; there is an utter absence of mental imagery (or revived sensations), and of anything correlate with attention. (This inference, however, does not seem to be justified, in the case of stentor, by Jennings' observations.) The mental life of the protozoa cannot therefore be a continuous "stream of consciousness," but only a succession of discrete and isolated experiences of the most primitive sort. From this humble beginning of mind, the author sketches in broad outline the developing consciousness through the entire animal series. "The reactions of animals to stimulation show, as we review the various animal forms from the lowest to the highest, increasing adaptation to the qualitative differences and to the spatial characteristics of the stimuli acting upon them. It is therefore possible to suppose that the animal mind shows increasing variety in its sensation contents, and increasing complexity in its spatial (and other) perceptions. But besides this advance in the methods of responding to present stimulation, the higher animals show in a growing degree the influence of past stimulation."

The author presents a detailed description of this increasing complexity in animal response to stimulation. Three chapters on sensory discrimination trace the development of sensory equipment (pp. 58-147). This is followed by a discussion of spatially determined reactions and space perception (pp. 148-204). Here are considered the question of the adaptation of animal reactions to the spatial relations of stimuli (light, gravitation, and the like), and the question of animal perception of space. It is inferred that orientation in the lower animals is probably due to an experience of unpleasantness or uneasiness,—and that no spatial perception need be assumed to account for the reaction. But certain responses to genuine visual stimuli (*i. e.*, where eyes are present) may be due to a consciousness of spatial relations.

Chapters on "The Modifications of Conscious Processes by Individual Experience" (pp. 205-269) describe the various labyrinth and puzzle-box experiments, and discuss the elimination of useless movements in the acquisition

of motor habits. Here, and in the succeeding chapter on the "memory idea" (pp. 270-284), the author reports that an examination of the learning process in animals fails to discover any conclusive evidence for the presence of "ideas" (excepting perhaps in the case of monkeys). "The behavior of the lower forms of animal life, at least, can be fully explained without supposing that the animals concerned ever consciously recall the effects of a previously experienced stimulus in the entire absence of the stimulus itself." The closing chapter (pp. 285-294) deals with the biological significance of attention.

Professor Washburn's book is the pioneer in its field. It will unquestionably prove to be a time-saver to the student of animal behavior, and will be a welcome adjunct to the work of the class-room. Many of its discussions are carried through with a thoroughness and an insight which render them of paramount value. This is particularly true of the learning process. The treatment of spatially determined reactions and spatial perception and of tropisms is, however, in the opinion of the reviewer, too vague and too inconclusive to be of value to the student.

It is suggested that future editions could be improved by the addition of a more inclusive index. To cite but a few omissions, such important topics as memory, mental image, and experience are not mentioned in the author's index. The bibliography might be extended to include Wundt (writings since 1892), Sanford, Brehm, Jourdan, and Ribot, and a complete list of the work done in this field by Darwin, Mœbius, Wasmann and Watson.

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