

neuroid structures in protozoa and to physiological gradients in lower animals, which, to some biologists at least, appear to be fundamentally allied with the problem of the elementary nervous system.

G. E. COGHILL

UNIVERSITY OF KANSAS

The Fundus Oculi of Birds Especially as Viewed by the Ophthalmoscope: A study in comparative anatomy and physiology. C. A. Wood. Chicago: Lakeside Press, 1917. Pp. 181.

The great variety of structures presented by the eyes of birds with the diverse functions indicated by the habits of their possessors, makes the study of vision in birds one of the most promising fields for the solution of the general problems of the physiological anatomy of the eye. Investigators in many other fields, also, may look to the study of avian vision for valuable material. The evolutionary theories of sexual selection and mimicry will stand or fall with the analysis of visual acuity of birds; an understanding of such instinctive activities as homing and, at the other extreme, of cerebral function in binocular vision would be greatly furthered by investigations of the powers of sight in birds. With such problems in mind I took up Dr. Wood's monograph on the ocular fundus of birds with the feeling that here was opportunity for a real advance in the science of avian vision. But after a careful reading of the volume I am left with much the same feeling of hunger that follows a boarding-house chicken dinner; the portion was large, but it contained surprisingly little meat.

After a brief introduction the author offers a summary of the literature on the anatomy and physiology of the avian eye. This is followed by chapters dealing with the collection of material and methods of making ophthalmological examinations of the eyes of living birds. Only methods of viewing and picturing the eye-ground are included, although this part occupies nearly one third of the volume. A chapter is devoted to the effects of domestication with the conclusion that "domestication or prolonged captivity brings about abnormal changes in the eye-ground of birds." This statement is of practical importance for the investigator of avian vision since our studies of visual reactions must be carried out with domesticated species or with animals that have been long enough in captivity to permit of taming. The evidence advanced in support of the statement, however, consists of a few isolated cases of

cataract, etc., in captive birds, and a general greater variability in the coloration of the retina in domesticated species.

The remaining portions of the book are devoted to descriptions of the ophthalmoscopic appearance of the fundus of the eyes of type species of most orders of birds. The descriptions include pigmentation, visible nerve fibers, the form and position of the pecten, and, sometimes, of the macula. The descriptions are illustrated by beautifully executed colored plates. As these seek to represent the exact appearance of the eye as viewed by the ophthalmoscope they lack the clearness of detail, especially in the pecten, which is evident in a good dissection. Further, as they are not drawn to scale and include only a small portion of the eye-ground it is impossible to determine proportions or the exact relative positions of the structures shown, although Dr. Wood maintains that the chief advantage of ophthalmoscopic examination over dissection lies in the possibility of accurate determination of proportions. A similar fault appears in a series of 47 diagrams of the position of the pecten and macula in different birds; a single outline is used for all, even such divergent eye-forms as those of the owl and swallow.

Dr. Wood seems to have given the application of ophthalmoscopic methods to the study of comparative anatomy a thorough test. The sole advantage of its use seems to be the observation of the true colors of the fundus. Whether or not these have any more functional significance than skin pigmentation is a matter for research.

K. S. LASHLEY

UNIVERSITY OF MINNESOTA

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