

check-list with much additional explanation, while the keys and detailed descriptions covering all the known plumages make the identification of specimens an easy matter, the section on "measurements and structure" being particularly noteworthy in pointing out details too often omitted. The section on "field characters" describes the more prominent features by which the live bird may be recognized, while that on "characters of allied forms" points out the differences between the form under consideration and its nearest geographic allies, which not only enables one to see exactly the systematic status of the British species or race, as the case may be, but also to identify a possible extralimital straggler.

Under "breeding" facts of interest to the student of oölogy and of nesting activities are summarized with measurements and descriptions of eggs and data on the time of nesting, brooding and incubation period. The general character of the food of each species is stated and a list of the more important items including, in the case of Raptores, a list of the birds which each species is known to kill. The paragraphs on distribution give the character of occurrence both geographical and seasonal, as well as the relative abundance in the British Isles and "abroad."

The text figures illustrate structural characters of wing, tail, foot or bill with drawings of the heads of many species to aid in identification, while the full page plates, some of which are in colors, depict either very closely related forms or birds in the unfamiliar juvenal plumage.

An additional point which strengthens this work is the collaboration of the other notable authorities on British birds who have aided Mr. Witherby in the undertaking—Dr. Hartert, Mrs. Meinertzhagen, and Messrs. Jourdain, Oldham and Ticehurst. The work of a group of collaborators is necessarily more complete than that of any one individual.

It is difficult to over emphasize the importance of the 'Handbook' as a work of reference not only to the beginner but to the advanced ornithologist both of whom will find here the information of which they are in search.—W. S.

**Görnitz on Feather Colors and Pigments.**—Görnitz has published two papers which consider feather colors and pigments. The first paper<sup>1</sup> gives a good classification of feather colors. The original feature is a division of melanin pigments into two groups: eumelanins and phaeomelanins. Otherwise the classification is similar to that of other authors.

The other paper,<sup>2</sup> in the reviewer's judgment, is an important contribution to biological literature. It deals with some difficult problems of unusual interest. The eumelanins include the darker and much less soluble granular pigments of feathers, whereas the phaeomelanins are

<sup>1</sup> Versuch einer Klassifikation der häufigsten Federfärbungen. Von Karl Görnitz. *Jr. für Ornith.*, LXXI, 1923, Heft. 1. S. 127-131.

<sup>2</sup> Ueber die Wirkung klimatischer Faktoren auf die Pigmentfarben der Vogelfedern. Von Dr. K. Görnitz. *Jr. für Ornith.* LXXI, 1923, Heft. 4. S. 456-511. Taf. 7.

lighter in color and much more soluble. The latter show various shades of light brown and even orange ("rotgelb"). The orange colored melanins mentioned by the writer are, in the reviewer's judgment, better described as broken orange.

An iron reaction was obtained for some of this pigment, isolated from "rotbrauner" feathers. Eumelanin pigment treated with either chlorine or hydrogen peroxide was converted into a substance resembling eumelanin in color and solubility. This result led to the assumption that phaeomelanins may be oxidation products of eumelanins or represent a more advanced stage of oxidation. This is contrary to an opinion which has existed that darker melanins represent the more advanced oxidation such as is involved in the action of tyrosinase on tyrosin.

The chemical considerations are followed by a discussion of the effects of climate on feather colors. A large number of geographical variations of different species are compared from the standpoint of temperature and humidity. Here the author deals with the very difficult problem of the evolution of color patterns. Though numerous exceptions are encountered, the following conclusions are reached. First, that melanin pigment formation is increased by higher temperatures and decreased by cold, eumelanins being susceptible to extreme cold only. Second, dry climates show an increase in phaeomelanin formation and a decrease in the production of eumelanin.

The lipochromes also are treated. Zooxanthin shows a tendency to increase in warm climates and to decrease in very cold climates. Zoonerythrin was found to show little climatic variation, but a slight tendency to the same behavior is claimed. The color patterns of migrating species are influenced by the climate of their winter range, especially when the winter stay is a long one. The writer claims to have discovered an alkali solubility for lipochrome pigment. Boiling yellow feathers in a solution of sodium hydroxide resulted in a yellow color for the solution. A similar result was obtained for red lipochrome pigment. In the reviewer's judgment, the solutions obtained should have been tested for further evidence of actual lipochrome solution.

An old error occurs in both papers, i. e., the idea that white feathers owe their color to the entrance of air into the feather structure. (See Strong, 194).<sup>1</sup>—R. M. S.

**Thomson's 'The Biology of Birds.'**—There have appeared in recent years a number of general works on birds, dealing with their structure and activities, such as those by Pycraft, Beebe, Evans, etc., not to mention the introductory chapters of the larger systematic works, and now Prof. Thomson presents his 'The Biology of Birds'<sup>2</sup> covering much the same ground but under a slightly different title.

<sup>1</sup> The Causes of Whiteness in Hair and Feathers, By R. M. Strong, Science, N. S., Vol. LIV., No. 1398, Page 356, October 14, 1921.

<sup>2</sup> The Biology of Birds. By J. Arthur Thomson, M. A., LL. D., Professor of Natural History in the University of Aberdeen. New York. The MacMillan Company. 1923. Pp. 1-436