be a source of so much confusion to one to whom English is the native language and who has been brought up to use the English system of weights and measures, how much greater must be the confusion to a person brought up on the relatively simple metric system and perhaps attempting to read a paper in a tongue which is foreign to his own and to translate these units into the metric system! If we can not have the metric system in everyday life, let us at least have it in our scientific journals!

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SCIENTIFIC BOOKS

Cloud Studies. By ARTHUR W. CLAYDEN, M.A. Second Edition. E. P. Dutton and Co., N. Y.

STUDENTS of nature should be pleased that another edition of Clayden's "Cloud Studies" is now available. Mr. Clayden has given a great deal of time to developing the art of cloud photography and the result is a series of beautiful cloud photographs which should introduce any reader to a knowledge of the different cloud forms. These cloud forms are called by the names adopted at the International Meteorological Conference at Munich in 1891, a modification and extension of the cloud nomenclature introduced by Howard in 1803.

Mr. Clayden has been an enthusiastic observer as well as a photographer of clouds and in his introduction he tells how to observe clouds easily by means of a blackened mirror. Such a mirror diminishes the glare and brings out in a wonderful manner the detailed structure of the finest cirrus and enables one to observe right up to the edge of the sun. It enables one to view the clouds looking downward instead of in the unnatural position of stretching the neck and the face upward. In the more comfortable position of gazing downward into the mirror long-continued observations may be made and one form of cloud can be watched changing into another.

Beginning with the highest cloud forms Mr. Clayden takes up in succession the different forms of clouds beginning with the highest. In chapter III he pictures, describes and names no less than nine forms of cirrus, quite distinct from each other; but some of these are transition forms and border closely on cirro-cumulus and cirro-stratus. Chapter IV is devoted to cirro-stratus and cirro-cumulus, and numerous examples of each form are given. It is difficult to photograph the widely extended sheets of cirro-stratus so that most of the photographs partake of the cirro-cumulus type. Chapter V takes up the "Alto" clouds, alto-stratus and alto-cumulus. It is almost impossible to photograph the widespread, almost uniform, dark sheets of alto-stratus so that most of the examples given are of alto-cumulus. Chapter VI is devoted to the lower clouds, stratus, strato-cumulus and nimbus. The different types are illustrated by photographs, but these are much less satisfactory than those of the upper clouds. Owing to the absence of color in the photographs it is difficult for an inexperienced person to tell whether dark patches are clouds or sky. This difficulty can be overcome only when it is possible to photograph in colors.

In chapter VII he takes up the cumulus which is perhaps, the best known cloud and easy to photograph. In chapter VIII is described the cumulo-nimbus or shower cloud. Some photographs show the anvil-shaped top of the cloud and others the massive cumulus-like structure of the cloud. Here again we miss the absence of color to distinguish cloud from sky. In chapter IX he discusses clouds which form in wave-like lines and ripples and finally in chapter X has an excellent description of methods of photographing clouds and of determining cloud heights by photography.

The strength of the treatise lies in its photographs and descriptions of clouds. Mr. Clayden has clearly been a student of nature and not of books. His discussion of how clouds are formed and the physical processes involved is very inadequate. It is true that he rightly attributes cloud formation to adiabatic cooling of moist air by expansion and refers to the work of Aitken and Wilson as to the necessity of nuclei for condensation of moisture in droplets. He makes no mention, however, of the usual formation of cloud sheets in inclined strata and ignores the work of Bjerknes and other writers who show that the chief cause of cloud formation and of the ascent of air in inclined strata is the contrast of adjacent bodies of air at different temperatures and the overrunning of colder air from the direction of the pole by warmer air from the south and east.

H. H. CLAYTON

Die Vögel Mitteleuropas. Herausgegeben von der Staatl. Stelle für Naturdenkmalpflege in Preussen. By DR. OSKAR and FRAU MAGDALENA HEINROTH. Hugo Bermühler Verlag, Berlin-Lichterfelde. Lieferungen 1–10; 1924–1925; pp. 1–80; 16 colored plates; 42 black plates.

THE first ten parts of this work appeared between July, 1924, and April, 1925. They are devoted to an account of part of the order Passeriformes of central Europe, *i.e.*, Germany, and they include the wren, water ouzel, accentors, thrushes, flycatchers, waxwing, shrikes, swallows, and the beginning of the Old World warblers, in all thirty-one species.

There is given a brief general statement regarding the families to which these belong and the more or less convenient groups into which the authors divide some of the families. There is also of each species an account, which, while it does not go into technical details, gives habits, measurements, and geographic distribution, though usually not a complete description of adult plumages. While no attempt is made to provide a full life history, the material given throws much interesting light on the birds treated, and in some cases is considerably extended. The text is made up in large part of original life history observations of birds in the field and in captivity, and for this reason the accounts of the various species differ much in length, according to the opportunities of the authors.

Much exceedingly interesting information is given on the song, notes, nesting habits, the young, and the general behavior of the different birds. In the exactness of the data presented, the text gives excellent evidence of the care with which the observations have been made. Of particular value are the notes on the development of nestling birds, with specific data on the age of each stage of plumage, information which every one who has had occasion to search for realizes is difficult to obtain, and furthermore, all too rare in books on birds. Dr. Heinroth has for a great many years been able to rear large numbers of birds in captivity, and this has given him an unexampled opportunity to determine many facts which would easily escape the chance observer in the field, but which are of great importance, nevertheless. Some of the longer accounts of the life history of the species treated are especially good and amount almost to a monograph of the behavior of the species. Worthy of particular mention are those of the nightingales (*Luscinia megarhyncha* and *Luscinia luscinia*), the blackbird (*Turdus merula*), the spotted flycatcher (*Muscicapa striata*), the robin (*Erithacus rubecula*) and the swallow (*Hirundo rustica*). The book is not a technical treatise, but is designed to present an interesting side of the life history of the birds of the author's region.

One of the most important features of "Die Vögel Mitteleuropas" is the wealth of illustration. The numerous plates are, however, issued apparently as material was obtained for their completion, or as convenience dictated, since but in few instances do they illustrate the species described in the parts in which they appear. Both the colored and the uncolored plates are made up with the idea of showing the development of the species figured, from the egg through the nestling and juvenal plumages up to that of the adult. The value of these plates is greatly enhanced by the circumstance that they represent the various stages of plumage at precisely known ages of the birds, in this admirably supplementing the descriptions given in the text.

If the standard already set in the parts now discussed should be maintained, as we have every reason to believe it will be in the parts yet to be published, we are probably not saying too much when we predict that this work will prove to be one of the most important contributions to the life history and behavior of European birds that has appeared in many years.

HARRY C. OBERHOLSER

SPECIAL ARTICLES

THE FIBRILLAR STRUCTURE OF THE DENTAL ENAMEL MATRIX OF THE GUINEA PIG

RECENTLY we[1] have outlined certain morphological findings with regard to the organic matrix of guinea pig dental enamel. Preparations were made from material carefully decalcified through celloidin. By such a method, sections of this structure may be demonstrated.

Carter[2] has claimed that in the formation of enamel, globular material is laid down irregularly and "that there is no sign of any merging of the cells into the secretion such as one would find did the ameloblasts themselves become transformed into a stroma which became incorporated into the enamel." Our sections show that protoplasmic processes may extend from the ameloblastic layer into the enamel structure. These taper away to a point within a distance of from ten to fifteen microns. Thus, there is in the guinea pig a definite articulation between these two elements, as shown by Van Giesen stain.

Moreover, when the matrix is drawn away from the ameloblasts by the pull of the microtome knife, the organic matrix may split or tear. This rupture, however, is in a plane parallel to the length of the enamel rods. Fibril-like structures thus are formed. This result is produced likewise when the direction of tension does not coincide with the length of the enamel rods but lies at an angle with them. We have photomicrographic evidence of these observations.

These results tend to show that a protoplasmic fibrillar structure may connect the ameloblastic layer with enamel matrix in the guinea pig and that the matrix itself appears to be of fibrillar structure. Thus, we do not coincide with the belief that the formation of dental enamel is an irregular deposition of precipitated material. Rather, precipitation of calcareous

[1] Beckwith, T. D., and Williams, A., Proc. Soc. Exp. Biol. and Med., 1926, 24, 76.

[2] Carter, J. T., *Quart. Journ. Micros. Soc.*, 1918–19, 63, N.S., 387.