Vol. 1, No. 1, pp. 1–139. G. C. L. Bertram. "The Biology of the Weddell and Crabeater Seals."

Vol. 1, No. 2, pp. 141–194. Brian Roberts. "The Life Cycle of Wilson's Petrel."

Vol. 1, No. 3, pp. 195–254. Brian Roberts. "The Breeding Behavior of Penguins."

Vol. 1, No. 4, pp. 255–294. S. M. Manton (Mrs. J. P. Harding). "On Two New Species of the Hydroid Myriothela."

Vol. 1, No. 5, pp. 295–318. Theresa Clay. "Anoplura."

The reports are beautifully printed, but a good deal of space could have been saved by a different arrangement of the text, while the very wide margins are undesirable from any point of view, and especially now that there is a shortage of paper. There are four species of Antarctic seals, the Weddell and Crabeater being the most abundant, the former being a species of the coasts and inshore waters, the latter of the pack ice. The Crabeater has a misleading name, as its food is Euphausiid Crustacea, shrimp-like creatures of the plankton. Perhaps Floe-seal would be a better name, though the scientific name *Lobodon carcinophagus* can not be altered. During the course of the expedition it was necessary to kill 558 seals to provide food for 16 men and about 80 dogs. Dr. Bertram took every opportunity of doing the actual killing and butchering himself, in order to obtain the desirable records from each specimen. The records thus obtained, together with the concurrent observations of the living animals, give us an account of the biology of these seals which leaves little to be desired, and to this is appended a discussion of the behavior of the thirty living Pinnipedia of the world.

Wilson's petrel, which breeds in the Antarctic, is discussed at length by Dr. Roberts. Summing up, he says that the migration of this bird is one of the longest and perhaps the most remarkable of any bird known. In a straight line the Atlantic migration is about 7,000 miles in each direction yet the flight throughout is indirect and quite unlike that of land birds crossing the sea. For the greater part of eight months of the year most of them probably never come within sight of a landmark, yet they return at almost the same date each year to the same burrow and mate. "Oceanic migration of this type provides a noteworthy example of powers of endurance, and it also raises the problem of orientation in its most difficult form. In view of such facts it is extraordinary that visual memory is still quoted as the most satisfactory explanation of the way in which birds orient themselves during migration."

Four subspecies of Wilson's petrel are recognized, but they are separated on average characters, so that individual birds taken on migration can not be referred to any particular race with confidence. Dr. Roberts says, "the division into four races may not be useful for museum purposes," but he feels that it is desirable to have names for the different populations, which, when studied on their breeding grounds, do show average differences. It is interesting to find that Euphausiid Crustacea are the food of Wilson petrel as well as the so-called Crabeater seal. The parent petrels regurgitate partly digested *Euphausia* for the chicks, "in the early stages this takes the form of a clear oil," but some of the chicks were found to contain almost complete *Euphausia*.

The bird lice found on the Wilson's petrels proved to belong to a new species, which is described by Miss T. Clay as *Naubates robertsi* in her report on the Anoplura.

There are seventeen living species of penguins, which Dr. Roberts arranges in six families, one for each genus, except that the Adélie penguin is put in the same family as *Pygoscelis*. The present account has special reference to the Gentoo penguin, *Pygoscelis papua*, and gives a minutely detailed account, with many illustrations.

The author concludes that "each characteristic behavior phase appears to have little meaning unless considered in relation to its place in the cycle as a whole. There is a chain of stereotyped behavior acts correlated with physiological processes which are all closely related to each other. Bird behavior must surely be explained partly in physiological and partly in psychological terms, for endless difficulties arise through investigating by either method alone." All of which may be applied to other creatures than birds.

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SCIENTIFIC BOOKS

HARMONIC INTEGRALS

The Theory and Applications of Harmonic Integrals. By W. V. D. HODGE. ix + 281 pp. Cambridge, England: Cambridge University Press; New York: Macmillan Company. 1941. $4.50.

THE author of this monograph is one of the outstanding geometers in England, and in his special field—algebraic geometry—he is known, above all, for his important contributions to the theory of algebraic integrals attached to an algebraic variety (*abelian integrals*). This theory, inaugurated by the classical investigations of Abel and Riemann on the integrals

attached to an algebraic curve (1826, 1857) has been ever since the object of intensive study by analysts and geometers alike (Poincaré, Picard, Castelnuovo, Enriques, Severi, etc.) who were attracted to it either by its profound analytical content or by its power as a tool for the discovery of geometric properties of algebraic varieties. The theory gives rise to many difficult questions, and the difficulties increase with the dimension of the variety. Thus, while the theory of abelian integrals is almost a finished chapter in the case of algebraic curves and is a richly developed chapter also in the case of algebraic surfaces, it is on the whole unexplored territory in the case of varieties of higher dimension. The unsolved problems in which it abounds have to do mainly with the *classification* of the abelian integrals according to their singularities and with the properties of their *periods*. By the period of a *multiple,* say *m-fold,* abelian integral is meant its value which we obtain by integrating along an m-dimensional *cycle* of the variety (cycle = a closed m-dimensional region; a closed curve, if $m=1$; a closed surface, if $m=2$; etc.).

A typical and important problem, which remained unsolved for a long time, was the following: do there exist integrals which have no singularities and whose periods are all zero? Hodge was the first to prove that such integrals do not exist. This proof marks the beginning of a long series of investigations by Hodge which have materially contributed to a new and substantial progress of the theory of abelian integrals. One of the most significant aspects of these investigations is the diversity of the methods used. In addition to the purely analytical and algebro-geometric methods, topology and differential geometry come effectively into play.

Topological methods, already used by Poincaré in questions of the theory of algebraic surfaces, have been developed in this country by Lefschetz. The topological point of view in algebraic geometry plays an essential role in Hodge's solution of the problem mentioned above. Topology also forms the basis of de Rham's theory of integrals on arbitrary topological manifolds, a theory which is in close connection with Hodge's theory of harmonic integrals.

However, it is the adaptation of the methods and ideas of differential geometry (Riemannian geometry) to the theory of abelian integrals that best reveals the originality of Hodge's theory. Here the central concept is that of a *harmonic integral.* This is not the place to discuss this concept in any detail. It will suffice to say that the concept of a harmonic integral is more general than that of an abelian integral, but is more concrete than the concept of an integral attached to an arbitrary topological manifold. The fruitfulness of the concept of a harmonic integral lies perhaps just in its being a "harmonious" mixture of the right amounts of generality and concreteness.

The mathematical reader will find in Hodge's monograph a very well-written and highly stimulating account of a young and active mathematical theory. He will find ample evidence of the diversity of methods which we have mentioned above. As an ingenious blend of algebraic geometry, analysis, topology, tensor calculus and differential geometry, the monograph should prove of considerable interest to specialists in these various fields.

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ELECTRICITY AND MAGNETISM

A Textbook in Electricity and Magnetism. By H. C. KELLY. vi + 356 pages. New York: John Wiley and Sons, Inc. 1941. $3.75.

THIS elementary text attempts to give the reader an acquaintance with a great deal of modern physics as well as to cover the conventional topics suggested by its title. The twenty-eight chapters are short and emphasize the historical and descriptive aspects of the subject. The diagrams are numerous and well drawn, and a number of simple problems are placed at the end of each chapter. In the third chapter the author goes to some pains to find the potential due to a point mass without the use of the calculus, but does not hesitate to introduce integration by the time Chapter 7 is reached, and to discuss the partial differential equations of the electromagnetic field and the wave equation in Chapter 28. In discussing induced electromotive forces the author makes the common mistake of attributing the e.m.f. to "*relative* motion between a wire and a magnetic field."

The book should prove very useful in a survey course intended to cover modern developments in physics as well as the elements of electromagnetism. To cite a few of the modern topics presented, we find mention of superconductivity, the Barkhausen effect, the Stern-Gerlach experiment, the cyclotron and the electron microscope, and discussions of space-charge, the photo-electric effect, the Bohr theory and the mass spectrograph.

L. P.

HYDROBIOLOGY

A Symposium on Hydrobiology. By JAMES G. NEEDHAM and 51 other contributors. ix + 405 pages. Madison: University of Wisconsin Press. 1941. Price $3.50.

THIS book contains the 32 formal papers presented at a symposium on hydrobiology held at the University of Wisconsin on September 4–6, 1940, and the abstracts of 16 volunteer papers given at one of the