

annually in Great Britain, a statement which may be approximately accurate if the amount of cloth which is partially bleached as a preliminary to dyeing or printing, is included. W. M. G.

*Liverpool Marine Biology Committee. L.M.B.C. Memoirs on Typical British Marine Plants and Animals.* 26: *Botryllus*. By E. Catherine Herdman. Pp. xi+40+6 plates. (Liverpool: University Press of Liverpool, Ltd.; London: Hodder and Stoughton, Ltd., 1924.) 4s. 6d.

THE author of the present volume, on the compound Ascidian *Botryllus*, is a daughter and pupil of the late Sir William Herdman, who himself, twenty-five years ago, wrote a description of a simple ascidian as the first volume of the series to which this is the latest addition.

The editors of the series explain in a preface the interest attaching to *Botryllus*, and its advantages as a representative of the group to which it belongs. Miss Herdman's account, which follows, is carefully done, well arranged, clearly written, and excellently and fully illustrated by means of six plates, one of which is in colours. Besides the description of the anatomy, the author gives sections on embryology and development, and on the formation of the colony, as well as paragraphs on such subjects as coloration and the systematic position of the family. There are interesting references to the germ-layer theory in relation to the formation of the organs in the asexually produced blastozooids; to the mode of capture of the food particles; to the functions of the neural gland and dorsal tubercle; to the cause of the curious recurring alternations in the direction of the blood-flow; and to the special functions of the colonial vascular system. It is, however, to be regretted that in a book which the editors hope "will be found of value by students of biology in laboratories and in marine stations, and will be welcomed by many others working privately at marine natural history," the author has not included some account of the most suitable methods of examination.

*The Place of Partial Differential Equations in Mathematical Physics: Being a Course of Readership Lectures delivered at Patna University in 1921.* By Prof. Ganesh Prasad. Pp. iv+49. (Patna: Patna University, 1924.) n.p.

In the six lectures before us, Prof. Prasad gives an interesting account of the part played by partial differential equations in dealing with vibratory phenomena, conduction of heat, gravitational attractions, electrostatics, magnetostatics, hydrodynamics, electro-dynamics and the theory of electrons. Since D'Alembert's discovery in 1747 of the equation  $\dot{y} = c^2 y''$  arising from the motion of a vibrating string, the study of natural phenomena by mathematical physicists has led them to certain standard types of differential equations. The essential difficulty in finding the solution of such a differential equation lies in fitting it to specified boundary conditions. If we have an initial stage of heat given by

$$f(x) = x \text{ for } x > 0, f(x) = -x \text{ for } x < 0,$$

the first and second differential coefficients are non-existent at the origin and the equation of linear conduction,  $\partial v / \partial t = \partial^2 v / \partial x^2$ , is meaningless there. An

unlimited number of similar cases can be constructed. Though partial differential equations are quite serviceable for most ordinary purposes, in a rigorous treatment they have to be relegated to a secondary place. It is quite possible that at some future time differential equations will appear as but crude instruments and be discarded in favour of the more powerful and more refined integral equations.

*Linear Integral Equations.* By Prof. W. V. Lovitt. Pp. xiii+253. (New York: McGraw-Hill Book Co., Inc.; London: McGraw Hill Publishing Co., Ltd., 1924.) 15s. net.

THE subject of integral equations has been much neglected in university teaching in Great Britain, partly because of the scarcity of text-books suited to the needs of the normal student of mathematics. In addition to a clear exposition of the theory, to carry conviction what the student requires above all is a number of particular examples and applications. The works of Bôcher (1909) in English, Volterra (1913) in French, and Kneser (1922) in German are available but are scarcely in general use.

Prof. Lovitt has produced a very readable book on this very important branch of mathematical study. The discussion, confined to those equations which are linear and in which a single integration occurs, does not deal with equations involving several independent variables, systems of integral equations or integro-differential equations. The author covers, however, in systematic manner the general theory of linear equations, exemplifying the points as they arise by a large number of particular cases and applying the methods to problems in differential equations, the calculus of variations, Neumann's and Dirichlet's problems, and to a series of cases of vibration. There is nothing very new in substance in the book, but it is eminently readable and very well produced.

*In the High Himalayas: Sport and Travel in the Rhotang and Baralacha; with some Notes on the Natural History of that Area.* By Hugh Whistler. Pp. 223+16 plates. (London: H. F. and G. Witherby; 1924.) 15s. net.

MR. WHISTLER'S book treats of sport and travel in a remote part of the Himalayan districts of the Punjab, Kulu, Lahul, and Spiti, of which the last is geographically part of Tibet though politically a district of India. The chapters dealing with it are of most interest since the country is almost unknown, but the whole book contains a great deal of valuable geographical and natural history material, including a chapter on birds. There are some fair illustrations and an adequate map.

*Ross and Cromarty.* By Prof. W. J. Watson. (Cambridge County Geographies.) Pp. xi+140. (Cambridge: At the University Press, 1924.) 3s. 6d.

PROF. WATSON has added a useful volume to the series of county geographies. The book is especially interesting on the human side, though with commendable restraint his section on the people, race, and dialect occupies only two and a half pages. We notice that he describes the Celts as members of the Nordic race, without actually using that term, and to this stock he attributes some of the fair-haired people of this highland area.