Mr. Lawrence was one of the most careful and prolific of American ornithologists. The list of his published writings * contains 121 titles, the earliest of which appeared in 1844, the latest in 1891. The period of his productive activity thus covered nearly half a century. He was an active contemporary of all American ornithologists from Audubon and Nuttall to the younger writers of the present day. 'Baird, Cassin and Lawrence' are classic names in ornithology —names associated in joint authorship in Baird's great work on the birds of North America, published in 1858. For nearly fifty years Baird and Lawrence, then the foremost authorities on American birds, were warm personal friends, and on more than one occasion accomplished, by hearty coöperation, what neither could have done alone. It should not be forgotten that their arduous labors paved the way for the refinement of detail that characterizes the bird work of to-day.

Baird busied himself chiefly with the birds of the United States, Lawrence chiefly with those of tropical America. Lawrence described more than 300 new species from the West Indies, Mexico, Central and South America. One genus and twenty species were named in his honor—tokens of respect and esteem—by American and European naturalists.

Baird and Lawrence lived under widely different conditions. Baird led an active official life, burdened with the cares and responsibilities of three great institutions, two of which, the National Museum and Fish Commission, were his own creation; he was constantly overworked and died prematurely at the age of sixty-five years. Lawrence led a quiet, retiring life, far away from the public eye, and died at the ripe age of fourscore years and nine. Still, the two had many traits in common; both were plain and unassuming, kind and thoughtful in their family relations, and ever ready to extend a helping hand to those, however young, whose tastes led them to the study of birds. In looking back over the twenty-five years that have passed since I first enjoyed their acquaintance, my mind constantly recurs to the kindly words of encouragement and advice that shaped my early course as a naturalist, and the friendships that followed will always live among my most cherished memories.

C. HART MERRIAM.

* The Published Writings of George Newbold Lawrence, by L. S. Foster. Bull. U. S. National Museum, No. 40. 1892.

SCIENTIFIC LITERATURE.

A Treatise on Hydrostatics. By ALFRED GEORGE GREENHILL, Professor of Mathematics in the Artillery College, Woolwich. Macmillan & Co., London and New York. 16mo, pp. viii+536.

The science of hydrostatics, originating with Archimedes, is now more than twenty centuries old. It is, in many respects, one of the most perfect and satisfactory of the sciences. This fact, however, arises from the simplicity of the phenomena with which hydrostatics has to deal rather than from anything like continuity of progress during its lengthy history. Indeed, as regards purely hydrostatical principles, we are not very greatly in advance of Archimedes. Our superiority over him is due, first, to an immensely enlarged capacity, through the developments of mathematics, for the application of those principles; and, secondly, to the exploration of the much larger and more interesting domain of hydrodynamics, of which, in fact, hydrostatics is only a special case.

The work of Professor Greenhill treats hydrostatics from the modern point of view. He does not hesitate to cross the border for an excursion into hydrokinetics whenever desirable or essential, although some might

infer from the title of the book that such excursions are avoided. The scope and character of the work may be best inferred from the following paragraphs of the preface:

"The aim of the present Treatise on Hydrostatics is to develop the subject from the outset by means of illustrations of existing problems, chosen in general on as large a scale as possible, and carried out to their numerical results; in this way it is hoped that the student will acquire a real working knowledge of the subject, while at the same time the book will prove useful to the practical engineer."

"In accordance with modern ideas of mathematical instruction, a free use is made of the symbols and operations of the Calculus, where the treatment requires it, although an alternative demonstration by elementary methods is occasionally submitted; because, as has well been said, "it is easier to learn the differential calculus than to follow a demonstration which attempts to avoid its use."

Too much stress cannot be laid on this remark with regard to the rôle of the calculus in applied science. We are coming now, after two centuries, to realize clearly that the use of the calculus has become general in all higher investigations, not because the pure mathematicians have so desired, but because the phenomena of nature demand for their interpretation such an instrument of research.

The book is a mine of interesting and useful information, and must become one of the standards for students, teachers and engineers. The principles are illustrated by a wide variety of good examples, many of which are drawn from practical applications. Special attention is given to the problems of flotation and stability of ships, and to problems arising in naval architecture. The theory of the various hydrostatic instruments, including the hydrometer, the barometer and the gas thermometer, is worked out quite fully. A chapter is devoted to pneumatics, and another to pneumatic machines. There are also chapters on capillarity, hydraulics, the general equations of equilibrium, and on the mechanical theory of heat. In short, the work is a very comprehensive one. Few books contain more information per page, and few abound to such an extent in historical references.

The exposition of the author is in general clear and logical, though occasionally an important principle is announced without due warning. Thus, Bernoulli's theorem appears without demonstration on p. 467 in the chapter on hydraulics. It would have been more in accord with the admirable spirit of the book, we think, if the author had given in that chapter the general equations of fluid motion, and thence deduced Bernoulli's theorem, even if this enlargement had required a change in the title of the work.

Some obscurity arises here and there from the author's habit of condensation. Thus, on p. 458 we read, "so that the attraction of pure gravitation on a plummet weighing Wg is WG dynes, where G denotes the acceleration of gravity." Of course, the expert would quickly see that Wg means W grammes, but the average engineer will not commend such economy.

The book has a good, but not quite good enough, index. For example, the unusual words *barad* and *spoud* are occasionally used by the author. Their meaning is plain from the context, in most cases, to the specialist, but the general reader would not get any light on these terms from the index; for it does not contain the word *spoud*, while it refers for *barad* to a page on which this word does not occur.

These faults, however, are small ones, and such, moreover, as are well-nigh inseparable from the first edition of a book so full of sound knowledge as this one.

R. S. Woodward.