

to the particular set of natural conditions under which it grows are facts which are seldom absent from his mind, and as a consequence there is a freshness and reality about much which he has written that are often absent from the writings of the laboratory and museum worker.

Dr. Fowler's accounts of the Hydromedusæ and Scyphomedusæ are, in our opinion, the least satisfactory portions of the volume. The style is too concentrated and concise to make the writing effective, and intellectual interest has been entirely sacrificed in an attempt to introduce every available fact and to deposit it in a properly labelled compartment. The result resembles the syllabus of an advanced course of lectures on the groups dealt with rather than an intelligible account of those groups.

In the chapters on Anthozoa and Ctenophora, Mr. Bourne presents us with an excellent series of detailed descriptions of particular types, together with a clearly stated and well-marshalled body of facts concerning the groups as a whole. His work will undoubtedly prove of great value to both teachers and students. We, however, fail to find in these two sections that originality of treatment and originality of thought which characterise Prof. Minchin's section on the Porifera.

The whole work is well illustrated, being in this respect a great improvement on the volume of the treatise previously published (Part III. Echinoderma). The figures for which Prof. Minchin and Mr. Bourne are responsible, many of which are original, are specially worthy of praise.

THE GRAPHICAL MENSURATION OF VAULTS.

Il Calcolo Grafico applicato alla Misura delle Volte.
Prof. Ernesto Breglia. 5th serie, vol. i. (Atti del Reale Istituto d'Incoraggiamento di Napoli, 1899.)

GRAPHICAL methods are used to a certain extent in the solution of engineering problems, although perhaps their employment is not so extended as their neatness and simplicity merit. In some cases, it is true, where the simplification is great and the application easy, they are used practically to the exclusion of other methods. But in other cases where a graphical treatment would effect almost as great a simplification the methods have never been very generally applied. The reason lies, we think, in the fact that it requires greater ingenuity to treat a problem graphically than analytically. Problems such as occur in practice, even though they may be complicated, can generally be hammered out by analytical means. A good mathematician, no doubt, will be able to find a short cut to the solution, but the engineer, whose ready stock of mathematical knowledge on which he can draw with ease amounts to little more than the algebra he learnt at school and an acquaintance with the principles of the calculus, will be able to work out the solution by dint of determined plodding. With graphical methods it is different. To begin with, the geometrical training which an English engineer receives at school is a hindrance rather than a help, so that when he comes to study graphical systems he finds himself in a region unknown to him and is obliged to disembarass himself of the Euclidean notions acquired in his youth. We are afraid that the Englishman will never be quite happy

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in using geometrical methods until the groundwork of his knowledge is laid with some more suitable text-book than Euclid's Elements. In addition to this, with these methods each new problem requires somewhat different treatment; it is hard, and often impossible, to lay down very definitely the lines on which to proceed. The ingenuity which is consequently required can only be obtained, by any except the born mathematician, by the habitual use of the system.

Prof. E. Breglia's paper illustrates what we have been saying. The method that he has worked out for measuring the volumes of arches and vaults is extremely neat. In the simpler cases it is, as is natural, very much easier to follow and apply, and the ease of doing so is such that it should commend itself to all who have need to make such measurements. In the cases of vaults of more complicated shape the method becomes also more complex; artifices have to be used in order to "dodge" the more important difficulties. It is just these artifices that are so difficult to find when a new problem is attacked. To apply Prof. Breglia's method to the determination of the volume of a vault similar in shape to one of those he has examined in the paper before us would be fairly simple, even though the shape might be very complicated; to apply it to the case of a vault of quite a different shape would not be nearly so easy. Prof. Breglia has, however, examined a great variety of cases in a thorough manner, and has thus rendered his paper very valuable.

Prof. Breglia's system has other advantages besides a simplicity which enables the volume of a vault of complicated shape to be found without the use of advanced mathematics. The accuracy can be increased practically at will by varying the number of sections into which the vault is divided; with analytical methods high accuracy is often only attainable by undue complication of the mathematics. We are inclined to think, also, with Prof. Breglia that error is less likely to occur in its use, as should any mistake be made it will show itself directly; but this is an advantage that must not be given too great weight, as graphical methods possess possibilities of error, especially in the interpretation of the results, which are not to be met with in other methods. The system is, however, a very useful one, and the paper is worthy the careful attention of all those interested in the subject.

OUR BOOK SHELF.

Experimental Chemistry. By Lyman C. Newell, Ph.D.
Pp. xv + 410. (Boston: Heath and Co., 1900.)
Price 5s.

DR. NEWELL has added one more to the already formidable array of elementary science text-books, each of which, according to their respective authors, has been written to supply a long-felt need. In the present instance, the object is to promote the more efficient teaching of chemistry by modern methods; and in writing his book Dr. Newell has been actuated by "a desire to provide a course of study which shall be a judicious combination of the inductive and deductive methods."

We fail to see in what way Dr. Newell's book superior to a hundred others of a similar kind. The ideal that the author has set before him is a very high one, and we should be the last to deprecate any attempts to improve upon modern methods of teaching experimental science. It is obvious that the time at the disposal of the average student is so limited that it would be