

"Any one of the main pleas of our argument, if established, is fatal to Darwin's theory."

This is not, as some might hastily suppose, the self-laudation of a flippant "paper-scientist"; it is the deliberate statement of a clear-headed man who took nothing for granted, and who never wrote on anything till he felt convinced that he understood it.

We next come to a thoroughly practical Essay on *Scientific and Technical Education*, a subject on which Jenkin was peculiarly qualified to speak. The following extract may be taken as a specimen. Jenkin has been alluding to the willing and valuable assistance which a Teacher often receives from his higher practical students in conducting some new research; and proceeds to say:—

"The rank and file—the ordinary well-meaning student who will never become a leading light in science—is worthy of our attention. If he is well educated he may become a successful manufacturer, contractor, engineer, or farmer, and sensibly increase the power and wealth of our country. It seems to me that this student is not so well provided for in our scientific teaching as is desirable. And the main question I propose for discussion is, how we are to improve the education of this second-best young man. My own answer put briefly, is that we can teach him systematically the art of measurement. We cannot give him the hunger for knowledge, the acute logical discrimination, nor the imaginative faculty required for research; but we can teach him how to ascertain and record facts accurately; we can bring home to him the truth that no scientific knowledge is definite except that based on the numerical comparison which we call measurement; we can teach him the best modes of making that comparison in respect of a vast number of magnitudes, and in teaching this we shall teach him to use his hands and eyes. This practical teaching gives clear conceptions to the minds of many who receive a verbal definition as a mere string of dead words. I should be glad if it were generally proclaimed that the elementary training in all our science laboratories should be a training in the art of measurement. I wish that the classes were called measurement classes. Then a student of ordinary intelligence would know that by entering a given class he would learn how to measure those magnitudes with which he will have to deal in after life. The attempt to measure them will lead him to consider their nature, and he will approach scientific study in the class room with a faith in the reality of science which no verbal exhortation will ever give him. You may define the absolute unit of electrical resistance as accurately as you will, and your definition shall affect the average brain to no perceptible extent; but a young man of very ordinary education and intelligence can learn to measure resistances in ohms, and having learnt this, an ohm becomes a reality to him. Not only does the knowledge he has acquired make him a more valuable assistant to the engineer and contractor, but having acquired a working faith in the existence of ohms, he is prepared to take some trouble to understand the scientific definition."

Prof. Ewing reprints in full, in the last division of the work, three characteristic papers selected from Prof. Jenkin's writings on *Applied Science*:—and he gives in brief but clear abstract, and with full references, the contents of all. This part of the work seems to be very well done, and it forms a sort of commentary on, as well as complement of, the short article of Sir W. Thomson's

to which we have already alluded. These handsome volumes will be specially welcomed by practical scientific men, but as we said at starting, there is much in them of interest and value to all.

P. G. T.

#### OIL ON TROUBLED WATERS.

*Le Filage de l'Huile.* Par le Vice-Amiral G. Cloué. (Paris: Gauthier-Villars, 1887.)

THAT the great effect produced by oil in smoothing troubled waters should have been so well known in times past as to have passed into a proverb, and yet that no general practical use of this effect should have been made until the last few years, is a remarkable instance of the tardiness of mankind to apply the benefits that natural phenomena provide. To the Hydrographic Office of the United States is mainly due the credit of bringing into prominence, and forcing on the notice of seamen, in various publications, the great importance of this property of oil under circumstances when life and property are endangered by breaking seas, and the extreme facility and trifling expense of its employment. Thanks to the efforts of the Americans, the facts are now well known to all English-speaking mariners, and many are the instances of the successful use of oil; but, nevertheless, the prejudices of many are still against it.

The Admiralty, in 1886, issued a memorandum on the subject to the fleet, largely founded on the American publications. Admiral Cloué has done a like service for his countrymen, and has written the best and most complete essay on the subject, in the little *brochure* before us. Drawing on the mass of experiences collected by the American Office, and giving them due credit for their action, he reports additional striking cases which have occurred during the last year or two, and suggests many practical means of employing oil under circumstances other than those yet tried, or where it has to some extent failed.

The facts are briefly these. In the heaviest gales at sea, when breaking seas are a source of danger to small or heavily laden vessels, or an inconvenience and discomfort to larger or more seaworthy ones, a very small quantity of oil, skilfully applied to suit the circumstances, spreads upon the surface of the water with marvellous rapidity, and forms a perfect breakwater, the raging waves being instantaneously transformed into a harmless swell, which quietly lifts the ship without any of the violent shocks and blows caused by the impact of an almost wall-like mass of water about to break. Spray alone comes on board in place of the sheets of water and green seas which often do so much damage. Admiral Cloué calculates, from a number of instances where the quantity of oil used and the speed of the vessel are given, that the film of oil which causes this marvellous and beneficent effect can be little more than 1/100,000 of a millimetre in thickness!

Experience already goes to show that a small quantity of oil is more efficacious than a free application of it, the film apparently spreading more quickly. Less than half a gallon an hour seems to secure the largest ship from being boarded by the waves.

The ordinary method of its application is to hang small canvas bags, containing about a couple of gallons of oil, so

as to dangle or float on the water, the bags being pierced with small holes by a sail needle, through which the oil slowly exudes. These bags are placed in different positions, according to whether the ship is flying before the tempest, or lying to comparatively motionless. This simple appliance is therefore within the means of every ship, and there can be little doubt that already many vessels owe their immunity from damage, and in some cases even their safety, to its employment.

Among remarkable instances of saving life, is one, cited by Admiral Cloué, of the boats of a ship burnt in 1885, 800 miles from the Seychelles Islands, in which the crew were making their way to land. A cyclone was encountered, which raised a terrific sea, but the boats, provided with oil by the prescience of the captain, weathered it out in perfect safety for sixty hours, riding to a floating anchor of their masts and oars, to which was attached a bag of oil.

Our author points out that from the time of Pliny oil has been thus used, but only by small communities, or by individuals, whose efforts to bring it into general use have always failed. Benjamin Franklin presented a paper on the subject to the Royal Society of London, which is printed in the Philosophical Transactions, 1774, but it remained without fruit.

Experiments were carried out in this country in 1883 by Mr. Shields, at Peterhead and Folkestone, with a view of diminishing the heavy sea at the entrance of these harbours. These experiments were successful, but at the expense of a great quantity of oil; the fact being that the conditions of breaking seas in shallow water are totally different from those in the open ocean.

Admiral Cloué remarks on the great utility of oil when wrecks have to be boarded; and suggests that the builders of rock lighthouses, when their work is delayed by the difficulty of landing material, might find it to be of much service.

The general application of oil is in fact yet in its infancy, and everyone must welcome any such good collection of facts, and of suggestions tending to extend its sphere of usefulness, as that given in "Le Filage de l'Huile."

W. J. L. WHARTON.

#### OUR BOOK SHELF.

*Comparative Morphology and Biology of the Fungi, Mycelozoa, and Bacteria.* By A. De Bary. Translated by Henry E. F. Garnsey, M.A. Revised by Isaac Bayley Balfour, M.A., M.D., F.R.S. (Oxford: Clarendon Press, 1887.)

ANYONE acquainted with the numerous researches of De Bary, published in German, will readily indorse Prof. Balfour's remark in the preface to this English translation, viz. "it brings within reach of all English-speaking students the most thorough and comprehensive treatise upon these groups which has appeared in any language," and after perusing this volume we should add that "a finer volume, and a more handsomely and exhaustively illustrated one," is not known in the literature of this subject.

The book seems to us more like a well and comprehensively arranged collection of classical monographs on Fungi and allied organisms, written by a master mind, translated by a scholar, and revised and edited by a practical worker and teacher of these subjects.

It is difficult to pick out any one chapter in which this is not conspicuous. The array of facts, and of phenomena as to form, growth, and development of Fungi, and minute details bearing important relations to one another and to the whole, are told with singular lucidity and in comprehensive sequence; and numerous suggestions that at once engage and invite the reader's and student's inquisitive mind are everywhere, almost on every page, to be met with. As the title of the book indicates, the subjects of Fungi, Mycelozoa, and Bacteria are each separately treated in the first, second, and third parts of the volume respectively.

As was to be expected from De Bary's researches, the first part forms the bulk of the volume. As far as our present knowledge of the ever-enlarging subject of the thallus, spores, and development of Fungi goes, hardly anything could be added to make the book complete both for students and workers; but we venture to think that in Chapter V., besides the important bibliography added to the description of the different groups of Fungi, an appendix setting forth briefly the various species hitherto recognized, not only in name but also in distinguishing characters, would be a valuable addition.

This is still more the case in the third part—Bacteria. We doubt whether this will advance the knowledge of the student beyond a general insight into the nature and mode of life of Bacteria, though he will find here a most valuable and suggestive account of the different modes of spore-formation.

The illustrations are very numerous and well rendered. The bibliography in the first part (Fungi) is carefully and judiciously arranged.

As to the translation little need be said. It is excellent, and the book reads more like an original than a translation, if it were not that one is repeatedly reminded of the contrary by the presence, after an exact rendering in English, of the original German. There seems to be really no necessity to put (p. 1) after filamentous Fungi (*Fadenpilze*); (p. 2) after compound Fungus body (*Zusammengesetzter Pilzkörper*); (p. 4) after sprouting Fungi (*Sprosspilze*); (p. 73) endogenous spore-formation (*Endogene Sporenbildung*); (p. 84) solution or gelatinous swelling (*Auflösung, gallertige Verquellung*).

Why should (on p. 110) to "tube germination" be added (*Schlauchkeimung*); to "sprout germination" (*Sprosskeimung*); to "germ tube" (*Keimschlauch*)?

It is different with "abjunction" and "abscission" explained on p. 61 in a footnote, for here confusion might arise as to the exact meaning of the German "*Abgliederung*" and "*Abschnürung*."

The "Explanation of Terms" at the end of the volume is in this respect most welcome.

E. KLEIN.

*Emin Pasha in Central Africa.* A Collection of his Letters and Journals. Edited and Annotated by G. Schweinfurth, F. Ratzel, R. W. Felkin, and G. Hartlaub. Translated by Mrs. R. W. Felkin. (London: George Philip and Son, 1888.)

THE personal interest connected with this volume is even greater than its scientific interest. Emin Pasha already ranks as one of the heroes of the modern world, and the record of the bare facts of his career has all the fascination of a good romance. Appointed in 1878 to be Governor of the Equatorial Province, he ruled his territories with astonishing vigour and discretion, so that in 1882 he was able to report that slave-dealers had been wholly banished from his borders, and that the people subject to him were prosperous and contented. The troubles in the Sudan created for Emin many most formidable difficulties, but his courage never failed him, and we may hope that long before this time he has been stimulated to fresh hope and activity by aid received from Mr. Stanley. The letters translated in this volume begin with one dated Dufile, July 16, 1877, and include several received