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AN AMERICAN PROFESSOR.

Memoirs of Frederick A. P. Barnard, D.D., LL.D., &c., Tenth President of Columbia College in the City of New York. By John Fulton. Pp. xii + 485. (New York: published for the Columbia University Press by The Macmillan Co. London: Macmillan and Co., Ltd. 1896.)

THE name of Barnard is honourably associated with the history of education in the United States. To English readers, the best-known bearer of the name is the Hon. Henry Barnard, formerly United States Commissioner of Education, and now living in retirement at Hartford, Connecticut. As the author of numerous local and special reports, and the compiler of valuable statistics and monographs on the various aspects of public instruction; and particularly, as the editor of four or five massive volumes containing reprints of standard treatises on the philosophy and history of education in England and Germany, he has done more than any man in the American Union to promote the study of pedagogical literature.

The present volume recounts the history and doings of one who is less generally known on this side of the Atlantic—the Rev. Frederick A. P. Barnard, a versatile, fluent, and vigorous man who filled with credit many academic offices, and exercised considerable public influence, both within and without the college and university world of America. He was born in 1809, and graduated at Yale 1828, became tutor in 1829, teacher in the asylum for the deaf and dumb at Hartford and in that of New York, his own interest in children thus afflicted being greatly enhanced by the defect of hearing which troubled him through life, and which he manfully strove to fight against. In 1837 he was professor of mathematics and natural philosophy in the University of Alabama, and afterwards of chemistry, remaining in that University till 1854, when he took orders in the Episcopal Church, and became professor of mathematics and astronomy in the University of Mississippi, becoming its president in 1856. He removed to Columbia College in 1864, subsequently served as United States Commissioner to the Paris Expositions of 1847 and 1878, and wrote for the former an elaborate report on machinery and the industrial arts. His versatility and many-sided interests are well illustrated by the facts that he occasionally served as professor in literature and history, and that his published works include a treatise on arithmetic; an analytic grammar with symbolic illustration descriptive mainly of a system designed for the use of the deaf and dumb; letters on Collegiate Government, 1855; history of the United States Coast Survey, 1857; recent progress of Science, 1869; and the Metric System, 1871. Although no scientific observation or discovery of an original kind can be ascribed to him, he was a member in 1860 of the astronomical expedition to observe the total eclipse of the sun in Labrador, in 1862 he was engaged in continuing the reduction of the observations of the stars in the southern hemisphere by Gillis, and in 1863 had charge of the publication of Charts and Maps of the United States Coast Survey. He served in 1860 as

President of the American Association for the Advancement of Science, and in 1872 of the American Institute. He received honorary degrees from Jefferson College, Missouri, from Yale and from Mississippi, and also that of Doctor of Literature from the University of the State of New York. During part of his life he served as editor of a review, and was a frequent contributor to newspapers and magazines, both in prose and verse.

The pious care of his widow in collecting his speeches and reports, and the facile pen of his biographer, Mr. Fulton, have produced a large volume of nearly 500 pages, which, though containing many facts illustrative of the growth of higher education in America, and much information respecting significant but ephemeral academic controversies, strikes the English reader as somewhat disproportioned to the amount of Barnard's actual achievement and force in the world. A due sense of historical perspective, and of the difference between what is temporary and what is permanent in a human life, is one of the highest and, it must be owned, one of the rarest qualifications of a biographer. Had it been possessed by the author of this volume, the narrative might with great advantage have been reduced to half its present length.

Barnard's views about the purpose of education, though not novel, showed insight and good sense.

"It has always seemed to me," he said, "to be the great, as it is the almost universal, educational mistake of our time, that children, instead of being introduced to subjects which address the perceptive faculties, and which are adapted to furnish them with a flood of novel and clearly comprehensible ideas, are usually condemned to the dreary study of unintelligible words, which impose a heavy burden on the memory, and are only apprehended after the understanding has become matured with advancing years."

He saw also, with greater clearness than many of his associates, the intellectual dangers of that "elective system" which has obtained so much favour in the States, and the confusion which would arise, especially in small colleges, "if every student were allowed to study what he chose, all that he chose, and nothing that he did not choose." He insisted with much force that the demand for such options "did not proceed from a genuine desire for special or partial instruction, but simply and solely from the ambition to obtain the college stamp of scholarship without submitting to that severe and systematic intellectual training which alone can make the scholar."

Of his resolute opposition to Slavery, and of his sympathy with the party of Union in the Civil War, notwithstanding the prevalent feeling among his neighbours in the South, the volume gives an interesting account. It was not till his removal to Columbia College in New York, that he acquired full freedom to carry into effect his views on academic organisation and reform without being hindered by quasi-political opposition or distrust. At fifty-five years of age he was elected to the presidency of that institution, which, though with an interesting history and considerable resources, had hardly entitled itself to the rank of a university. By the development of a School of Mines and the Schools of Law and of Medicine, and especially by the provision of new means and encouragement for post-graduate research, Barnard did much to

vindicate the claims of Columbia College to that rank, and to secure for it increasing repute and public usefulness. He urged on the Trustees the importance of making the College available for the advanced education of women, and succeeded after long and arduous effort in establishing what is now known as the Barnard Annex to the College, a feminine institution practically under the care of the same professors, and aiming at the same academic course. In 1882 he took the first steps in a movement with which the name of Dr. Murray Butler has since been conspicuously associated for establishing a professorship in the literature, history, and art of Education, and for securing professional training for those students who intended to become teachers. On the whole the book, though diffuse in style and encumbered with some needless detail, is a useful contribution to educational history. It is the record of a strenuous and honourable life, of high and generous aims often obscured by discouragement, but ever kept steadily in view, and of a considerable number of experiments, both in regard to instruction and discipline, which have done much to render the solution of educational problems easier, especially in America.

J. G. FITCH.

APPLIED CHEMISTRY OF NITRO-EXPLOSIVES.

Nitro-Explosives. By P. Gerald Sanford, F.I.C., F.C.S. Pp. xii + 270. (London: Crosby Lockwood and Sons, 1896.)

WE had lately under our notice a work on explosives which dealt with their manufacture more from an engineer's point of view than from that of a chemist, and consequently the various appliances were described with a detail which only a practical engineer could properly express. In the present volume the processes are placed before us exclusively from a chemist's point of view, and the appliances and machines used receive generally but a brief notice; indeed, some fifty sketches is the sum total of the illustrations covering the apparatus used in the manufacture of the numerous nitro-compounds touched upon in the book. Of these sketches a considerable number are of different pieces of chemical apparatus made use of in testing the raw or finished material.

The author first briefly considers some of the chemical groups from which the nitro-compounds are formed, and, in doing so, volunteers the statement that "the nitro-explosives belong to the so-called High Explosives." This, however, depends very much on whether these explosives are intended to be used as disruptive agents for producing local effect, or as propelling agents. In other words, taking Hess's definition, a high explosive is one which requires the use of a detonator to develop its full value, as with guncotton or dynamite; a low explosive, as gunpowder, does not require a detonator, but will exert its full power by simple ignition. Here again, however, we require to make some qualification as, although all the nitro-explosives are high explosives in one sense, it depends on whether they can, or cannot, be detonated in order that we may define them as high explosives pure and simple, or as explosives of high

energy. Practically speaking, only the latter are suitable for propelling or ballistic purposes, while the former class should be used as blasting agents only. An explosive which can be detonated by a detonator, can also, by suitably confining it, be often exploded by a simple ignition in such a manner that its explosion really becomes a detonation, or partakes of the nature of a detonation, *i.e.* very high local pressures are developed. It is, therefore, a matter of considerable importance to definitely ascertain that explosives to be used as ballistic agents cannot be detonated.

The chief value of the book depends on those portions dealing with the manufacture of nitro-glycerine, dynamite, and guncotton, and the testing of the raw and finished material. The descriptions relating to these explosives show very evidently that the author has personally participated in their manufacture, and his remarks, which are generally to the point, are consequently of considerable value to chemists and others engaged in similar operations. Mr. Sanford very properly lays much stress on the testing of the materials used in all the stages of manufacture, and it will be found that nearly as much space has been devoted, in different parts of the book, to testing and analysis as to the actual manufacture of the explosives. Unfortunately, the reader is credited with being already more or less familiar with the appliances connected with the manufacture of explosives, and therefore the author apparently considers that a brief notice is all that is necessary. Nitro-glycerine and nitro-cellulose have, however, become so important in connection with civil and military undertakings, that those who employ such explosives are glad to be able to read an interesting account which is trustworthy without being exhaustive, and which does not make too great a demand on the pocket. To such this book is especially recommended, as these substances receive the greatest share of attention, and they form the basis of the more powerful and popular blasting materials, and also of practically all the smokeless powders used in small arms or artillery; but, besides these uses, nitro-cellulose (collodion-cotton) is employed to a very large extent in the production of that most useful material called celluloid, xylonite, or imitation ivory, of which so many articles of every-day life are made, such as knife-handles, buttons, photographic dishes, and billiard balls. The manufacture of this substance forms one of the most interesting portions of the book, and, although not properly coming under the category of an explosive, it finds a fitting place in this work.

It must not, however, be forgotten by those who make use of celluloid that it becomes, under certain conditions, a powerful explosive. Celluloid shavings also should never be allowed to accumulate, as they take fire easily at a comparatively low temperature, and, in this state, burn with surprising rapidity.

In the analysis and testing of explosives, to which, as we have stated above, due prominence has been given, the various operations are briefly but concisely explained. They are evidently written for the use of practical chemists, and will, no doubt, be duly appreciated by them. With regard to the heat or stability test which is applied to most explosives before they are passed for service, it has lately been put beyond doubt that the sun's rays have a marked effect on some explosive substances,