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## MONTESSORI EDUCATIONAL METHODS.

*The Advanced Montessori Method: Scientific Pedagogy as Applied to the Education of Children from Seven to Eleven Years.* By Maria Montessori. I., *Spontaneous Activity in Education.* Translated from the Italian by F. Simmonds and L. Hutchinson. Pp. vii+357. II., *The Montessori Elementary Material.* Translated from the Italian by A. Livingston. Pp. xviii+455. (London: W. Heinemann, 1918.) Price 8s. 6d. net and 12s. 6d. net respectively.

WHATEVER one may think of the fundamental doctrines of Dr. Montessori, her books are always eminently readable. She has a fine enthusiasm for her subject, and a rare fund of anecdotal or biographical illustrations, which are skilfully chosen for the purpose of carrying conviction. An uncritical mind is not censorious about matters of proof. An analogy is as good as a demonstration, and the freedom with which Dr. Montessori relies on analogy reminds one of a famous seventeenth-century educational reformer, Comenius. Of course, her analogies are less crude, but much of her theory and practice rests on an assumed analogy between the mature mind of the adult and the mind of the child. This assumption leads her to the conclusion that since the mature mind does its work in an orderly, logical way, applying to the world around its mechanism of categories which reduces that world to a formal order, so our first business should be to establish definite sensory categories in the mind of the child which shall make the perceptual analysis of his environment orderly and accurate. "It is the qualities of the objects, not the objects themselves, which are important"; so we must train the senses in the accurate discrimination of sensory qualities. This is the object of the didactic materials designed for the use of children from three to six years of age.

Dr. Montessori has little respect for experimental psychology; yet it is worth while noting that Stern's researches showed that children were apparently not natively interested in the qualities of objects until they were past the age of thirteen, and further researches have shown that although children might be trained to observe pictures and the like with special regard to such qualities, when left alone they quickly slip back into what seems to be the natural order of the development of interest—objects as such first of all, then things that are happening; then the spatial and causal relations of objects, and latest of all their qualities.

Unfortunately, Dr. Montessori never gives the evidence on which her conclusions are based. A pretty story does not establish a principle. This defect in her books is the more noteworthy because she has presumably had a scientific training and because she explicitly claims that her results are arrived at by exact methods. A chapter headed

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rather naively "My Contributions to Experimental Science" would surely make any person acquainted with rigorous scientific method smile. As a summary of results for popular consumption, it is not without merit, but one seeks in vain for references to the original memoirs in which the detailed work is carefully described and where the conclusions are adequately discussed. She is so acute a critic of the work of others that we might at least expect her to take as much pains as they have done to make her whole method of investigation and its detailed results accessible to scientific criticism. Popular books are necessary, but they must rest upon a solid basis of carefully recorded fact if they are to stand the test of time.

Apart from this grave defect in the Montessori literature, judged from the point of view of a scientific pedagogy, there is so much humanity in it that we must do homage to its distinguished author for her service to the cause of humane education. She enjoys flogging a dead horse (or should we say a dying horse?), apparently believing that it is still in vigorous life. She is so wrapt up in her own work that she is unaware of the great changes which the biological conception of education was bringing about in our schools before we had heard her name. But a remarkable business talent has obtained for her a hearing such as few educational writers in English-speaking countries enjoy. Where one person has heard the name of Dewey, a thousand have heard that of Montessori, and we may rejoice to think of the numbers who will read the chapters in this book on the will and the intelligence.

It is in the second volume that the application of the Montessori method to the primary school is described. There is much suggestive matter in its chapters, though very little that is new, except perhaps the "didactic materials." The author believes that teachers should be supplied with the material necessary to enable the children of themselves to achieve a desired result. This material should have been determined experimentally, and, once it has been designed, the teacher has only to make himself thoroughly familiar with its use. So we find the words and sentences for the grammar work are provided. They are carefully graduated and laid out in neat boxes. One is irresistibly reminded of Pestalozzi's ambitious designs. Get the mechanism right and train your teachers in the use of it, then all will be well. Of course, the mechanism is the result of experimental inquiry, as was Pestalozzi's, but, in spite of the charm with which it is described, we fear it will share the same fate as Froebel's gifts and Pestalozzi's A B C's.

Rather more than a third of the volume is given to grammar. Under the stimulus of the apparatus, children of eleven are led to distinguish eight kinds of adverbs and fourteen kinds of conjunctions, but the apparatus for arithmetic only carries them to a stage which a good Standard III. child in an English school would find easy. The rest of the book deals with geometry, music,

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rhythm, and verse structure. The range of the last may be gathered from its concluding paragraph, which tells us that "the child is now ready for the more difficult problems of anacrusis, catalexis, irregular feet, and irregular pauses." There is nothing of the history or geography in the book. No doubt the didactic materials are still in preparation.

J. A. G.

#### MODERN INDUSTRY.

- (1) *What Industry Owes to Chemical Science.* By R. B. Pilcher and F. Butler-Jones. With an introduction by Sir G. Beilby. Pp. xiv+150. (London: Constable and Co., Ltd., 1918.) Price 3s. net.
- (2) *Some Problems of Modern Industry: Being the Watt University Lecture for 1918.* By W. C. Hichens. Pp. 61. (London: Nisbet and Co., Ltd., 1918.) Price 6d. net.

(1) IF British trade is to hold its own in face of the acute competition which is to be expected, great alterations must be effected, and these two books point out some directions in which improvements may be made. Messrs. Pilcher and Butler-Jones's handbook is a capital *résumé* of the improvements made in metallurgy and in the manufacture of dyes, explosives, glass, pottery, and many other commodities by the application of scientific research. It is very readable, and gives in a handy form an accurate and interesting account of the growth and results of industrial chemistry. It shows how much we owe to British and French chemists, and avoids a common mistake which gives the main credit in this matter to Germany. It is the most compact and convenient history of industrial chemistry which we have come across. As a rule, the authors have kept to general principles, and this is wise, because the book is not intended for experts in each particular trade, but for the public as a whole, and because no one or two men can write on the various industries concerned with first-hand knowledge of all, but must depend on other books for a large part of the information.

In some cases, where the authors have gone into detail—for example, in describing the Pattinson and Parkes processes for lead refining—the details show that the authors have no recent actual experience of the methods employed in this country, but have probably relied on text-books. In dealing with monazite sand the large and rich deposits in the south of India might be mentioned, and the successful diversion of these sources from German hands to our own. In relation to the competition between artificial and natural indigo the recent action of the Indian Government in applying modern scientific methods to the production and marketing of natural indigo should be recognised. Would that all Governments and Government Departments were equally broad-minded and far-seeing! In this country the permanent Government officials are usually recruited from a class which, though aware of the importance of chemistry, is so out of touch with chemists, and so lacking in sympathy with chemical ideas,

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that it is hard for them to realise what is really required by the country. The average Member of Parliament and the average man of business do not recognise that a first-class man of science is, as a rule, valuable only in his own subject. Messrs. Pilcher and Butler-Jones's book will show the public at large how enormous the science has become, and how stupid it is to expect an electrician to be an authority on paraffin oils, or a genius in spectroscopic work on gases to be a sound guide in the manufacture of artificial rubber.

(2) As chairman of Cammell, Laird, and Co., Mr. Hichens is able to look at modern industry in a broad manner. He deals mainly with ethical questions, the relations with labour, conditions of work, the right of the State to a share in profits, and so on. He has a pleasant style of writing, and his commercial training has not destroyed his power of refreshing his mind and the minds of his audience by recalling some picture of a bygone age before trade-unions or excess profits were thought of. It is impossible in an hour's lecture to do more than indicate the sort of problem to be tackled. Mr. Hichens has done this in an agreeable and interesting manner, and his lecture should appeal to all students of social problems.

#### BALLISTICS.

*Text-book of Ordnance and Gunnery.* By Lt.-Col. W. H. Tschappat. Pp. x+705. (New York: John Wiley and Sons, Inc.; London: Chapman and Hall, Ltd., 1917.) Price 30s. net.

AT no previous time in history has so much attention been paid to artillery as during the present war. The unprecedented number and variety of guns in use enable a mass of evidence, sufficient to prove or disprove any theory which is considered worthy of a practical trial, to be accumulated in a very short space of time. Moreover, it is almost certain that all the belligerent countries are liberally spending money on researches into the various branches of the art of gunnery, and employing, for this purpose, more men of scientific reputation and mechanical genius than have ever considered the subject seriously before. As a natural consequence, "ordnance and gunnery" must be in a state of rapid development, and it would therefore appear to be a somewhat unfortunate moment for the publication of Col. Tschappat's book, which is, so largely, merely a revision of an excellent book with the same title by Lt.-Col. Lissak.

That the revision has effected a decided improvement cannot be denied, but there is little that is new, of any importance, to be found in it. The major alteration is in the treatment of interior ballistics. Col. Lissak used Ingall's method. In the volume under review a carefully elaborated method of producing the pressure and velocity curves by integrating the energy equations is presented. The method has the advantage that a complete calculation of a gun can be made without any firing data, but the process seems laborious, and there does not seem to be any means provided for quickly finding the point