

condemn others for having misgivings which at the bottom of your own minds, if you look so deep, you will find that you share yourselves with them. You who believe that you have hold of newer and wider truths, show it as you may and must show it, unless you are misled by your own dreams, in leading wider, simpler, and nobler lives. Assert your own freedom if you will, but assert it modestly and quietly, respecting others as you wish to be respected yourselves. Only, and especially, I would say this—be honest with yourselves whatever the temptation; say nothing to others that you do not think, and play no tricks with your own minds. Of all the evil spirits abroad at this hour in the world, humbug is the most dangerous.

"This above all—to your ownself be true,
And it will follow, as the night the day,
You cannot then be false to any man."

2. SCIENTIFIC EDUCATION IN ENGLAND.

(REPORT OF A SELECT COMMITTEE OF THE HOUSE OF COMMONS, 1868.)

On the 15th of July, 1868, the House of Commons ordered the printing of a blue-book of 480 pages, containing the report of a Select Committee to inquire into the provisions for giving instruction in Theoretical and Applied Science to the industrial classes. The Committee had called before it witnesses representing the "Department of Science and Art," the "Committee of Council on Education," the "Government Colleges of Science and Naval Architecture," several of the Universities and Colleges in England, Scotland and Ireland, and a great number of humbler schools, as well as of the great staple industries of the principal manufacturing towns and districts. Out of the immense mass of information thus collected, a few points may be gleaned as of interest or importance here in Canada.

The "Science and Art Department" is a noble effort on the part of the British Government to diffuse practical knowledge and training among working men. It aids some 300 schools, scattered all over the Kingdom, and on the fair and enlightened principle of paying for "results," as ascertained by rigorous examination of the pupils. Its funds are not squandered at the asking of political influence, but given as the earnings of the hard and profitable work of the teacher and pupil. Fourteen thousand pupils attend the schools, which are in great part evening schools, accessible to actual working people. For this work the Department paid, in the year ending March, 1868, £144,158; but of this only £13,500 were in direct payments to teachers, the remainder being for buildings, books, museums, examinations, &c. The subjects taught were such as mathematics, chemistry, natural philosophy, botany, zoology, physiology, geology, mechanics, navigation, mining, metallurgy, civil engineering, drawing, painting and modelling.

One curious point in the evidence on this subject bears on the difficulty of procuring good teachers. The reason is that "the demand for anybody who appears above the horizon with any scientific knowledge applicable to industry is so great that few of these people, comparatively speaking, turn into teachers. The witnesses examined ably maintain the practical value to the country of all the subjects above named, and distinctly state that they do not consider "technical instruction" in science schools, as including the teaching of trades. These can better be learned in the work-shop. The business of the science school is thus stated in the words of Lord Rosse's commission on the Science School of Dublin: "We do not consider that the practical applications of science to industry or the arts themselves, should be undertaken by the college of science, as the special part of its teaching; its aim should rather be to impart a general and thorough knowledge of those branches of science which may be so applied, leaving it to the student subsequently to specialise his knowledge, and turn his attention in the direction he may find most suitable; but practical subjects, when capable of being rendered illustrative of scientific principles, should, in all cases, be introduced into the course of instruction." Exception is, however, made in favour of such subjects as engineering, mining, and navigation, which can be practically taught in schools. The object is not directly the work, but "the intelligence of the man in his work." Small aids are given under judicious conditions to localities erecting suitable buildings for science schools, and any teacher, who for two years has "passed" thirty students a year, is allowed a free trip to London, at the expense of the Department, "that he may visit the schools and museums in London and see what is going on."

Very varied results have attended the establishment of Science Schools; some have been ephemeral and of little value, others in the highest degree successful, and some of the largest and wealthiest manufacturing places have shown the utmost indifference to these schools, while others of less note have put forth the most energetic efforts in their behalf. Birmingham, it seems, is one of the former class, and the remark of one of the witnesses, "so much the worse

for Birmingham." is curiously illustrated in the appendix by a list of some scores of kinds of "Brummagon" goods which have, within the last few years, been wholly driven from the foreign and Colonial markets by the competition of the better educated artisans of France, Germany and America.

Dr. Lyon Playfair brings out some curious points. One of these, in which he corroborates the statements of a previous witness, is that the iron girders for the Kensington Museum itself had been imported from Belgium, the manufacturers in that country bringing "more science" to their aid, and so selling cheaper than those of England.

The Science Schools of Switzerland are spoken of as "typical system." They have "the best Elementary Schools," finishing "on half time work," and "special industrial schools, where students may be educated in the sciences bearing on their professions." Scotland takes the lead in Great Britain in science education in the Universities. "The four Scotch Universities, for very many years, have given much more science instruction than the Universities of England, and the effect has been that they have got a great hold of the population." "There are more university students, in proportion to the population, in Scotland than in any other part of the world; there is one university student for every 866 of the Scotch population, while there is only one university student for every 5,445 of the population of England, and one to every 2,894 of the population of Ireland, so that it will be seen that in Scotland we have got much more hold on the people on account mainly of our teaching subjects which relate to their future vocations in life." In connection with this it is stated that a chair of Civil Engineering has recently been established, a sum of £6,000 having been given by Sir David Baxter, and a like sum by the government. An engineering workshop is also to be established, and government has spent £40,000 on the magnificent industrial museum connected with the university. The government have further offered to double the size of the museum if the City Corporation undertakes to widen the street leading to it. The old Chair of Agriculture has also been put on an efficient footing. The Laboratories of Practical Chemistry in London, Manchester, and Edinburgh, are, it appears, too small to accommodate the students desiring access to them, and Dr. Playfair would "like to see the government give aid to two or three good laboratories throughout the country." Prussia has lately built two, one in Berlin and one in Bonn, at a cost of £50,000 each.

The school of mines in Jermyn street, London, an outgrowth of the geological survey of the United Kingdom is the leading institution of that class in Great Britain. It has lectures on geology, palæontology, natural philosophy, chemistry, mineralogy, metallurgy, and mechanical drawing. It has 89 students, of whom only 18 take the whole course; and it also delivers popular lectures and lectures to working men. Its comparatively small number of students is attributed to apathy on the part of the mining people, to want of an educational head to the institution, to the too limited character of the course, its not being near the mining districts, and other causes. The students actually educated are said to have been eminently and useful. The cost of the school for teaching purposes is only £2,400 annually; and it is the opinion of the witnesses examined that extension in various directions is required to bring out the full utility of the institution. More especially it requires more commodious rooms, the services of tutors, and additional professorships. Professor Huxley, however, claims that it cannot be regarded as a failure, its success being really great, in training highly useful young men, and when tested with relation to the means employed.

Prof. Huxley's examination brought out incidentally some strong opinions in regard to the neglect of science education, in the older Universities, and more especially Oxford and Cambridge. He regards their courses of study as the reverse of the proper order, which according to him would be science first, and literature afterwards. He does not think that these Universities as at present constituted, will ever do any good with scientific education. The Professors of science are able, but no adequate encouragements are given, and the atmosphere of the Universities and their modes of study are uncongenial to science. He does not hesitate to say "I think that the spirit of the teaching at our older Universities is opposed to the spirit of scientific thought." Every scientific man knows that there is some truth in this, in so far as college education is supposed to be a process of "reading" without the study of facts and things, and from the remnants of the old prejudice that education should be limited to training, merely in the sense of intellectual gymnastics, without reference to any practical results. Still Prof. Huxley is, as he himself admits, rather "revolutionary" in his ideas on this subject.

Prof. Huxley bears willing testimony to the value of the science teaching in the schools, already mentioned under the "Depart-