

cated who does not possess the power of bringing his perceptive faculties to play on the phenomena that surround him, and also of exercising his reasoning powers to systematise his observations, and to compare them with those of others who have preceded him. The surest way of cultivating the Perception is by the severe study of some branch of Natural Science; the Reason is to be trained in the lecture-room and the study. Nature does not proceed on the principle of setting one of her gifts at variance with another; and so far from one of these sets of faculties being opposed to the other, neither can be cultivated to the full extent of the mental powers without the assistance of the other. No nation has distinguished itself by producing a greater number of keen and accurate observers of Nature than the Scotch, and none has set a higher value on the education that is derived from books. In the scientific education of the agricultural population of England, it will be found that the long disuse for generations of the reasoning powers is the greatest difficulty to be overcome. Although we do meet here and there with those who are more or less accurate observers of Nature, it is extremely rare to find one who has any power of forming a connected train of reasoning as the result of his observations.

We need but look around us on the events passing before our eyes on the Continent of Europe, to recognise the manner in which Education is proclaiming herself victorious along the whole line. As a nation, we are slow to learn. But that nation must indeed be both deaf and blind, which does not at the present time see the necessity of straining every nerve to redeem itself from the disgrace of ignorance. With our working classes taught to exercise those faculties which they all possess, but which so few know how to use, and thus trained to form the strength of the nation in all fresh advancements in Science and the Arts, England would quickly distance all competitors, and assume that position which it would now seem younger rivals are likely to snatch from her grasp.

#### HUXLEY'S LAY SERMONS

*Lay Sermons, Addresses, and Reviews.* By Thomas Henry Huxley, LL.D., F.R.S. (Macmillan and Co., 1870.)

IN this volume Professor Huxley has presented to the public a miscellaneous collection of essays, some didactic, some controversial, some addressed to a general audience, some to a special one, and composed at various times during a number of years extending from 1854 to within the last few months.

The subjects of which the Professor treats are as various as the occasions for which his papers were written and the audiences which he addresses, and, as may be easily believed, his essays are of very unequal value. But one great element of value they all possess in common, and that is, the thorough-going boldness, and honesty, and out-spokenness with which they deal with all subjects alike. This is no small merit in any writer, and it is an especially great one in a man occupying the position which is held by Professor Huxley. It is a remarkable condition of English society at the present time that a man who combines real scientific eminence with great

general ability and special oratorical power, as Professor Huxley does, is made, with or without any consent of his own, into a kind of popular oracle. Like an oracle he is expected to have a response ready for any imaginable query, and like an oracle too he must find himself not unfrequently under special and strong temptation to "prophesy smooth things." Yet Mr. Huxley does not prophesy smooth things; on the contrary, he does not hesitate to put the most unpopular propositions in the plainest possible language when he sees that it is right to do so; and to say that a man—and that man a public teacher—lies under special temptation, and that he resists that temptation, is to say at once that his teaching must be worth listening to, and that even where we cannot accept his doctrines, we may still listen to them with advantage and gain instruction from them.

With one exception, the papers in this volume may be classed under three heads, viz.: Educational Essays, either theoretical or practical, which include Nos. 1, 3, 4, 5, 6, and 9: Scientific Controversy, consisting of Nos. 12 and 13, on the Origin of Species; and also 7, 8, and 14, of which the first is the famous "Essay on the Physical Basis of Life," and the other two are replies to the attacks made upon the former: Finally, Presidential Addresses to the Geological Society, Nos. 10 and 11, of which the latter might fairly come under our second heading, consisting as it does of a very able reply to Sir W. Thomson's strictures upon modern geology. The essay which will not come into any of these divisions is the shortest in the book; viz. that on "Emancipation, Black and White." We must however devote some space to it, since it appears to us to be almost the best reasoned and most temperate view of what its author calls the "irrepressible woman question" which we have yet seen, although we are not prepared to accept the author's conclusions without reserve. In this essay Mr. Huxley's allegiance to the facts of science comes into uncomfortable collision with his allegiance to the traditions of party. He comes before us in the character of an advanced Liberal, but he cannot forget that he is, before all things, a biologist; and the consequence very naturally is, that although he is prepared to support a policy of emancipation—apparently upon the general principle that *all* government is a mistake—yet he is compelled to admit that the arguments of *extreme* emancipationists are "to a great extent nonsensical." We are confident that this question is one which must be ultimately settled mainly upon physiological grounds, and it is just because the conventions of society very rightly do not admit of the full and fair discussion of those grounds before mixed audiences, that the extreme emancipationists have been enabled to obtain for their theory the amount of currency which has lately fallen to its lot. In the present instance, Mr. Huxley appears to have followed out his physiological argument with characteristic fairness to a certain point, and consequently sees that after all due emancipation, "Nature's old salique law will not be repealed, no change of dynasty will be effected;" and again, that "so long as potential motherhood is her lot, woman will be found to be fearfully weighted in the race of life." But why should Mr. Huxley halt at this admission? Why does not his Darwinian logic carry him on to its legitimate and necessary consequence? According to the law

of natural selection, when once fairly engaged in the struggle for existence, no less a penalty than ultimate extinction awaits the weaker race. If the parallelism between a race and a sex can be maintained at all—and the parallelism is Mr. Huxley's, not ours—it plainly implies that, put into competition with man, woman must sooner or later cease to exist *as a competitor*, just as certainly as the black rat has been driven out before the *Mus decumanus*, or as, to adopt a different class of example, the handloom weavers have been driven from the market by machinery and steam. But while we thus doubt the wisdom, or indeed the possibility, of placing women on a level with men, and in competition with them, we would by no means therefore be understood to argue against giving them a liberal education or improving the law in regard to their property.

Passing on to consider for a short time the Educational essays, we need say but a very few words of the single specimen given of the writer's method in practical education, viz. the Lecture on a Piece of Chalk. It is certain to be well known to most of our readers. Those who do know it, for the most part recognise it as a model both in matter and in manner of what a single lecture ought to be; those who do not had better read it at once, for till they have so done they will have but an imperfect idea of such a model. The other educational essays, viz. the first six in the book (with the exception of the second) contain an exposition of the author's views on many of those points in the theory of education which are most keenly disputed at the present time, such as the value of natural science as contrasted with mathematics or philology as an instrument of education; that of the natural history sciences as contrasted with other branches of natural science, the method by which they should be taught, &c. Now it is only fair to admit that in all these matters Professor Huxley's addresses must be looked upon as the speeches of an advocate, and moreover of an advocate who feels that he carries the feeling of the public with him for the most part, but is by no means equally sure that he can overcome the prejudices of the jury. Still, considered as the speeches of an advocate, they are admirable, and it must be remembered that an advocate may prove his case, and this, we think, Mr. Huxley has in several instances done. In regard to the most important of the questions discussed, we are disposed to believe that any one of these three instruments of education may turn out a highly cultivated and thoroughly well educated man, provided the teacher knows how to teach and the learner presents good raw material upon which he may exercise his skill; but this by no means proves that they are all of equal value. One thing we can certainly say in regard to the classical education of our own day, that is to say, of the day of those who are the acting men of the present generation, viz. that, however well it may have served the turn of that small minority who were sure to make the best of any kind of education, and for whom, therefore, it is the least necessary to make provision, it has done nothing at all for the great majority of those who have been submitted to it. It is not too much to say, that out of the men who have gone from public schools to Oxford, and who have spent their whole lives between the ages of eight and twenty-two in learning Latin and Greek, not one in three could at the latter age read a Latin or Greek author with ease and

intelligence. This may not in itself prove the case of science as an instrument of education, or even prove the inefficiency of classics; but at least it shows that classics have failed as a fact, and reduces us to this dilemma, that we must admit either that they are but a very imperfect means of education, or that the general standard of educability among young Englishmen is unaccountably low. One other alternative indeed remains, viz. the supposition that classics have been generally very badly taught, but this seems to us hardly tenable. It is difficult to believe that so much labour has been bestowed by so many good scholars as may be found amongst the schoolmasters of the last fifty years, upon the art of teaching classics, without the elements even of the art being discovered. At any rate reformers, or even revolutionists, in education may fairly argue, that what has not been done in so many years by a method which has had the whole field of the higher education to itself, is hardly likely to be effected by a persistent continuance in the same path. We are reminded of the physician of Laputa, of whom, when he had already almost killed his victim by his discipline, Gulliver says, "We left the doctor endeavouring to recover his patient *by the same operation*."

We have left ourselves no space in which to notice the remaining and more directly scientific portion of Professor Huxley's work. The book is not to be discussed fairly in the space at our disposal: it is, however, full of interest throughout, and we need perhaps the less regret that we are unable to direct our readers' attention to the remaining essays, inasmuch as they constitute that part of the work which deals with the scientific controversies of the day some of which have already been discussed in NATURE.

G. W. C.

#### FERNET'S ELEMENTARY PHYSICS

*Traité de Physique Élémentaire.* Par Ch. Drion et E. Fernet. Troisième Edition. (Paris: V. Masson et Fils. 1869.)

THE third edition of this well-known handbook of French physics deserves more than a casual notice. We are told in the preface that it has been entirely recast by the second of the two original authors, M. Fernet, a pupil of the lamented Verdet, who has caught something of the spirit of his master. There has been no teacher of physics in our time whose work has been, on the whole, comparable to that of Verdet. He has all the clearness of Tyndall; and, as almost all of his published lectures were delivered to audiences more strictly scientific than those to whom the famous books on Sound and Heat were originally presented, he is never diffuse. His arrangement of the essential points of his subject, and his grouping of the illustrative details and of the exceptions to the general principles which govern it, have scarcely been equalled even in France, which is the special country of precise and exhaustive exposition. It is high praise, therefore, to say of M. Fernet, that in parts his book recalls his master's method and style.

The treatment of mechanics which is common in this country places statics before dynamics. There is only one thing to be said in favour of this arrangement—that the idea which lies at the root of dynamics, that of change of rate of motion, is a little difficult for a beginner to