

THE following seems a passable definition, such as Sir Edward Fry asks for in his letter of November 1. But, in offering it, I only speak of the sense in which I myself use the expression.

Characters are said to be acquired, when they are regularly found in those individuals only, who have been subjected to certain special and abnormal conditions.

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Science Teaching in Schools.

TWO articles have recently appeared in NATURE which call for some comment, if the columns of your journal are to be opened once more to a discussion of this question. Educational reformers will agree heartily with the general position taken up by Mr. H. G. Wells, in "Science, in School and after School" (vol. 1. p. 525), and by Prof. Armstrong in "Scientific Method in Board Schools" (p. 631). But they either ignore or give very little credit for the honest science teaching that is actually being done at the present time. I realise, only too personally, the great difference between training in scientific method and mere instruction in science; and how few are the attempts to make use of the former in all grades of schools. But I hold that the old-fashioned instruction in science has, under favourable conditions, a considerable educational value. To have enabled a boy to realise the composition of the air and water is to have introduced him to the world of nature, and has widened his ideas and conceptions to an extent which justifies the means. Was not this one of the original pleas for the introduction of science into the school course? But having entered my protest, I will pass on.

Mr. Wells admirably distinguishes between the two styles of science teaching, and points out the original function of the Science and Art Department in encouraging and examining only the one of them. But he admits that the field of operation of the Department has been very much widened in recent years, and that its examinations "seriously affect the teaching of middle-class, and even of the higher standards of elementary schools." Yet his only suggestion is that the Department should withdraw from this work; for that would be the effect of an age limit, and is intended to be the effect of the recent alteration in the regulations in the elementary stage.

But circumstances are such that the Department cannot and ought not to withdraw from its present control of science teaching in *day-schools*, for its influence is greater than that of any other examining body; not simply financially, but from the magnitude of its operations. It is a historical quibble to say that the Department is concerned primarily with continuation and adult classes, when it specially encourages the formation of organised science day-schools, and yet rigidly confines the teaching in them to the schedules devised for adult instruction.

Last session there were 94 organised science day-schools, containing about 10,000 pupils taught on the lines laid down by the Department. As is well known, the majority of these are what are otherwise known as Higher Grade Board Schools, which are absolutely dependent for their existence on the grants obtained from the Department. I take it as indisputable that this is the very class of schools where the science ought to have an educational basis; where its function is "to develop and train the hand, eye and mind together, enlarge the scope of the observation, and stimulate the development of the reasoning power." I also believe that many of the teachers are anxious to make it so, judging from their liberal denunciations of the present "pernicious system." Equally axiomatic is it that, under the Science and Art Department, it is impossible to indulge in such teaching. Time will not permit. The pressure is so great that oxygen and water are almost always written and spoken of as O and H₂O.

Mr. Wells considers other examining bodies, whose work is exclusively directed to school needs, are far more blameworthy. This I absolutely deny. In the first place, the South Kensington examinations are the only ones which are entirely controlled by scientific men. The sole cause for the existence of the Department is the encouragement of science and art, whereas the other bodies referred to provide for the examination of secondary education generally; and the examining board may not have a single representative of science upon it. But further, assuming that the South Kensington examinations are neither better nor worse than others, there are two causes which make them an educational abomination.

(1) In one year the pupils have to be rushed through such an excessive amount of work that the teaching degenerates into the merest cram. The Department distinctly states that students in the first year are to be prepared for the first stage, and in the second year for the second stage. Putting aside entirely the consideration as to whether the scheme is any particular subject, as chemistry, will any practical teacher deny that the requirements for either the first or second stage are far beyond what it is possible to accomplish with satisfaction within the given time? It must be kept in mind that the time-table has to provide not only for the seven or eight subjects of which the Department takes cognisance, but "for instruction in those literary subjects which are essential for a good general education." Do not these latter often suffer in favour of the former, especially at the approach of May?

(2) The consequence of this restriction is that boys scarcely in their teens enter by thousands for an examination beyond their normal capacities. It is in this that the South Kensington examinations differ so entirely from those of the Universities. The difference in standard between the Department's examination in chemistry and the Cambridge Junior Locals or London Matriculation is not great; but in practice, the average age of candidates in the latter is higher by two or three years. Time is allowed for the awakening and development of the powers of observation and reasoning. A boy is then able to describe intelligently what he has become thoroughly familiar with, instead of reproducing mechanically his notes or text-book.

In still another particular have the University Boards a decided advantage. Either they dispense altogether with an examination in practical chemistry, or they make something more of it than an analytical drill. Not much, it is true, but it must be remembered that practical chemistry is the most perverted subject in the whole range of knowledge at the hands of both teachers and examiners. But the greatest mockery is that which passes under the name at South Kensington. Of the written part of the examination it is needless to say anything; no boy would regard it as a test of what he has done in the laboratory, but what he has seen in the lecture-room. As to the analysis of salts, what bearing has it on the chemistry he is being taught elsewhere? Though at a certain stage it has a considerable educational value, the amount of time wasted upon it is appalling. It is useless to reiterate how easily it lends itself to being converted into a mechanical grind.

Mr. Wells is of the opinion that the recent abolition of the second class pass in the May examinations has had a beneficial effect. So it may, in extinguishing what might be termed "bogus" classes. But it has only intensified the evils in organised science schools, and put a higher premium on the cleverest cramming. The change did not deter such schools from sending in their pupils as before, but now they had to obtain 60 per cent. of the possible marks, or fail—and most of them failed. This year there were fewer failures, because the teaching has answered to the whip. Financially the result is satisfactory to them, but educationally it is disastrous. At that age the average boy is not capable of obtaining more than forty or forty-five per cent. of the marks in such a subject as chemistry. Very often he does not understand the full meaning of the question; and when he does, he is unable to write down more than a moiety of what he knows, or what could be drawn from him by a series of oral questions. There is no consideration shown for the immaturity of the candidates, but the standard is pitched higher than that of any other public examination in the country.

So far from agreeing with Prof. Armstrong that science must be admitted to equal rights with the *three R's*, I hold that it is taught too extensively as long as the present system of examination prevails, and that the first battle to be fought ought to be against the South Kensington examinations, until they truly perform their double function.

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WILL you allow me to take the opportunity afforded by the publication, in NATURE, vol. 1. p. 631, of Prof. Armstrong's address at the Berners Street Board School, to offer my testimony to the value of teaching, based on the principles which he advocates so eloquently? The *practical* difficulty of teaching what Prof. Armstrong has called scientific method in an ordinary school, is often the ground of the objection made to it, so that it may interest your readers to hear of any experiments in this direction.