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# ESSAYS.

## THE CONFLICT OF STUDIES.

If we cast our eyes back for a period of fifty years we shall arrive at an epoch when the higher education of England remained still, as it had been for many generations, solely and exclusively classical. An illustrious man trained at this time stated in later life, with well-feigned regret, that he belonged to the pre-scientific period. Suddenly a strong current arose in favour of *useful knowledge;* the machinery of lectures, mechanics' institutions, and cheap literature, was employed for the diffusion of this useful knowledge among the humbler classes. Whatever might have been the result of these agencies within the sphere of their immediate operation, it cannot be said that any decisive influence was produced on the schools and colleges which supply the most elaborate education.

At a later period, when the machinery set in action for the benefit of the humbler classes had decayed in power, when mechanics' institutions had fallen into debt and difficulty, when lectures had given place to musical and other entertainments, when popular literature had ceased to affect to teach and aspired only to please, the exclusively classical education of the upper classes



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in England first encountered serious criticism. Perhaps not more than ten or twelve years have elapsed since these time-honoured studies began to experience any vigorous rivalry; though for a considerably longer period the elements of mathematics had gained a partial and temporary toleration.

I do not know that any single cause, or any combination of two or three definite causes, can be assigned with certainty as having led to the conflict of studies which we now propose to consider. As we proceed some suggestions will occur which may throw light on this matter; but I do not propose to discuss it formally. I do not pretend to exhaust the subject on which I write, but only to offer such remarks as have presented themselves to my own reflection, and so far as I know have not yet been brought prominently forward.

The first point to which I shall allude is one which seems to me commonly neglected, namely, that in balancing the claims of various modes of education and systems of studies we must remember that our decision must depend very much on the precise benefit which we hope to secure. We may propose to educate an individual mainly for his own benefit, or for that of others, as for instance the state. If we take the benefit of the state as the principal end we shall probably be led to the conclusion that the indications of any special excellence should be carefully watched and encouraged, even at the expense of the general development of the powers. If a youth shews any of the tastes and habits which have been in past time the presages of military distinction, we may hold that the law of the safety of the country justifies the cultivation of this

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promise even to the neglect of higher intellectual qualities, or to the peril of moral excellence itself. This may be an extreme case; but let us take a more moderate example. Suppose a youth to exhibit a fondness for imaginative exercises and literature, which may be the dawn of poetical genius. Moreover let us suppose that, in spite of the authority of an ancient sage, we find a function and a value for poets in our commonwealth; then we may conclude that we ought to stimulate the imagination: though perhaps it might be for the true happiness of the individual if the memory and the reason were trained rather than a faculty which is already unduly developed. It is unnecessary to illustrate the matter further, for it is sufficiently obvious. If we are merely pleasing our fancy with the construction of a Platonic republic we may determine that the endowments of the individual belong strictly to the state, and are to be developed and employed primarily for the public benefit; and if we believe that history repeats itself we may anticipate that at some future period the example of Sparta will be revived, and individual and family life be subordinated to the paramount claims of the commonwealth.

Probably however the end which is usually sought is the good of the individual rather than of the state; but our proceedings seem often ill-calculated to secure the supposed end.

Although there may be little immediate prospect of having such a control exercised by the state as to involve the absolute command of all individual talent; yet on some grounds at least we might long for such a dispensation. How often do we see men eminently



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qualified for some important work which they will not undertake; and then we may wish for some benevolent despotism to exert the necessary constraining authority. Here for instance is a philosopher who could supply us with a treatise on some difficult and important branch of science; there a scholar who could edit in a worthy manner the works of some great author: but philosopher and scholar alike neglect what seems to all others the obvious duty. Not only may we complain that those who possess such eminent endowments do not employ them; but we have the additional mortification of finding that those who could perform the required work well, though somewhat inferior to the great masters, are discouraged from attempting it by the conviction that at last their performance may be thrown into the shade by utterances from the oracles which have so long been dumb.

I wish that those who occupy the highest places in professional science and learning would sometimes reflect on the fact that their eminence may be really an obstacle to the progress of knowledge if they communicate little or nothing themselves: for their reputation naturally deters others from attempting to produce works on the appropriated subjects.

Although we have no such despotic power as to compel an individual to cultivate just that faculty which seems strongest, yet by our system of competitive examinations and prizes we tend to the same result. We take a boy at school who seems to exhibit an aptitude, say for mathematics, and foster that taste in every way we can. The boy comes to the University; he is already saturated with mathematics, and so must have

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almost exhausted the special benefit which that study is held to confer: at the same time in other departments of knowledge, such as languages, history, natural science, he may be very deficient. Nevertheless he is kept for three or more years still at the old pursuits, exercising only those energies which have been abundantly developed, and leaving others dormant which have been too long neglected. If our object is to train mathematical teachers and professors this may be defended, though perhaps with only partial success; but if, as we commonly maintain, our object is to cultivate the mind so as to render it well fitted for future exertion in any direction which has to be followed, our arrangements are open to serious doubts.

The excessive cultivation for examination purposes of one department of knowledge to the exclusion of others seems to me one of the great evils of our modern system of bribing students by great prizes and rewards to go through our competitive struggles. We are in danger of giving up all pretence of a general course of training for youth, and of allowing and even encouraging boys to select some special subject which they fancy they prefer, or rather perhaps which they least dislike. I should desire quite a contrary system; a scheme of study and examination should be drawn up after due deliberation, and all candidates be required to pass through this before the avenues to special distinction were opened. In theory perhaps this is still attempted; but in practice we seem to deviate from such a course more and more every year at Cambridge. For instance, students of classics are no longer compelled, as they formerly were, to pass a mathematical examination for

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their degree; and for the most part undergraduates in the colleges are excused from attendance at lectures on the subjects which they do not profess to cultivate. Even where an attempt is made to prescribe some general course the standard in each department is fixed so low as not to ensure more than the simplest rudiments of knowledge.

Much too of the prevalent culture of specialities seems to wear a sordid mercenary aspect. It is not sufficient to afford the means of study, there must be the proper share of honours and emoluments to act as a bounty or a bribe. We must not merely allow a youth to study what he pleases, but also reward him for doing so; perhaps even must appreciate him and his favourite pursuits at his own valuation.

Although I am not presumptuous enough to hold the balance between various studies, yet I shall endeavour to offer some general remarks which may assist those who are disposed to make the attempt.

As we must employ some mode of testing the diligence of teachers and the attention of pupils, it seems inevitable that there must be processes of the nature of examinations; hence it is important to pay some attention to the adaptability of subjects to the exigencies of examinations. It seems to me that the older subjects, classics and mathematics, are strongly to be recommended on the ground of the accuracy with which we can compare the relative performance of the students. In fact the definiteness of these subjects is obvious, and is commonly admitted. There is however another advantage, which I think belongs in general to these subjects, namely, that the examina-

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tions can be brought to bear upon what is really most valuable in the subjects. It is of course easy to say that the art of examination by long practice on these subjects has arrived at a degree of excellence far beyond what ought reasonably to be expected in the case of studies of quite recent popularity; but this does not seem to me to explain the matter completely. Take for instance Mathematics, and observe how real and fresh the examination papers can be made; they in fact abound in new results which are quite commensurate in importance and interest with the theorems previously established and studied. Now for a contrast take the subject of History; this may be readily admitted to be important and instructive especially for the original inquirer who has to seek for evidence, to estimate its value, and to combine it in a consistent whole. But it may be seriously doubted whether the valuable parts of the subject can be developed in our usual systems of examination. From the cases, not I admit very numerous, which have fallen under my own notice, I have formed an unfavourable judgment on this matter; it appears to me that we find in examination papers chiefly dates and striking obvious events, which form rather the skeleton of history than history itself; that the mere receptivity of the students is all that can be tested, to the exclusion of the faculties of comparison and of judgment; though these may be well developed by original researches in the subject. Thus, briefly, it seems to me that much of what constitutes the real value of mathematics can be tested by examinations, but in history there is little of this merit.

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Again, take the Experimental Sciences. I am but little satisfied with what I have seen of examinations in these subjects. I have had much to do with examinations, principally but not exclusively in pure and mixed mathematics; and my experience is that nothing is so hopelessly worthless as the products of examination in experimental science. Nowhere else is the proportion of what is intelligible and true to what is absurd and false so small. Often after encountering a mass of confusion and error the disheartening conviction has been forced on the examiner that the candidates must have derived positive harm from their attempts. *Experiments* indeed strictly so called can scarcely be introduced in an examination room; in other words, the distinguishing characteristic of the subjects cannot be subjected to test. I have heard it said by an eminent professor that the intelligent use of instruments is a most essential part of natural philosophy, and that it is almost impossible to examine a large class in this matter; it would be dangerous to trust a good instrument in the hands of an average candidate. In Chemistry especially it seems to me that mere paper examination, which is all that can under ordinary circumstances be effected, is a most inadequate representation of the best parts of the subject. I may add, though it is not of much importance, that after undergoing numerous competitive examinations, and assisting in conducting many more, I have always remembered one in chemistry as the most unsatisfactory in its results.

The Natural Sciences I can speak of with only the slightest experience; but here also it seems to me

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that much of the real value of the subject evaporates when we bring it into the examination room. With respect to both the natural sciences and the experimental sciences it may be admitted that there is no difficulty in conducting an effective examination if the candidates are few, and the time ample; but what I wish to notice is the unsatisfactory character of the process of testing the progress of large numbers with a reasonable expenditure of examining power.

One point may be just glanced at for a moment. There must at this moment be numerous able and eminent teachers of experimental and natural science in England; but I apprehend that in extremely few cases these teachers were themselves discovered by examination tests in the subjects which they now adorn. The contrary of course holds good in mathematics and classics; here the leading authorities were almost unanimously first brought to notice by examinations in their respective pursuits; so that we have sufficient evidence that this method of transmitting instruction succeeds in these cases. But we must not assume too readily that a system which has succeeded with classics and mathematics will be equally applicable to other studies; and that distinction acquired by passing examinations will be good evidence of the existence of the capacity for teaching and investigating.

We must not lay undue stress on what may be called the examination-value of a study; those indeed who are desirous of arranging a course for self-training may neglect this consideration entirely. But those who demand an assured place for any particular study

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in our schemes of examination and rewards must pay attention to the point. They are bound to shew that what they consider the special benefits of the study can be well and readily tested by examinations; that is, they must shew that he who acquits himself best in an examination, conducted with the usual limits of time and expense, is really the one who knows best the valuable parts of the subject, and that he knows them well. It must be remarked that actual experience in examinations may give much information as to the educational value of certain subjects. Many persons who have been engaged in conducting the examinations for the Moral Sciences Tripos in Cambridge have found the estimate they had formed as to the merit of these studies in training the minds of the candidates much augmented.

Let me now say something as to the special advantages of mathematics. Leaving aside such points as are well known and obvious, I should like to draw attention to the inexhaustible variety of the problems and exercises which it furnishes; these may be graduated to precisely the amount of attainment which may be possessed, while yet retaining an interest and value. It seems to me that no other branch of study at all compares with mathematics in this. When we propose a deduction to a beginner we give him an exercise in many cases that would have been admired in the vigorous days of the Greek geometry. Although grammatical exercises are well suited to ensure the great benefits connected with the study of languages, yet these exercises seem to me stiff and artificial in comparison with the problems of mathe-

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