

not taught in this practical manner. All scientific authorities are agreed in stating that science can only be taught in one particular way—that is, practically—and is it not, therefore, reasonable to condemn the results of science-teaching, unless the teaching has been carried out on this system? As a matter of fact, however, the introduction of science-teaching into schools has invariably proved most successful, in every single instance in which the instruction has been made practical in its character. Under these circumstances science yields to no other branch of study as a means of mental discipline. In the second place, as regards culture, it may at once be conceded that science is inferior to other branches of study, such as literature—with, however, the very important proviso that the studies in question cannot claim any superiority in this respect unless they are carried beyond a certain point which is rarely reached in schools and not commonly attained even in a university. The literary appreciation of Homer and Æschylus, of Juvenal and Tacitus, of Shakespeare and Tennyson, presupposes a high culture, much higher than could be afforded by the study of science. But how often and to what an extent can the ordinary educational course of schools be said to be conducive to literary culture? In England, certainly, in the great public schools, it cannot be said that the educational training is favourable to “culture” in the high sense of the term. On the contrary, the tendency of English school-life is to produce what the Germans understand by “Philistines.” How many boys in the highest form of a large English school appreciate the beauties of one of Horace’s odes, or would find the smallest difficulty in reading the death of Agricola in the original with an unflinching voice? However, not to dwell upon this I willingly concede that the prosecution of literature in its higher walks gives rise to a form of culture more elevated, more polished, and more spiritual than is produced by the study of science. I will also willingly admit that the too exclusive study of science in certain temperaments, is apt to harden the mind, to close the eyes to the higher and less tangible elements of human life, and to disturb the true balance between the intellectual and emotional faculties. Nevertheless these defects are not inherent in the culture produced by science, and there is another aspect to the question. It is easy to make the step from nature to nature’s God. To the religious temperament the study of science must ever conduce to that highest of all forms of culture, the culture that is implied by reverence. It is a common charge against science that it is materialistic; but the charge is unfounded. Science fluctuates, like many other things, and it at present may tend towards what is commonly called materialism. I venture to assert, however, that science is in its essence religious, and that the time is not far off when this will be generally recognized. At any rate—and this is all that concerns us here—there can be no question that science tends to produce a profounder admiration of the wondrous works of the Creator, as displayed in the visible universe, a truer appreciation of the real objects of human life, and a more intelligent compassion for those who ignorantly sin against the unalterable laws of existence. In the third place, enquire what educational standing science can claim on the score of *utility*. Here, again, I conceive that the claims of science are undeniable. Always admitting that the ideal education would consist of a judicious mixture of scientific and non-scientific studies, we must remember that the time allotted by the majority of mankind to learning is too short to allow of this general culture: and that the average school-boy is not likely to master thoroughly more than one department of knowledge. Having painfully mastered the “three R’s,” the average school-boy is driven to make choice as to what set of studies he will embrace; and his choice is, or ought to be, guided by a due consideration of what knowledges will be most *useful* to him in his future life. I say, then, that the claims of science are in this respect undeniable. Most men in civilized communities lead lives of an eminently practical character; and it is no exaggeration to describe human existence as being in its essence an incessant struggle with the national forces by which man is environed. The more intelligently this struggle is carried out, the higher is the stage of civilization which is attained to, and every victory in this fight raises man nearer to his ideal condition. I am far from saying that the satisfaction of his material wants is all that the man requires for his happiness and his welfare. Man is more than an animal, and has wants other than those of the day. Nevertheless, it seems tolerably certain that no great spiritual progress is possible where man’s material wants remain unsatisfied; whilst the satisfaction of these wants in all cases depends directly or indirectly upon the completeness of the harmony between man and nature.

And how can this harmony be brought about? Surely in no other way than by instilling into the plastic minds of our children some knowledge of the world they live in; some love for the wonderful nature by which they are surrounded; some acquaintance with the laws which govern the universe. Most men, as I have

said before, lead lives of an eminently practical character. In winning their bread they are brought daily into contact with natural productions; they conduct operations depending entirely upon natural laws, or they have to deal with artificial products or machinery removed by the skill of man but one stage from the raw material of nature. It were easy for me to unroll before you the long list of scientific achievements of which our present civilization is the direct outcome, but there is no necessity for this. The common working life of man pre-eminently demands a knowledge of common things; and this knowledge can only be obtained from science. How, then, can we doubt the utility of science as a branch of education? It appears, therefore, to me that if a boy has to choose between obtaining a certain limited knowledge of science or a certain equally limited knowledge of some non-scientific study, such as the classics, he will act wisely in choosing the former. If he can acquire both, so much the better; but if he has only time for one, utility alone, in my opinion, demands that he should choose science. Is the farmer more likely to succeed in discharging his functions in life by being able to construe a little Virgil, or by knowing something of the laws of chemistry? Will it more profit the skilled artisan to be able to string together Latin verses or to know something of mechanical laws? But I will not multiply examples of this kind. I will only draw your attention to one more consideration. No one but a medical man can estimate, even imperfectly, the amount of misery, disease, and even vice, which depends more or less directly upon the gross public ignorance of the commonest natural laws, and which might be more or less completely removed by the general diffusion of scientific knowledge. How many lives might be preserved if mothers but knew the rudiments of physiology, or had the faintest acquaintance with the structure and functions of the animal body? How much suffering might be obviated if there were but any general knowledge of the more important laws of health? How many of the ills to which humanity is heir might be mitigated or altogether abolished if sanitary science were but understood by those who frame municipal laws? Upon the whole, then, I contend that the claims of science as a branch of education stand as follows:—As regards discipline, science is at least as good an educational agency as any other branch of study, and it is unequivocally better than many. As regards culture, science does not stand as high as literature, but it nevertheless holds no despicable position. It confers a peculiar culture, which, if different in kind to literary culture, and inferior in value, is, notwithstanding, genuine and real. At any rate, some knowledge of science is essentially bound up in the ideas comprised by the term “educated.” A man may be as “leavened” as you please; but he is certainly not an “educated” man, if he is unable to state why water boils, or why the mercury falls in its imprisoning tube at the approach of rain. Lastly, as regards utility, science stands perhaps pre-eminently high, so long, at any rate, as our present civilization maintains itself unchanged. There are, and probably always will be, departments of human activity in which the knowledge of other subjects is more important than that of science. It is, however, probably impossible to over-estimate the material benefits which would accrue from the general introduction of science into education. It is difficult in treating of a matter of this kind to avoid—whatever conclusion one may arrive at—the censure meted out to the saddler who openly expressed his belief that “there was nothing like leather.” I have not, however, really exposed myself to this censure, if I have succeeded in making my views clear. In advocating the claims of science, I by no means wish to disparage other branches of study. On the contrary, I have merely tried to show that the full value of science as an educational agent has not as yet been generally recognized. It is to be remembered, also, that it is, in the nature of things, the last comer who has to assert himself. The non-scientific branches of study are in possession of the field, and sit serene in the honour which is conferred by time alone. Science finds it necessary, in its position of a comparative stranger, to introduce itself to the public, to divest itself of some of its natural modesty, and, if necessary, to obtrude its claims with something of self-assertion. If I have established my position that science has high theoretical claims for a recognized place in general education, I should, in conclusion, like to say a few words upon the practical difficulties which attend the carrying out of these claims in actual life. The difficulties in question are by no means confined to Canada, though perhaps more conspicuous here than in older communities; and they may be summed up under three heads:—1. The difficulty of obtaining competent teachers; 2. The difficulty of teaching science practically; and 3. The difficulty of obtaining suitable school-books on scientific subjects. In the first place, the difficulty of obtaining competent teachers, though a very serious one, may be lightly passed over, as its origin and remedy are alike clear. Science has suddenly risen into importance in education, and there