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THE ACADIAN SCIENTIST

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WOLFVILLE, N. S., JANUARY, 1888.

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THE PRESENT RIGHTS AND DUTIES OF SCIENCE.

J. W. DAWSON, F. R. S., D. C. L.

The great truth underlying the subject of this paper is that everything human has its ethical aspect. A stone, a brick-bat, an ounce of dynamite, or an ounce of gold, may in itself be absolutely unconnected with the domain of morals; but so soon as it comes into human hands questions of right and duty cluster round it. If this is true of merely material things, still more is it true of operations of mind. Every thought, every imagination, every conclusion, has direct relations with the moral nature as well as the intellect. It becomes us, then, in viewing the materials of our modern civilization and social systems, to regard them from this point of view, and not to allow any great power to be abroad in the world without questioning it as to its duties and ascertaining what are its rights. It is in this ethical aspect that I desire for a little to regard the developments of modern science.

Science is a term of wide application, and may include any of those subjects of human thought in which facts are systematically arranged and referred to definite general principles. I propose here to take a narrower range, and to restrict myself to those sciences which relate to matter and force—the physical and biological sciences. Not that, with one of our modern schools of thought, I regard these as including all sciences worthy of the name, but because these have in our times attained a growth so vast, and have come to bulk so largely in the eyes of men as agencies for good or evil.

The rapid advance of precise knowledge and of inductive results with reference to matter and the energy which actuates it, and the myriad ap-

plications of this knowledge to the arts and utilities of life, constitute indeed one of the main features of our time—one by which it is markedly distinguished from bygone ages, and one by which it will probably be characterized in the estimates formed of it by ages to come.

The cultivators of science have also come to be a most important class, even in numbers, and in influence greatly more important; and while on the one hand they appear as patient, self-denying plodders, toiling for the good of their fellows, on the other they become aggressive and troublesome when they attempt too rudely to explode our old ideas or to change our old ways.

What duties, then, does society owe to science and its cultivators, and what reciprocal rights devolve on them? Or, to put in the converse way, What are the rights of science in relation to society, and what its duties to society in return?

With reference to its rights, science has fared very differently in different periods. In the dawn of civilization we can see in Chaldea and in Egypt bodies of learned men sheltering their scientific pursuits under the garb of religion, and cultivating, as a means of securing consideration, no little chicanery in the form of astrology and divination. Yet these adventitious claims were sometimes dangerous as well as profitable. If the magi of Babylon had not mixed up their science with the forecasting of events and the interpretations of dreams, Nebuchadnezzar would not have condemned them to be slain and their houses made a dunghill. It is not to be concealed that similar baseless pretensions may still produce conflicts between science and other powers in society.

In the Græco-Roman period, with a few exceptions, among which Aristotle

stands pre-eminent, science wandered from the safe paths of accurate investigation into those of speculative philosophy, prematurely grasping at the ultimate explanations of things; and so lost credit and cultivated opposition and contempt. We shall see that still the same tendencies produce like results.

The Arabian science, one-sided and unequal, and never penetrating the mass of the people, owed whatever it possessed of good to the inheritance of the practical culture of the East as distinguished from the speculations of Greece. Short-lived and leaving only a few brilliant results, it has at one time been unfairly overlooked and at another unduly exalted.

In the Middle Ages, amidst the exiles of the distant old world and the birth of Arabia, the dread realities of life and death pressed too heavily on men's minds to permit much scientific activity, and caused them to cling to civil and ecclesiastical despotisms subversive of free thought and fatal to scientific progress. Yet in those dark ages were laid many foundations of good things to come.

With the emergence of the modern world out of the chaos of the Middle Age, came the revival of learning and the birth of modern science—from the first a healthy babe, cradled by the ancient and modern literature and the reformed religions; at first walking hand in hand with them, but latterly showing a tendency to use its young vigor to smite down these its old nurses and associates, and to claim the whole field of humanity for itself. It is this young Sampson, revelling in his earlier strength, who presents himself to us now, that we may consider what right he should enjoy, what duties he should perform.

The right of investigation may be said to be freely granted to acc-

science. The denunciations of the impiety of prying into the secrets of nature, and the few *à esprit étroit* concurrent as to the pursuits of naturalists, are now quoted only to be laughed at, or are confined to such naughty things as vivisection or to the too ostentatious proclamation of our affinity with imagined poor relations like apes and gorillas. Further, the ordinary man of business is well aware that he is indebted to science for most of the conveniences and accommodations that surround him at home, facilitate his movements when abroad, and enable him to communicate with distant friends, as well as for a thousand safeguards that are thrown around his health and his property. He may know little of the facts or principles involved in the transmission of his message across the Atlantic, but he is quite sure that somebody must understand them, and that ~~this somebody~~, whoever he is, must be a useful and respectable person, and ~~should be encouraged~~ rather than otherwise. Besides, he has a dim notion that there are men still working at problems yet unsolved which may some day minister ~~to~~ rather to safety and comfort, though he would scarcely feel called upon to contribute to the maintenance of such persons, since after all they may prove to be but dreamers, it would be wrong to hinder them.

Nay, modern society is disposed to go much farther than this. Most of the great civilized countries of the world are now familiar with scientific commissions of one kind or another. We have, for example, National and State geological surveys, which are supposed to be specially intended to develop the mineral resources of the districts which they explore, or perhaps to reflect some glory upon the community which supports them, for its liberal patronage of science. The geological survey, once established, becomes a very general scientific survey, less perhaps for the advantage of economic industries, except indirectly, than he had been intended, but greatly for the advancement of pure science.

* Occasionally, when some insect or vegetable plague makes its ravages very

severely felt, the ridicule which usually attaches to fly-catching and bug-hunting, or the gathering of obscure fungi, gives place to some temporary regard for these occupations, and the entomologist or botanist is subsidized that he may discover the cause of the trouble. The despised man of science thus has his revenge, and he usually takes it. Again, places are often given in our educational institutions to eminent specialists, not because of their ascertained aptitude for teaching, but because of the reputation which they have gained, and which is reflected on the institution with which they may become connected. Thus while education sometimes loses, science gains; but in this way men are often misplaced, and good workers are converted into indifferent professors.

Latterly these imperfect methods have been somewhat decried, and there has been some agitation as to the endowment of scientific research for its own sake—a somewhat difficult matter, for not only has the public to be persuaded to spend its money on what is apparently unprofitable, but the right men have to be found, and care has to be taken that under the influence of generous diet they do not become fat and lazy.

One of the best and safest means of giving such support is undoubtedly that of furnishing facilities for study in great libraries, museums, and laboratories, and in providing means for the publication of results, as is now done in connection with universities and learned societies, and in such great institutions as the Smithsonian and the institutes founded by the liberality of Mr. Peabody and other benefactors. Another method, also very useful, is that of giving grants for special research, as is now done by the British Government through the Royal Society, and by the British Association. When we consider how little opposition is now made to any kind of scientific research, and how much scientific men are aided by the public, we have perhaps little to complain of in regard to the rights of science. Yet when we reflect on what science has done, how many promising fields of investigation are yet uncul-

tivated, how fruitful even small advances may sometimes be in practical results, it can scarcely be doubted that our negligently and precarious support of science delays the progress of civilization, and may postpone to future times benefits which we ourselves might enjoy.

Another aspect of this subject must not be overlooked—its educational bearing. Science has a right to a large share in the education of the young. In this it is undoubtedly securing a constantly increasing recognition, but it has yet attained to its proper position, whether as to quantity or quality. Much that passes for education in science fails because it is not scientific education. The study of textbooks, however good—and most of them are very bad; the cramming of dry elements for examinations—these things are not learning science, and they are themselves, with reference to what we know of mind and its functions, most unscientific. Science has, in short, a right to be taught according to its own proper methods, even although educators should insist on teaching languages and literature as heretofore, in the most unscientific methods possible.

To succeed in this, the teacher must himself know his subject well, and he must have the gift of presenting it acceptably, and the art of presenting it in the most natural order; and the student must learn, because he hungers and thirsts to know, not because he is driven. Such study of science is valuable, not merely as a means of adding to knowledge. It is one of the best and most practical kinds of training to any future pursuit. So soon as science can be generally taught in this way, it will be the strongest aid and stimulus to other branches of learning, and we shall hear no more of the conflicting claims of science and literature in our educational work.

Some of our most advanced scientific educators hold that in education science should precede literature, and certainly knowledge and thought necessarily precede expression. It must be borne in mind, however, that all young people begin life with certain natural science studies of their own, and if the educator, instead of crushing all the native

inbred tendency to observe and compare, and forcing his pupil to attend to dry abstractions, were first to systematize and render scientific the stores of fact his pupil already have, and then to make these the basis of further progress, learning would become easy and pleasant; but alas! where are the teachers to be found competent to take this first step in rational education? They cannot be found till education in science shall have taken a higher place in our systems of instruction.

At present many difficulties oppose this desirable consummation. Nearly all our educators are still wedded to the abstract scholastic methods of education still in use. Even our scientific textbooks are generally tainted with the same bad leaven. It is difficult to procure apparatus and collections for schools, and still more difficult to secure public appreciation of the work. All scientific educators throughout the world are daily struggling with these disadvantages, and they will in due time be removed. When this shall be, and when science shall have taken its true place as an educator, a new era will have dawned upon the world, in the added force given to intellect, and in the more full and satisfactory solution of all the hard questions which beset society.

(To be Continued.)

CAMPING OUT AT CASCO BAY.

BY A. E. C.

Casco Bay on the coast of Maine is a very attractive resort to the tourist or the naturalist. Extending well inland beyond "where the sea fogs pitch their tents and mists from the mighty Atlantic" its shores combine the dryness and genial warmth of the land breeze with just enough of the flavor of old ocean to make a brief sojourn there during the heat of summer truly delightful. The bay is studded with islands of every variety of size and shape from the small barren rock to those containing large farms, churches and a considerable population. A trip among these islands on a Portland Str. is always an enjoyable excursion. To the lover of Nature or the student of nature Casco Bay offers inducements of no ordinary kind. In addition to the picturesque scenery and the delightful climate the naturalist will find a variety of minerals, a good opportunity of studying marine life, and the exceptional privilege of making a complete collection of post-pliocene mollusks;

It was the writer's good fortune in the summer of '82 to be included in a party of four Scientists who were to spend some weeks on Prince's Point with the double purpose of recruiting physically and studying such natural objects as might fall in our way. The Point projects into the Bay between two Stations of the Grand Trunk R. R., Cumberland and Yarmouth, and may be reached from either. Two of our party, the Professor and Mr. W. were to come on the Maine Central from Waterville, and Mr. H. and myself were to meet them at the Junction. The principals of the party being old campers-out came thoroughly prepared, *utrumque paratū*. They brought an enormous quantity of *impedimenta* but it was all useful when life on the shore began. In addition to tents, camping chests, and various kinds of outfits, such as the uninitiated would never think of, they brought a fine boat, the *Iron Duke*, buoyant enough to carry half a dozen and light enough for two to carry up the beach. The boat, the baggage and ourselves were soon on board a hay-wagon we had chartered and *en route* for the Point. This journey having been accomplished our real camp life began. Two tents were pitched, the *Iron Duke* was launched and two of the party who knew the ground were in a few minutes loading the boat with canners and flat fish, while the others were preparing for the first meal. All were busy like *Aeneas* and his companions on the African coast. "Some out into parts and fix on spite the quivering limbs, others place the brazen caldrons on the shores and prepare the fires." Thus was our life on the shores auspiciously begun.

(To be Continued.)

THE TRANSIT OF VENUS.

BY PROF. A. E. COLDWELL.

The great importance attached to this astronomical event has made it the subject of innumerable articles in Scientific magazines, literary periodicals and the daily press, so that almost every intelligent reader has some conception of what the transit is and what results are to be obtained from accurate

observations of it. Venus, being an inferior planet, at certain times in its orbit comes directly between the earth and the sun and appears to the observer as a dark spot on the disk of that luminary. This passage of Venus across the disk of the sun gives to astronomers an opportunity for getting the difference of the parallaxes of the two bodies, and as their relative parallaxes are known from one of Kepler's laws the absolute distance of the sun from the earth is thus obtainable. This distance is a very important one to the student of the heavens for it is his unit of measure and on its accuracy depends the accuracy of all his other measurements. The comparative distances of the planets from the sun are known from the law "That the cubes of their mean distances are proportional to the squares of the times of revolution." Having then the absolute distance of any one, as the earth, the distances of the others can be easily found. The diameter of the earth's orbit is the astronomer's base line for ascertaining the distance of the stars and an error in this base will be increased a great many thousand fold in the operation.

In this connection it may not be uninteresting to give a short sketch of the attempts to get the distance between the earth and sun. The first to attack the problem was Anstarchus (281—264, B. C.) He attempted to determine the sun's distance by measuring the angle between it and the moon at quadrature. This result was entirely too small being only twenty times the distance of the moon. Ptolemy (90 A. D.) thought that the more distant the sun the smaller would be the shadow of the earth on the moon when the latter was eclipsed. He attempted to measure this shadow and obtained from his observations and calculations 1210 radii of the earth for the sun's distance. This very erroneous result was given to the world in the "Almagest," and accepted as reliable for fourteen centuries. In the 17th century mind began to wake up from its long sleep and this problem was again attacked. By a different process, Huyghens made the distance 99 millions of miles. In 1671

the French sent an expedition to Cayenne to make observations on Mars. From these they deduced a distance for the sun of between 80 and 90 millions of miles. In modern times, with the aid of superior instruments and better methods, a nearer approximation has been obtained. Halley was the first to suggest observations of Venus, and these were made in 1761, and afterwards in 1769. These observations were not fully reduced till 1824 when Bessel obtained from them the figures that have done duty so long in our Astronomy, 95,370,000. The transit of Dec. 8th 1874 was observed with all the skill that science could command. The results have not yet been fully announced but they gave between 92,570,000 and 93,000,000.

The day on which the recent transit occurred was unfortunately stormy in this vicinity, but we are glad to learn that excellent observations were made at Ottawa, Cambridge and other places. We may expect, as the result of this most important astronomical event of the 19th century a very near approximation to the correct value of the celestial unit.

The Acadian Scientist.

A. J. PINEO, General Editor.

WOLFVILLE, N. S., JAN., 1883.

THE ACADIAN SCIENTIST is the official organ of the Acadian Science Club. Owing to the increasing membership of the Club throughout Canada and the United States the publication of such a periodical has become a necessity as a means of bringing widely separated members into communication with each other, of conveying information in regard to the work of the Club from Directors to Students, and of bringing the society to the notice of such as may be in a position to participate in the benefits it confers. In the selection of matter for our columns the interests of the Club will therefore receive prominent consideration. From time to time lectures germane to the subjects of study will be published, as also notes and in-

struction in regard to the work. As it is of the utmost importance that the members should collect and study specimens illustrating the work of the text-books such full instructions will be given in regard to collecting and preserving objects of natural history that the beginner will find them ample for his work and more practiced collectors will doubtless find in them some useful hints. Indeed we shall aim to make our paper of such a character that no working naturalist can afford to be without it.

We hope that Teachers also will find our little paper of value to them in the discharge of their professional duties. As the officers of the A. S. C. and many of its members are identified in one way or another with teaching interests, hints and practical suggestions in regard to the teaching of sciences will occasionally appear.

We hope also to make our paper of interest to every intelligent reading man and woman. As all such are interested in the progress and latest discoveries of science, we believe that they will find the synopsis of scientific news that we shall give from month to month to be of advantage to them especially if they have not the time or opportunity to read larger and more costly scientific periodicals.

In short we hope to so conduct our paper that it will pay expenses at least, and that by its humble means there may be awakened a little deeper popular interest in the study of Nature's works.

We are a little ahead of time with this issue, for while it is our January number we hope that it will reach our friends by the 20th of December. We send it out early as there have been some important changes made in the course of study of the A. S. C., and it is desirable that the revised statement should come to the notice of members and those who contemplate joining the Club before the beginning of the new year. In making our bow, therefore, it becomes quite in order for us to wish the Members of the Club and our readers generally, the compliments of the Holiday Season, which we do most heartily.

The *Acadian Scientist*, at its present merely nominal subscription price, is the cheapest publication of its kind that we know of, yet in order that it may be brought to the notice of as many as possible of those to whom its contents would be of interest, we have concluded to offer some inducements in the way of premiums to those who will work in obtaining subscribers for us.

We have on hand a large and fine stock of *minerals*, the accumulated results of years of collecting, not for the present purpose, but from pure love for the work. We have specimens in beautiful crystallizations from Part-ridge Island, Cape Blomidon, Cape Split and various other points of the North Mountains—localities familiar in name to every student of mineralogy in America—as well as from many places of less note in N. S. and other countries. We have also a limited stock of land, freshwater, and marine shells, tarfishes, crabs, etc. of Nova Scotia and other places.

The above we intend to distribute among those who get up clubs as follows: To every one sending us a club of five subscribers with \$1.25, we will send post-paid fifty cents worth of specimens; for ten subscribers we will send one dollar's worth and so on.

We make this offer for two reasons: Firstly, and principally in order that we may secure a large circulation; secondly because we believe that some by means of this will obtain the specimens and be led to engage in the study of them and other works of Nature who would otherwise not do so. Here is an excellent chance for young naturalists to add some fine specimens to their cabinets. In most villages one could in few hours obtain not five subscribers only, but fifty, for at the mere trifle that is charged for our paper very few would refuse to take it. The person getting up the club would then be entitled to Five Dollars worth of specimens, which would make an excellent addition to or beginning of a cabinet. Send on a club of five and get the premium, and we are sure that you will be so highly pleased with it that you will make an effort to secure more.

We shall send minerals unless shells, etc., are preferred and ordered.

This offer holds good until March 1st 1883.

ARTICLES RECEIVED: "How to Study," "An Excursion to Blomidon," Rise and Fall of the Trilobite," "Wayside Rambles" No 1, "Winter Work for Naturalists" etc.

THE ACADIAN SCIENCE CLUB.

This society is designed to subserve no private interests. It is purely an educational movement inaugurated by a number of persons identified with the educational affairs of our land, and its sole aims are to awaken a deeper popular interest in scientific subjects and to aid in the dissemination of scientific knowledge. The gentlemen who act as directors of this institution willingly devote their time and attention to the work, in as far as their professional duties will allow, and bespeak the co-operation of all who are in any way interested in the cause of popular education.

It is the controlling motive of the Acadian Science Club to encourage young men and young women who are not at present able, from whatever cause, to enjoy the advantages of an Academic or Collegiate training, to undertake and continue a systematic course of study at home. Very many such are naturally of literary tastes and devote more or less time to reading and study of a desultory kind, and in an immethodical manner. Such will see the obvious advantage of having a course of study arranged for them and the benefits that must result from their union with a large society of which all the members are engaged in similar work for the same ends. We expect our membership to consist largely of this class.

But we wish that we could reach, and help out of their folly another and larger class,—we mean the novel readers—those whose chief intellectual pabulum is the distorted, pernicious literature of a sensational character which is abroad in so many forms that few escape having their beautiful development of their God-given powers of mind retarded thereby. If we could reach this class, could persuade them to fling aside the vile trash that is poisoning their minds and turn to the great book of Nature, which Longfellow so beautifully terms the "Manuscript of God," could lead them to see that there is more of interest and romance in Nature's works than in the sickly sentimentalities of the latest

novel, but of a kind that ministers only to intellectual growth, not mental dissipation, we should feel that our labor had indeed not been in vain, but that we had accomplished a noble work.

"Want of time," is an objection frequently presented by many, chiefly from those engaged in manual labor, but who could not, by exercising a systematic economy in respect to that which is of such priceless value, secure to the improvement of their minds the small amount of time required each day for the accomplishing of the work of the A. S. C.? The habit of study once formed, the hour devoted to it after the day's labor in the workshop, on the farm, or behind the counter, would be looked upon as a pleasing recreation, while the fact of having some definite subject with which to employ the mind during the hours of toil, would lighten labor and add a new interest to life. We could name individuals who, in addition to arduous physical labor, still find time for study and even original work, in one or more departments of natural history.

It is hoped that the Acadian Science Club may become a large fraternity of such as may wish to engage in the delightful study of Nature. Brought into sympathy with each other by their union in a common cause, the members will be of mutual assistance, and by their combined and individual influence will, we trust, lead others to see a little more of beauty and wisdom in the fair creations of God as they exist around us in the natural world.

As for harmless amusement and still more for the free exercise of the fancy and imagination, I know few studies to compare with Natural History, with the search for most beautiful and curious productions of nature, amid her loveliest scenery and in her freshest atmosphere.—*Kingley.*

The class of '84 who took geology last year may substitute mineralogy for that subject in the present year.

Minerals for naming should be sent to Mr. Hibbings, the Director of that department.

A SUBTERRANEAN PALACE.

THE SCENE OF ENCHANTMENT THAT CONFRONTED A PARTY OF NEW MEXICAN MINERS.

A party of New Mexican Miners, while prospecting near Mesilla, on a spur of the mountains, discovered a passage which led into the rock at a downward angle of about forty-five degrees. Impelled by curiosity, three of the party, steadied by a lariat held by the others, started down the tunnel of the mountain. The passage was rough and ungron, and about four feet high. By the light of a candle they found twenty feet further a large hall completely filled with long delicate columns, reaching from the floor upward out of sight. They were stalactites, hanging from the walls in endless variety, while from the floor rose rich stalagmites, meeting them and forming figures of all conceivable shapes. Unfortunately the candle was extinguished and nothing could be done but follow the lariat back. As their eyes became accustomed to the gloom a curious phenomenon appeared, in various parts of the cave luminous spots of light were seen. Some near them gave out bluish flashes of flame, while others seemed like moons, glowing with a peculiar pale yellow light; others again were of irregular shape, that made their brilliancy more apparent. Every move revealed new wonders. Oval balls of light blazed from behind the columns, lighting them at every step, while as they could see, gleaming and sparkling, the mysterious lights appeared in the cavern a realization of the old tale of enchantment.

THE POPULAR SCIENCE MONTHLY,

for November, gives an illustrated account of a phenomenon which has never before been observed—that of a snake having crawled in between the bark and wood of a tree and died there, becoming lignified, or changed into wood, in the same manner as animals become fossilized, i. e. the cells and fibres of the wood have actually taken the place of the organic parts of the reptile and left it perfect in shape, size, and all other details, even to the eye cavities, scales, etc.

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O wanderer, from where dost thou come to my sight,
And whither art going so radiantly robed?
Hast been to the uttermost limits of night,
And far into Nature's deep mysteries probed?
No answer! No speech! O mysterious thing,
That burneth thy torch in the heavenly spangl
Far from me my boasting of wisdom I fling,
And bowing I bury my face in my hands.

Kansas City Review.

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This Society aims to awaken and foster a more general interest in Scientific knowledge, to induce young men and young women to engage in systematic study at home, and to afford its members the means for mutual assistance in the pleasing and ennobling study of Nature's work.

METHODS:

1. The adoption of an uniform course of study, to be pursued by means of prescribed text-books.
2. Course of lectures and instruction, to be given at convenient centres; summer meetings for excursions and field work; correspondence between members, etc.
3. Yearly examinations, at the student homes, with the preparation of an essay at the end of the course, when the student will receive a certificate showing standing, as determined by the examinations and essay, and shall be recognized as a graduate member of the society.

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