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On the Practical Teaching of Experimental Physics in Schools. (*)

In recent times so many important additions have been made to our knowledge of Heat and Electricity, that a new impulse has been given to the study of Physics, to original research in it, and to the old controversy how far and in what manner the teaching of Experimental Physics can or should be made an inseparable portion of a system of National Education. Those who take a professional interest in any branch of Physics, and make its pursuit or its teaching the business of their lives, urge the claims of Physics to be placed on an equal footing with Writing, Reading, and Arithmetic, as an educational subject, principally upon two grounds. First, they maintain that Physics holds the foremost position as a means of developing the various functions of the human intellect; in other words, of best furthering the ultimate aims of general education. Attention, memory, judgment, imagination, are alike roused, brightened, and sharpened by an early individual acquaintance with natural phenomena. In proof of this, they point to the history of philosophy and the literature of all civilised nations. On every page which preserves the teaching of the ancient Greek philosophers, and of the great thinkers of succeeding times, we find physical phenomena taken as starting points, or used as illustrations of profound metaphysical doctrines; and the very downfall of philosophical systems coincides exactly with the times when the onward progress of physical sciences showed the Physics of the ancients to be either altogether wrong, or their facts wrongly interpreted. But the greatest support for this recommendation of Physics is derived from the fact, that no kind of human knowledge is so intimately connected with our earliest experiences. The very growth of the faculties of a child depends on physical phenomena. As soon as its eyes are opened it is a physical observer, and soon although unconsciously, becomes a physical experimenter, the range of its experiments constantly extending as the child grows. Each moment in the very earliest life adds to the clearness of the primary conceptions, which are at first confused and incorrect. The child soon learns to distinguish between solid and liquid, between hot and cold bodies, between light and darkness. The ear at the same time lays in a store of experiences on sound. The years of boyhood enrich the amount of physical knowledge immensely, and by a thousand instances, each of which is nothing else but a physical experiment, the boy becomes acquainted with a vast range of physical facts. He experiments on the weight, hardness, rigidity of bodies; on the rebound of a marble or a cricket-ball, on the motion of bodies projected in different ways: he learns music, or is delighted with the echo of the mountains or forest; he makes experiments on reflection and refraction of light; observes colours, studies the the effect of a burning glass, plays with small magnets, and rubs sealing-wax on other bodies to observe electrical attraction. These experiences possess, of course, no inherent connection: the boy *sees* merely, he does not think, or think erroneously, but there is stored up in this manner a vast material, even in the dullest mind, on which to work, so as to bring out our highest faculties. In not one of the sciences which have the study of a natural phenomena for its object, stands the teacher upon so well prepared a ground for the purpose of education—a ground which only requires conscientious labour to bring forth the best and most valuable of fruits.

But it is also urged upon another ground, of a more

(*) Paper read by B. Loewy, Esquire, before the College of Preceptors.

utilitarian character, that Physics—and here I must include Chemistry—should form widespread subjects of education. The present century has seen discoveries in Physics which have not only exerted a most decisive and favourable influence upon our whole culture, but which have led to so great and novel general principles in Physics that those who are best able to judge of the range of these principles express an opinion that we are only at the beginning of a great era of still more astounding discoveries. That facts and principles of so vast promise and importance should, by means of the various channels of national education, become the common possession of all classes, has very naturally been the most anxious desire not only of distinguished men of science, but also of enlightened statesmen over the civilised world; for it is seen at once that a sound knowledge of these facts and principles would most probably stir up mankind to make new exertions for discovering still unknown realms of science.

It is only just to say, that these claims of Physics to be one of the recognised subjects of education, have not been utterly disregarded in this country. The number of science schools where Physics form a prominent subject, of science teachers, and of youthful students, is undoubtedly, although very slowly, increasing; and something is done by Government and by private support to advance physical research. But has the teaching of Physics so far really fulfilled the expectations and promises of those to whose opinions I have briefly alluded? It is far too early to answer this question; but if the value of the knowledge of Physics imparted in our schools is to be judged from the published results of different examinations carried on for the purpose of testing the amount of general education attained by the candidates, we should arrive at a most disheartening conviction. The average number of pupils who present themselves in Experimental Physics at this College is never more than between 4 and 5 per cent, of the total number of pupils examined at each examination; but a worse feature in the case is, that out of 100 pupils who take up Physics, only three or four give accurate answers to some of the proposed questions; 20 or 30 per cent, give answers bearing in a very vague manner on the question. The remainder are mostly totally unacquainted with the subject. Glance again at this result as a whole, and it comes to this, that out of 1500 boys and girls only about three are able to give a correct answer to a few simple questions about natural phenomena which can be observed and experimented on every day, in every place, and should be so studied in every school. At the London University the number of failures in "Natural Philosophy" is a striking feature in the Matriculation examination, being usually as much as the failures in three other subjects taken together, and nearly always greater than the number of failures in any other subject. At this examination the number of questions set to the candidates has recently been swelled to sixteen; and if, as I understand, correct answers to two, or at most three, of these sixteen questions qualify a candidate to pass, the expectations of the examiners have sunk very low indeed.

Now if we admit that physics is a subject of great importance from an educational as well as a material point of view—and no one will probably be prepared to deny this presumption—the time has clearly arrived when teachers should without delay ascertain the present state of physical science teaching, investigate the causes of such strikingly unsatisfactory results as I have sketched in the few instances that have come within my knowledge, make further inquiries whether there exist other facts connected with the question of a more hopeful nature, and mutually exchange their experiences; and it is only in the light of a communication to you of my own personal experience as a teacher of Experimental Physics that I wish you to consider the following remarks and suggestions on the subject.

There are at present three different methods of teaching Physics principally in use. The first of these consists in purely oral instruction. The teacher states some physical fact, and elicits perhaps by his questions some illustrations of the fact from the individual experience and recollections of his pupils. As a mere mental exercise nothing could be said against this method, which, however, is equally applicable to history, geography, or in fact any kind of knowledge. But a fact in Physics differs in this precisely from all other facts, that our own senses supply the only evidence for its truth. It follows that the chief aim of the teaching of Physics must naturally be solely to train our senses so as to perceive the facts, and then to show how to separate the accidental from the essential, to connect effects with their causes, and thus to see not only the truth in a single fact, but the agreement of many facts in one definite principle, and so to lead the mind to the recognition of that one principle, or law of nature, which embraces all the solitary facts. No mere description of physical facts would ever make a discoverer; indeed, it is well known that a method of learning something about physical facts has at all times produced considerable harm. The class of projectors and sham inventors is principally recruited from mere readers of books on Physics; their conclusions are derived from erroneous ideas about facts which they have never really seen, and are naturally of a kind to vanish in the air when put to the best of actual experiment. A method of teaching physics without the basis of experiment stands thus really in direct contradiction with its essential purpose. As a matter of fact such a mode of teaching is utterly tedious to learners; it must lead to errors and misunderstandings; and moreover it is extremely limited in its range, because many facts and phenomena are quite beyond all comprehension, unless they are perceived by the senses. It appears from the examination papers which are presented to me from time to time at this College, that such a method is unfortunately still pursued in many schools; the confusion produced in the mind of the pupils of these schools manifests itself in every statement, and stand in remarkable contrast with the clear and and truthful answers given by those few who have obviously seen what they describe. Written examinations are not a very high test of knowledge attained; but they prove something, and, as matters are, we are bound to accept what they prove.

A second method consists in oral instruction by lectures, illustrated by experiments performed by the teacher before the whole class. At first sight this seems to be an irreproachable method, and undoubtedly it is the best and only one by means of which some information on physical phenomena can be conveyed to large audiences. Nor seems there any other way of exhibiting before a body of students or educated people some result of recent discovery, or giving them a connected exposition of some great principle, with the leading steps or precursory experiments that have prepared its adoption or established its power. But I fail altogether to see its advantage as a school method. We do not teach writing, reading, or arithmetic, by confining ourselves to writing letters or sentences on a black-board, or by reading the alphabet or a page out of a book before our classes, or by showing how a sum in arithmetic is done. We do all these things; but our pupils learn how to write and read, and so on, only by repeating over and over again for themselves what the teacher has shown. The tediousness of the lecturing process before a class of boys or girls is notorious; and in a lecture on Physics especially, as every conscientious teacher will admit who has ever attempted such a lecture, the natural vivacity and curiosity of youthful minds directs their whole attention so much to the apparatus displayed on the table, and finally to the experiment, that the verbal instruction is only very partially listened to; and I have over and over convinced myself that the instruction is taken as a kind of bitter pill, and the experiment as its coating of jam. It is undoubtedly true, that by performing one or two experiments illustrative of some principle, and by indefatigable questioning and cross-questioning, knowledge of that principle may be ineradicably established in half the members of a class; but the other half, through want of attention, seems utterly incapable of learning anything about the subject, and gradually, more and more, the work of the teacher fails to effect uniform progress. We might disregard this want of complete success if our aim in teaching Physics were nothing else but to demonstrate and impress upon our pupils a certain number of physical facts or laws; but surely it is far more than mere pieces of knowledge which we are anxious to give to our boys and girls during their schools years. We wish to train their senses of their intellects, we endeavor to guide and direct their powers of volition to the right ends, and we are working for this—that their emotional and moral life may be in accordance with the highest possible standard. How can we possibly proceed with a greater certainty of success in such a work than by bringing our youthful charges face to face with nature itself? Let them arouse for themselves those forces which man has discovered and uses for his benefit. Let each of them learn to put questions to nature in a proper manner, calculated to receive answers; show them how to read these answers for themselves; let them put answer to answer, and thus learn from nature itself what no human lips can ever teach so well.

This can, in my opinion, only be accomplished by a method of teaching altogether different from those two which I have briefly sketched. There is a third method of teaching Physics in use, especially at Universities, a modification of which seems to me particularly suited for elementary instruction. Anybody who desires to become thoroughly acquainted with some branch of Physics or of Chemistry, or in fact any of the other branches of the Natural Sciences, either from an individual inclination for and interest in the subject, or for some special definite professional purpose, does not trust to the reading of books, nor does he depend on mere lecture courses with illustrative experiments. He considers books and lectures as useful adjuncts to his studies, but he essentially trusts to the individual practical work which he may be enabled to do under the guidance of experienced teachers. He devotes a considerable time, often three or four years, to regular work in a laboratory, where he learns how to observe, how to measure, how to compute his results, and how to deduce physical facts from his work. It is not our object to make our pupils in schools physical experimenters, no more than we aim at making a writing master, or a public reader, or a professor of mathematics, of every child to whom we teach writing, reading, and arithmetic. The fact proves that practical work is considered to be the only real method of obtaining the knowledge desired; and experience shows abundantly that men who have done a certain amount of practical work in physical or chemical laboratories will stand above every mere book student, however wide his range of treating any problem not of science alone, but of life itself. He who has ever done practical science work in a genuine scientific manner will, in my opinion, be a different and a more useful man than the most profound scientific library hermit. That so great advantages should be rendered available also to those who make their first elementary steps in acquiring knowledge, has been the wish of every earnest teacher; but unfortunately it has, so far, generally been considered that there are many serious obstacles in the way of introducing in our public and private schools systematic practical work to be done by the pupils there. I propose to show how these difficulties may be diminished or entirely overcome, and for this purpose it may be best to describe, as far as possible on an occasion like the present, the system of teaching Experimental Physics, and related branches of the Experimental Sciences, which has been adopted, and is more worked out and perfected at the London International College since the beginning of 1873.

Although differences of considerable weight in devising a plan of teaching must naturally exist in the scope of education, and many other circumstances between this College and other private or public schools and educational establishments, still many points of agreement present themselves, especially in respect of the teaching of Physics; and I shall speak more of pupils having a certain average age than as being members of a definite class or form, so as to exclude at once a striking feature of dissimilarity.

Let us then begin our work with pupils who have reached the age of ten, and who can fairly read, write, and do a simple sum in arithmetic. Now is the time to rouse their attention to the existence of an infinite variety of beautiful forms, of periodic events, of great movements around us; and to show that it is not only worth our while to observe, but that there must be method in every observation, and that such observations lead to general conclusions of great importance. Ten, eleven—these are the years for Botany, Zoology, and Physical Geography, where, from the smallest, to the grandest scale on which Nature works, the most striking examples should be selected and displayed or pointed out by the teacher. Physical experiment is here not essential, but a beginning should be made to illustrate some great principle, and I shall here at once indicate the general way of superintending and arranging the experiments. An hour, say in every month, being specially appointed for experiments in the youngest class, let me suppose that you wish to illustrate the following three facts bearing on Physical Geography and Botany: 1st, the solvent action of water, the dependence of this action on temperature, and on the nature of the substance dissolved; 2nd, the spherical form assumed by a liquid when withdrawn from the action of external forces; 3rd, the effect of endosmose on two liquids of different density separated by a membrane. These three sets of experiments may precede or follow that stage in Physical Geography where the action of rivers or springs, or the figure of the earth, and in Botany where the ascent of sap in plants, is under consideration. Or the experiments may form some physical exercises quite by themselves, and merely used for reference. The plan for working now suggested is the same for boys of all ages; with this difference, that after the age of twelve experiments are made constantly during every hour devoted to the subject. Divide your class into groups of two at most, and after assigning to each a definite place for working, provide each group with an independent experiment by placing in their hands slips of paper on which definite but short directions for its performance are given. Let each boy copy out your directions for the experiment he has to do in a small note book with pencil, and at the end of his copy make out for himself a list of the things required for it. Your directions are, out of school hours, again to be copied out fairly with ink into a special book, and a little sketch of the arrangement of the experiment is to be added, however unsightly at first the illustration may be turned out. If possible, let each boy answer at the end of his fair copy, in his own words, this question: What had I to show by this experiment? While the boys are copying out their directions, make a list, in a special book, of the names of the boys in each group, with the number of the experiment supplied to each. As each group has to perform each experiment, such a list is absolutely required for a systematic teaching. To prevent all unnecessary questioning and loss of time after the experiment is written out, place your whole store of glasses, tubing, and in fact everything necessary for work, so as to be readily and freely accessible to the boys. Next, whenever any single question is asked as to the name of a utensil, or where it is to be found—and a storm of such questions is sure to roar around you as soon as experiments are written out for the first time, all pupils being mostly under the same difficulty—answer each question as if coming from the whole class. Take them all round, show them where everything is kept, state the name of each object—and, for example, what you mean by a tube ¼ of an inch wide or ½ of an inch wide, or a flask capable of holding 2 oz., 3 oz., etc., or water, or a small beaker-glass, a middle-sized, or a large one; and declare at the same time that each boy has to carry himself every piece of apparatus required to his place, with the exception of chemicals, to which, for obvious reasons, access should not be allowed to boys at all, unless they are of more advanced age, and their character for carefulness is well established. All chemicals should be carried from the place where they are kept and restored again under the immediate superintendence of the teacher; but with this exception he should reserve his whole attention to the close observation of each group. The utmost vigilance will be required; he must be constantly moving about, and have his eyes everywhere, directing the attention of each group to their work, to the precautions to be observed in order to avoid failure, to casual explanations in order to extend the views of his pupils, and especially holding constantly before each worker the definite fact which his experiment is to prove. Each group should, for that purpose, be kept away from every other as far as possible. Every school-room can be very readily converted into an experimental workroom. The seats and flat tables, or rough planking placed across inclined school desks, the floor even, may be utilized by the scattered groups of workers. As soon as each group has completed the experiment assigned to it, it is to report itself to the teacher, who at once inspects their place, directs the removal and cleansing of the utensils used, and supplies another experiment.

Let me now use the three sets of facts previously mentioned to give a few examples of the directions to be given. These should be as follows for the different experiments to be made by each group successively.

Experiment 1.—Before you are two bottles containing clear water, marked 1 and 2. Pour out a little from No. 1, about a ¼ of a small test-tubeful, into a small porcelain dish, and heat it over the lamp until it is boiled away. Place the dish aside and near you. Take another dish, pour in water from bottle No. 2, and heat it as before. When all the water is boiled away, inspect the two dishes. The first dish is quite clean, but the water from bottle 2 left a white substance behind. Thus water may be as clear as perfectly pure water, and yet contain substances which are dissolved in it.

Experiment 2.—Pour a little water from the bottle marked No. 1 into a small china dish, and heat it until the water is boiled away. Inspect the dish. There is nothing left behind in it. Pour now some of the same water into a small beaker glass, and drop a little lime into it. Stir the water gently, and filter it through a funnel into another beaker glass. The water runs through the filter perfectly clear. Pour a little of this clear water into a china dish and boil it away. There will be white lime left behind. Thus pure water dissolves lime when it comes in contact with it.

The directions to a few more experiments, which every teacher can easily formulate for himself, would now show how to dissolve any two *different* salts in equal quantities of water so as to discover differences of solubility, to dissolve a given substance in cold water to saturation, and to add then more of the substance to this saturated solution to cool until crystals are deposited, to distil pure water from a solution of a salt, and finally to allow of the slow evaporation of any solution until all the water has disappeared and the solid in solution is deposited. We should thus employ six or seven groups with experiments, each of which leads to an important independant fact, while the performance of the whole set must establish in the mind of the pupil a clear conception of a great principle, and of the various steps by which it is obtained, while the concurrent individual instruction of the teacher leads to a comprehension of its importance and bearing. For the two experiments on the globular form of liquids and on endosmose, the directions would be as follows. For the former: Fill a small beaker glass first with water and then with alcohol, and mix both liquids together by stirring them in a large beaker glass. Take up with the end of a pipette a small drop of oil from the bottle by closing the upper end with the thumb and bring the end of the tube into the middle of the liquid. See if the drop of oil remains in the middle. If it sinks, add a very little water until the drop floats in the liquid; if it rises, add a little alcohol. When the small drop neithes rises nor sinks suck up some more oil by the pipette, close the upper end, and immerse its lower end to about the middle of the mixture. Allow the oil to escape, and a globe of oil will be produced. Liquids have thus a tendency to assume a definite form, namely, that of a sphere.

Again, for the experiment on endosmose: Dissolve as much sugar as you can in a small beaker-glass half filled with hot water, until the solution is thick and syrupy. Take a glass tube 6 inches long, or a test-tube of which the bottom is broken, and tie a piece of thin bladder over the mouth of it. Fix the tube into a retort stand, and immerse the closed end of the tube two inches deep in water contained in a beaker. Pour the solution of sugar through the open end into the tube until it stands inside on a level with the water outside. Taste the water around the tube: it tastes like pure water. Leave the arrangement to stand until the next day. You will then find that the liquid in the tube has risen, and the water outside will have a sweetish taste. Thus the thinner liquid, the water, passes into the tube, and the thicker fluid, the syrup, passes out of it;

moreover, the thinner liquid passes more rapidly through the membrane than the thicker, for the liquid in the tube stands at a higher level.

These few examples of the experimental directions will be quite sufficient for my purpose. They show that every teacher need only range through our physical text books to find ample store of facts, which, with very little exertion, may be prepared for class use as so many simple experiments to be performed by the pupils.

I will now presume that the class of beginners ripens to the age of twelve, and is promoted to a higher class. Regular practical work in Experimental Physics, and also in Chemistry, should now begin, and not end until the boy leaves school. The reading and learning of text-books should be reduced to a minimum, and made purely auxiliary to the practical work. Lecturing, if considered at all necessary, should be confined to a certain range of physical facts, in which it is perhaps still an open question whether they are not more adapted for being exhibited and explained before a larger audience than for being more closely studied by the individual; for example, certain phenomena of light, sound, and especially the various grander effects of electricity. But if we wish fairly to try whether Experimental Physics will have that powerful influence on our individual culture which some of its results have had on modern civilisation and the very aspect of human society, then we must make the trial in an honest and truthful spirit, and truth resides only in the experiments. Having already given all the more important indications of the detail of the experimental school method, I proceed to state the broad principles which should form the basis of such experimental teaching in all classes of a school.

First then, each teacher who feels inclined to adopt some such method as I propose should first of all learn carefully to perform for himself a number of simple physical experiments which he has selected from various sources. He should write out his own directions; these will afterwards serve for his pupils. He should also most assiduously think out *everything* that can be learned from each particular experiment, and never place any experiment in the hands of a pupil unless he is capable himself, from actual experience, to perform it with neatness and certainty. His stock of experimental experience may be small in the beginning, but it will grow with wonderful rapidity as he will be pushed forwards to unceasing activity by his classes constantly eager for new experiments.

Next, the experiments to be performed with boys from twelve to fourteen years old, say during a year or two, should be selected so as to range only over fundamental facts of Physics. Taking the following headings of these fundamental facts in a portion of Experimental Physics, and assuming that each pupil performs one or two well-selected experiments under each heading, he will have gained a clear idea what particular physical facts are classified under these headings, and have learned something about the definitions, technical terms, and range of Physics. These headings are, for Light, Heat, Magnetism, and Electricity, the following:

Light.—Formation of Shadows—Reflection by plane and spherical mirrors—Refraction—Lenses—Dispersion The Spectrum—The Microscope—The Telescope—Binocular Vision.

Heat.—Expansion—The graduation of the Thermometer.—Melting and Freezing—Convection—Ebullition —Evaporation—Condensation of Vapour—Tension of Vapour—Radiation—Conduction—Latent Heat—Specific Heat.

Magnetism.—Magnetisation—Induction—Effects of Terrestrial Magnetism.

Electricity.—Attraction and Repulsion—Conductors and Non-conductors—Induction—The Electroscope—The Electrophorus—The production of a Galvanic Current—Effects of a Galvanic Current—Action of Currents upon each other—Induction of Currents.

The experiments under each head should be selected for their simplicity; the most simple experiment is at this stage of learning generally the most instructive and intelligible. In many cases the pupils may be directed to construct for themselves, with inexpensive materials, important experimental apparatus. Nevertheless, a small stock of necessary things to start with will be required in each school. The current expenditure involved in experimental teaching should be provided for in the same manner as the expenditure of boys for books, stationery, &c.

One great aim in experimental class-work should be that the pupils may early arrive at a conviction of the uniformity of the effects produced in the universe by the same causes acting under the same surrounding circumstances. For this purpose it might appear requisite to conclude most experiments with a laborious computation, of which the result is some physical numerical constant. The close agreement of such constants, as derived from independent sets of experiments, convinces naturally of the uniformity of the connection in nature between cause and effect. But in school experiments an attempt to arrive at constants end invariably either in entire failure, or in the necessity of devoting a considerable time to each of the experiments. Hence we should proceed in this case on a different plan. One or two examples will show better what I mean. Let me suppose that an experiment is made on the specific heat of mercury in the following manner: —A pound of mercury at some high temperature, which we observe, is thrown into a pound of water at a lower temperature. We observe the temperature of the mixture as soon as the rise of temperature ceases, and by thus knowing how much heat the mercury has given up to the water we may easily calculate the specific heat of mercury. If we compare our result with the number which represents this physical constant, the specific heat of mercury, we shall find ourselves far from the truth, for reasons which cannot be so completely explained to beginners as to satisfy them. Similarly, suppose we were to pass some steam from a flask which contains boiling water into a bottle containing cold water, then the temperature of this water will rise, and by certain simple principles we may from our experiment proceed to calculate the latent heat of steam. But our result will considerably differ from the truth, and the results of your pupils, which should be compared with one another from time to time, will not at all agree with one another, and this produces an unsatisfactory impression of doubt and uncertainty in them. But if each of your pupils weighs out his water and his mercury in the first experiment with the utmost exactitude in the same vessels, if the temperature of the water is made to be exactly the same by each, and also the mercury has in every experiment been heated to that temperature which you gave in your written directions to each experimenter, and if the mixture is made in the same bottle by all successively, you will find that nearly the whole class will obtain the same result. Similarly, if in the second experiment the temperature of the water which receives the steam and its quantity at starting is for all experimenters prescribed, it will be found that in every experiment, provided the same vessels are used throughout, a definite quantity of steam condensed produces a definite rise of temperature in the receiving vessel.

The same principle holds good in every kind of class experiments. Avoid unnecessary discrepancies by a uniform method of working, carefully considered beforehand and attentively carried out. The agreement of the results thus obtained by a whole class fills each member of it with indescribable delight, with a steadily growing confidence in and renewed longing for experimental study, and a sense of the importance of his work. On the other hand, the uniform discrepancy of these results from the truth allows you an opportunity of indicating in general terms to the whole class the sources of error, which are avoided in more delicately conducted experiments, and which in their case produced collectively a *uniform* deviation from the correct result.

The present moment, when a great exhibition of scientific instruments, containing the best educational apparatus for the teaching of Physics used amongst the most advanced nations may be seen in this city, and studied and examined by teachers for months to come, appears to me particularly fortunate and opportune for urging upon you, speaking as a teacher to teachers, the necessity of not resting until Experimental Physics has assumed amongst the recognised subjects of national education that position which is due to it, and which it will undoubtedly assume when it is taught and learnt by sounder methods than those hitherto pursued.

—*Educational Times.*

SCHOOL EXAMINATIONS.

Conferring of Degrees to Successful Competitors at William Molson Hall, 8 June.

A large number of scholars of the various High Schools and of persons interested in educational matters congregated in William Molson Hall to witness or take part in the announcement of the result of the examination of candidates from the high schools for the degree of B.A., conferred by McGill College upon scholars capable of successfully undergoing examination before a Board of Examiners appointed by the College authorities.

The Hon. Mr. Ferrier occupied the chair and there were also present Andrew Robertson, Q. C., Governor, the Rev. Dr. Murray, the Rev. Principal Lobley, Dr. Aspinwall Howe, Professor Markgraff, Mr. Murray, B.A., Oxf., W. C. Baynes, B.A., Secretary, Mr. Fawcett, M.A., Prof. J. A. McGregor, M.A., and others.

After prayers had been said,

Principal Dawson briefly announced the object for which the meeting of scholars and others had been called together. He reviewed the efforts the University had made in past years in the cause of education. The examinations of pupils candidates for degrees was commenced in 1867, and continued for six years, when they ceased for two years altogether, commencing again last year. During the time that had elapsed since the commencement, 73 scholars in all had proved successful, and in that exhibit was much that was congratulatory to the efforts of teachers in various schools. He announced that it is the intention of the authorities of the university to allow ladies to compete next year, and was certain that the step would be a highly beneficial one. So far, some scholars from the country academies and schools had entered, many of them being successful, but with the publicity that had been given throughout the country districts, it was very certain that next year a greater number of scholars would enrol themselves from the country schools. He had the greatest confidence in the examinations, and was certain that this department of university work would go on increasing in prosperity, and necessarily in usefulness. In the United States, Upper Canada and England, the necessity did not exist for these examinations, owing to the system of education in vogue in those countries; but in Lower Canada the case was different, and all that could be done was necessary to promote the usefulness of the schools. Under the new law, however, matters might improve with the introduction of the system proposed. Principal Dawson then proceeded to say that of the 16 candidates who presented themselves, 12 had passed. Of this number, 6 were from the High School of Montreal, 3 from the Proprietary School, 2 from Bræside, 1 from the Dunn Academy and 1 from the country. In conclusion, he commented on the highest number being from the High School, which should not be surprising from the fact that it was a very long established school, and the possessor of advantages in many other respects, over schools started recently. Alluding to the young gentleman from the country, who had passed very creditably, he said next year many more would present themselves, and the benefit these examinations extended to country schools would be more widely disseminated.

The following list of prizes was then read, each of the successful candidates receiving his degree as he came before the Principal :—

PASSED FOR ASSOCIATES IN ARTS.

J. Herbert Darey.—(High School.) Latin,* Greek,* French,* Geometry,* Algebra,* Mensuration,* English Literature,* History,* Geography,* Scripture.*

Paul Theodore Lafleur.—(High School.) Latin,* Greek,* French,* Geometry,* Algebra,* Mensuration,* English Literature,* History,* Geography,* Scripture.*

Edwin Hudson Bisset.—(High School.) Latin,* French,* Geometry,* Algebra,* Mensuration,* English Literature,* History,* Geography.

Andrew G. Ross.—(Proprietary School.) Latin,* French, German,* Geometry,* Algebra, English Literature,* History,* Geography,* Scripture.*

James R. Foster.—(Proprietary School.) Latin, French, German,* Geometry, Algebra, English Literature,* History,* Geography.*

Frederic Mindon Cole.—(High School.) Latin, French, Geometry, Algebra, Mensuration, English Literature,* History, Geography,* Scripture.*

William Dawson McGregor.—(Bræside Academy.) Latin, French,Geometry,* Algebra,Mensuration,History,* Geography,* Botany.*

John Ewart.—(Bræside Academy.) Latin, French, Geometry, Algebra, History,* Geography,* Scripture.*

J. Gordon Gibson.—(Dunham Academy.) Latin,* French, Geometry, English Literature, Geography,* Scripture.*

Wilfred T. Skaife.—(High School.) Latin,* French,* Geometry,* Algebra, History,* Geography.*

Charles J. Walker.—(Proprietary School.) Latin, French, Geometry, Algebra, English Literature, History,* Geography.*

PASSED FOR JUNIOR CERTIFICATE.

William R. Robertson.—(High School.) French, Geometry, Mensuration, English Literature, History, Geography.

Each boy received the customary marks of applause from his school-fellows as he came to the platform and received his certificate.

The Chairman having called upon him,

The Rev. Dr. Murray said as one of the examiners he had been asked to say a few words as to the examination and its objects. The examinations were university examinations, and intended to give education in its truest sense, that was to develop the resources of the mind in order to accomplish the great purposes

* Creditable answering.

for which man had been made. Education did not make men mere instruments altogether. When anyone made an object for himself in life he made—whether in law or medicine—himself the instrument for the accomplishment of the end which his department had in view. It was the highest and holiest aim in life for a man to endeavor to carry out the purpose for which he had been created to the glory of his maker. Consequently the highest end of man was to develop himself. In connection with universities, there were departments, but the main end of these examinations was education in its highest sense, or rather a tendency to test the quality of education given in the schools. It had been said that the university was going beyond its functions in having these examinations. He was of opinion that the argument was untenable and that the university did not go beyond its functions in testing the capacity of those who were to enter, and afterwards entered its precincts. As to the argument that the title of B.A. given in these examinations tended to throw discredit on the degree, it had been said that the title should not grace the name of every vulgar shopkeeper, but it was his opinion that any honorable man would do credit to the title that his capacity and education had earned for him. He then proceeded to compliment the young contestants on the answers he had received, and this confirmed him in the opinion that the examinations were successful. In closing he recommended that prizes be offered to the boys and girls who come out highest, and also to the school teachers in schools which seat the largest number of successful competitors. He thought those examinations were a test of the teachers' capacity for educating, and illustrated the standard of education of whatever school they came from, and he was certain the friends of education in the city would take measures to reward the teachers in some way. He recommended local centres of examination for country districts, because many difficulties stood in the way of sending young boys or girls to the city from country towns or villages. Expense and danger were incurred. To the boys who had not succeeded he gave a word of encouragement, and suggested that scholars who were unsuccessful should be pointed out the branches in which they had failed, so that they could in after life make good what they had passed over at school.

The Rev. Mr. Lorley, who had also taken part in the examinations, said he might have spoken of the very weak answers that had been given, though perhaps it might be more satisfactory to dwell particularly on the stronger ones, which, after all, were most numerous, some of them really surprising him. The most unsatisfactory answers had been given to those questions which were the most elementary character, and he would counsel the boys to be more thorough with the foundation or elementary principles, which they should endeavor not to forget. Attention to this would save them from constantly going back and losing time when they were trying to get forward in the more difficult branches. On the whole the results of the examination were in advance of that of last year, and the papers on Algebra, Geography, Arithmetic and Mensuration were really surprising, two of the boys giving answers in Algebra that he did not all expect. The paper on that subject was a very stiff one, which fact his colleagues would admit. He endorsed Professor Murray's remarks as to the prizes, and regretted that the two boys at least who had carried away diplomas had not also earned prizes of some value.

Principal Dawson said with regard to prizes that the boys would probably get prizes from the schools who sent them, and the Rev. Mr. Lorley having pronounced the Benediction, the proceedings closed.

Villa Maria Convent School.

The annual distribution of premiums, medals and honors to the pupils of this Institution, took place on the 22nd June. The annual event was formerly counted among the most brilliant of the season, being witnessed by the *elite* of Montreal society who made a point to visit what was in former days the Vice-Regal mansion, eager to enjoy the treat there offered to the admirers of beauty, art and talent. It was, however, celebrated, without its usual *eclat* this year, owing to the death of the late Superioress, the well known and lamented Sister of the Nativity. The exercises were conducted in private, a few only of the more intimate friends of the Institution being in attendance. The medals for general proficiency, presented by His Excellency the Earl of Dufferin, were awarded as follows:—The silver one was awarded to Miss Josephine Perrault of Montreal; Miss Maggie O'Meara of Pembroke, Ontario, being almost equal in merit, received a handsome medal as a testimony of successful competition, from the Lady Superioress General. In the contest for the bronze medal, Miss Hortense Murphy, of Montreal, and Miss Marion Murphy, of Quebec, were proclaimed the successful candidates in a class of nineteen. The question of assigning it was decided by drawing; the higher number favoring Miss Hortense Murphy. The other young lady was compensated for her loss, by a beautiful wrought silver medal, presented by the Reverend Mother Superioress. Congratulatory addresses were afterwards tendered by the members of their respective classes to the happy winners of those honors. The Edward Murphy prize, a valuable microscope, with an accompanying treatise, was awarded to Miss Lizzie Brennan, for success in the study of the natural sciences. The exquisite gold medal, presented by Mrs. Edward Murphy, as the prize of culinary art and domestic economy, was taken by Miss Zoe Sache, of Montreal. This course is complete, and affords young ladies every advantage for acquiring a practical knowledge of housekeeping. An address of thanks in the name of the graduating class was presented to Mr. and Mrs. Edward Murphy, whom this institution counts among its most distinguished and generous patrons. Medals for excellence of deportment were awarded to Miss Alice Collins and Miss Lena Kelly; for composition to Miss McLaughlin and Miss Gibson, and for mathematics and book-keeping to Miss M. Cuddy and Miss Marion Murphy. The names of the young ladies who received the graduating honors are as follows:—Misses Josephine Perrault, Zoe Sache, Lizzie Brennan, Katie Donnelly, Maggie Cuddy, Alice Collins and Agnes Donovan, of Montreal; Miss Maggie O'Meara, of Pembroke, Ont.; Miss Bruneau, of Sorel; Misses Fortin and Slavin, of St. John's, and Miss McLaughlin, of Portland, Me. A handsome volume was presented to each of the pupils. This work is a collection of the reminiscences of their school life, and personal recollections of Sister Nativity, made by the young ladies of the Institution, and to which have been added several letters, received by members of her community, or by the pupils themselves at the death of this venerated Superioress; also the obituary notices and accounts of the obsequies as given by the press, and selections from the "In Memoriams" written on this occasion. Beautiful and touching valedictories were recited by the young ladies of the graduating class, during which the deepest emotion was evinced by those sweet-girls, who, in their turn, had now to cross the threshold of their well-loved

"Alma Mater," where they are preserved from the world's blighting contact, far removed from its pomps and its vanities, and where they are taught to prize and emulate those more real and noble accomplishments which constitute true worth and dignity in woman.

At the close of the seance the Very Rev. Superioress, who presided, made a few feeling and appropriate remarks on the general satisfaction given by the pupils to their devoted teachers. She bade them adieu and hoped they would enjoy their vacation, and announced that the Convent would re-open on the 31st of August next.

Mr. Edward Murphy made a few brief remarks, thanking the young ladies for the beautiful and flattering address presented to Mrs. Murphy and himself. He complimented them on their success, as evidenced by the prizes and honors awarded. He said their expressions of gratitude to their teachers for their motherly solicitude and tender care were peculiarly grateful to his feelings, as he also was deeply indebted to their devotedness. Addressing the graduates, he said, now that their school days were ended and they were about to mix with the world, he hoped they would carry with them the imprint of the moral and religious training instilled so carefully into their young hearts, and would follow in the footsteps of the former gruduates of the Institution, who are now not only joys to their families, but also ornaments of society, remarkable for their unaffected piety and simplicity of manner, which add lustre to the brilliant educational accomplishments they received at the Villa. He said that his observation of the young ladies brought up in the institution proved to him, and he was glad to bear testimony to the fact, that the wellgrounded principles of piety were implanted so deeply and so solidly into their youthful minds that they did not wear off by change of position and contact with the world, but only shone the brighter contrasted with those less favored in their training. He remarked that the pupils brought up in the institution looked back to their bright and happy school days at Villa Maria, and their eagerness to visit their teachers was different from his experiences and reminiscences of his own irksome school days. He added, that the tears and emotions of the young ladies in parting from their loved and devoted teachers spoke eloquently that they also shared the feelings of former graduates. He concluded by congratulating the good Nuns on the marked success of their admirable institution, and said that the citizens of Montreal were favored in having in their midst a community doing such a vast amount of good as is done by the Ladies of the Congregation of Notre Dame.—*Montreal Gazette.*

(*To be continued.*)

McGill University Intelligence.

The corporation of McGill University have pleasure in acknowledging the following donations to the Faculty of Arts, during the quarter ending June 21st, 1876:—

TO THE LIBRARY.

From Principal Dawson, LL D.—Gentry's Life—Histories of the birds of Eastern Pennslyvania, vol. 1st., 8vo.

From the Superintendent of Education, Nova Scotia.—Annual report of the common, academic, and normal and model schools in Nova Scotia, for 1875, pam., 8vo.

From the Rev. T. W. Wood.—Ecclesiastical and academical colors, 18mo.

From W. H. Young, Esq., Troy N. Y.—Proceedings of the semi Centennial celebration of the Rensselaer Polytechnic Institute, Troy, N. Y., June, 1874, 8vo.

From His Eccellency the Governor-General of the Dominion of Canada—London University Calendar for the year 1876, 8vo.

From the Government of the Province of Quebec—Statutes of the Province of Quebec, 1875, 8vo.

From the Minister of Public Instruction for the Province of Quebec for 1863-74, and for part of 1875—Four copies, 8vo

From the Literary and Historical Society of Quebec.—Transactions. Sessions of 1873-74, and 1874-75, pam., 8vo.

From Dr. Woolwort, Albany, N. Y.—Natural History of New York. Palæontology. By J. Hall. Part 1st, of vol. iv. 4to.; twenty-fourth and twenty-sixth annual report on the New York State Museum of Natural History, 2 vols., 8vo.; twentieth and twenty-third annual report on the condition of the New York State Cabinet of Natural History, 2 vols., 8vo.; University of the State of New York, twenty-eighth annual report, 1875, 8vo.; annual reports on the condition of the State Cabinet of Natural History of the State of New York, 13 pam., 8vo.

From Peter Redpath, Esq.—Memoirs of the Historical Society of Pennsylvania, 5 vols., 8vo.; historical map of Pensylvania, 1875, 8vo.; contributions to American history, 1858, 8vo.; history of Braddock's Expedition, 8vo.; record of the Court at Upland, in Pennsylvania, 1676 to 1681, 8vo; discourses on the inauguration of the new hall of the Historical Society of Pensylvania, pam, 8vo.; catalogue of the paintings, &c., belonging to the Historical Society of Pennsylvania, pam., 8vo; proceedings of a meeting at a Bar of Philadelphia relative to the death of C. J. Biddle, pam., 8vo.

From the Government of the Dominion of Canada—Censuses of Canada, 1665 to 1871, vol. iv., 8vo.

From S. G. Lapham, Esq.—Biographical sketch of J. A. Lapham, LL.D., pam., 8vo.

TO THE MUSEUM.

From J. D. H. Wilkins, B.A.S.—Specimens of upper silurian from Ontario.

From Mrs. P. Redpath—Nest of the trap door spiders, from Mentone.

From the Museum of Comparative Zoology, Cambridge, U. S., per Prof. A. Agassiz- Seventy species of fishes, principally from Brazil.

From Mr. Cowan, of Brockville, per Dr. Harrington—Specimens of mineral manures and chemical preparations from the Brookville Chemical and Superposphate Works.

OFFICIAL NOTICES.

Ministry of Public Instruction.

APPOINTMENTS.

SCHOOL COMMISSIONERS.

His Excellency the Lieutenant-Governor has been pleased, by order in Council, dated the thirty first day of May, one thousand eight hundred and seventy six, to make the following appointments of school commissioners, to wit:

County of Laprairie, Saint Constant.—Mr. Moïse Boutillier, *vice* Mr. Joseph Brassard, deceased, and Mr. Theophile Robert, *vice* Mr. Hormidas Barbeau.

County of Saint Maurice, Shawenigan.—Mr. Adolphe Dupont, *vice* Mr. Theodore Lupien, absent.

County of Rimouski, Saint Gabriel.—Mr. Julien Dube, *vice* Mr. Cypr. Gaudreau, absent.

And by another order in Council, dated the 7th June, 1876

County of Gaspe, Les Capucins.—Messrs. Augustin Ross, Edmond Degagné, Philias Soucy, Paul Ouellet and Augustin Côté.

And by another order in Council, dated the 17th of June, 1876.

County of Gaspé, Grande Arbour.—Messrs. Timothé Auclair. Joseph Drapeau, Theophile Rioux, Charles Castonguay and Jean Terrien.

And by another order in Council, dated the 20th June, 1876.

County of Beauce, Les Saints-Anges.—Thomas Turmel, Urbain Vaillancourt, Joseph Cloutier, Ignace Turmel and François Lehouillé.

County of Ottawa, Saint Edouard de Wakefield.—Messrs. Edouard Pelissier, Benjamin Coté, Hypolite LeGrand, Robert Blackburn and Patrick McGlashan.

And by another order in Council, dated the 20th June, 1876.
Quebec, Protestant Board.—Robert Herbert Smith.
County of Ottawa, Hinks.—Alexis Deslages, Louis Fournier, Charles Aumond, Cornelius Ryan and Patrick S. Bean.

ERECTION OF SCHOOL MUNICIPALITY.

His Excellency the Lieutenant-Governor has been pleased, by order in Council, dated the 7th of June, 1876, to make the following erections of school municipalities, to wit :

County of Hochelaga, village of N. D. de Graces.—To erect into a school municipality the said village, comprising the Cote Saint Antoine, the Coto Saint Luc and the coteau Saint Pierre, such as it is actually erected for rural purposes.

Gaspé, Les Capucins.—To detach from the municipality of Cap Chatte that tract of territory which extends from the parish boundary of Saint Norbert du Cap Chatte east wards, to the river called Grande Rivière des Capucins, and the part not erected of township Romieux, to the limits of Daliboire.

Rimouski.—To detach from the school municipality of Saint Simon the territory occupied by the following persons, namely : Samuel Gaudreau, Octave Boucher, Joseph Lagacé, Antoine Fournier, junior. Achille Gaudreau, Napoléon Caron, André Fournier, to annex it to that of Saint Fabien for school purposes.

And by another order in Council, dated the 17th of June. 1876.

Levis, Saint Telesphore.—To erect into a school municipality the new parish of Saint Telesphore, in the county of Levis; bounded on the north-east by the parish of Saint David de l'Aube Rivière, north-west by the river Saint Lawrence, south-west by the Etchemin River, such as it is erected for other civil purposes, by the proclamation dated the twenty-sixth day of April last.

Gaspé, Grande Arbour.—To detach from the municipality of Mont Louis, county of Gaspé, the territory comprised between the Petit Cap de Glande, and the limits of the municipality of Rivière à Marthe, and to erect into a school municipality, under the name of Grande Arbour.

And by another order in Council, dated the 20th of June 1876 :

Beauce, Les Saints Anges—To erect into a school municipality, under the name of Les Saints Anges, in the county of Beauce, the new parish of that name, which is a dismemberment of Sainte Marie and Saint Joseph, with the limits assigned to it as a parish, in the canonical decree of His Grace the Archbishop of Quebec, of the 14th of November last (1875), less that part of the concession in the third range known as Petit Saint Elzéar, which is comprised within the district number thirteen of Sainte Marie, and which will continue to be so.

Ottawa, Saint Edouard de Wakefield.—To erect into a school municipality, under the name of Saint Edouard de Wakefield, in the county of Ottawa, the territory comprising lots numbers twenty-three, twenty-four, twenty-five, twenty-six, twenty-seven and twenty-eight, in the seconde range of township Wakefield, and the last fourteen lots of the third, fourth, fifth, sixth, seventh, eighth, ninth and tenth ranges, and the ten last lots of the first, second, third, fourth, fifth and sixth ranges of township Portland, in the same county.

And by another order in Council, dated the 22nd of June 1876 :

Hochelaga, River Saint Pierre.—To erect into a school municipality the village of River Saint Pierre, county of Hochelaga, with the same limits as those assigned to it as a rural municipality on the first day of January, one thousand eight hundred and seventy-five.

And by another order in Council, dated the 30th of June, 1876.

Temiscouata, Saint Clément.—To erect into a school municipality the new parish of Saint Clement, in the county of Temiscouata ; bounded as follow, namely : on the north by the river Mariekeihe, south by the second range of the township Hocquart, north east by the Trois-Pistoles river, south-west by part of township Viger, and part of township Demers, containing five miles and one third in front by five miles in depth.

Richmond, Windsor Mills.—To detach the village of Windsor Mill, in the country of Richmond, from the actual municipality of Windsor in the same county, to erect it into a separate school municipality under the said name, and with the same limits as it has for municipal purposes.

Richmond, Danville.—To detach the village of Danville, in the county of Richmond, of the township of Shipton, in the same county, and to erect into a separate school municipality, under the said name, with the same limits as those assigned to it for municipal purposes.

POETRY.

O little feet, that such long years
Must wander on through hopes and fears;
Must ache and bleed beneath your load ;
I, nearer to the wayside inn,
Where toil shall cease and rest begin,
Am weary thinking of your road.

O little hands, that, weak or strong,
Have still to serve or rule so long,
Have still so long to give or ask ;
I, who so much with book and pen
Have toiled among my fellow men,
Am weary thinking of your task.

O little hearts, that throb and beat
With such impatient feverish heat,
Such limitless and strong desires,
Mine, that so long has glowed and burned
With passions into ashes turned,
Now covers and conceals its fires.

O little souls, so pure and white,
As crystalline as rays of light
Direct from Heaven, their source divine !
Refracted through the mist of years,
How red my setting sun appears ;
How lurid looks this sun of mine.

—H. W. LONGFELLOW.

THE JOURNAL OF EDUCATION.

QUEBEC, JULY, 1876.

Department of Public Instruction.

Report of the Honorable the Minister of Public Instruction.

(Continued.)

McGILL UNIVERSITY.

The McGill University has been the first institution of the country, which, recognizing the want in our scholastic establishments of a course of science applied to the arts, has taken upon itself to fill the blank.

In truth is is only by a course of this kind, that we can educate engineers, architects, men capable of working mines and of managing to advantage industries of all descriptions. We cannot, in a country such as ours, where so many railways are in process of construction, and so many mines to be developed, so many industries ready for working, awaiting, so to speak, hands ready and prepared to assume the management, we cannot, we repeat, attach too much importance to education of this nature.

It is because we have hitherto failed in having courses of this kind, that almost all the engineers employed on our railways and other great public highways, are strangers, while we might have undertaken their control ourselves, had we earlier possessed a special institution wherein to attain the necessary knowledge.

I cannot too highly congratulate the McGill University, upon having for several years past, entered upon this course. A liberal subscription on the part of the friends of the institution, placed it first of all in a position to begin. Subsequently, thanks to the aid accorded by government, the directors were enabled to give to this course of study all the efficiency desirable, as the scheme of education given below amply establishes.

The number of diplomas already conferred is also a clear proof of the benefit which has already been effected, and which may be looked for hereafter.

Through this institution and the polytechnic school, there is every reason to hope that before very long, we shall have a sufficient number of educated men fully competent to assume the management of all our great public undertakings and private industries.

Department of Practical and Applied Science, in the faculty of arts.

Geology and Palæontology.—W. Dawson, LL.D., F.R.S., Professor.

English Language.—Ven. Archdeacon Leach, LL.D., Professor.

German.—C. F. A. Markgraf, M. A., Professor.

Mathematics and Natural Philosophy.—Alexander Johnson, LL.D., Professor.

French.—P. J. Darey, M. A., Professor.

Civil Engineering and Applied Mechanics.—G. F. Armstrong, M. A., C. E., F.G.S., Professor.

Practical Chemistry.—Gilbert P. Girdwood, M.D., Professor.

Assaying and Mining.—Bernard J. Harrington, B. A., Ph. D., Professor.

Assistant to Professor of Engineering—C. H. McLeod, Bachelor of Applied Science.

The courses of studies in this Department are designed to afford a complete preliminary training of a Technical as well as a Theoretical nature, for such students as are preparing to enter any of the various branches of the Professions of Engineering and Surveying, or are destined to be engaged in Assaying, Practical Chemistry, and the Higher forms of Manufacturing Art.

Three distinct courses of study are provided; each of which extends over three, or under certain conditions (§ I) two years, and is specially adapted to the prospective pursuits of the student.

(1) Civil and Mechanical Engineering.
(2) Assaying and Mining.
(3) Practical Chemistry.

The Degrees conferred by the University upon such Undergraduates of this Department as shall fulfil the conditions and pass the examination hereinafter stated (§ IV) will be, in the first instance, "Bachelor of Applied Science," mention being made in the Diploma of the particular course of study pursued; and subsequently the degree of "Master of Engineering" on those who have pursued Course 1st, and of "Master of Applied Science" on those who have pursued either of the remaining Courses [2 and 3.]

§ I. MATRICULATION AND ADMISSION.

1. Candidates for Matriculation must present themselves for examination on the 15th September, 1875. They may, however, be admitted at a later period of the Session upon special application, and if prepared to take their places in the classes in progress.

For entrance into the Junior year, the subjects for examination will be:—

Mathematics.—Arithmetic; Algebra, to Simple, Equations inclusive; Euclid's Elements, Books I, II., III.

English.—Writing from Dictation.

2. Candidates may enter in the Second or Middle year, and so reduce the course necessary for the degree in Applied Science, from three to two years, if competent to pass a satisfactory examination in the following subjects. In addition to this, those who intend to pursue Course 1st, must satisfy the Professor of Engineering that they possess a reasonable knowledge of the elements of Surveying and Levelling and of Linear, Drawing and Projection, as in Castle's Text Book of Surveying, and Davidson's Linear Drawing and Orthographic Projection, and of the *Elementary* Course of Twisden's Practical Mechanics, as in Chap. 2 Section 1, and Chap. 3, of Part 1st.

Mathematics.—Euclid, Books I., II., III., IV., VI., with defs. of Book V. omitting propositions 27, 28, 29, of Book VI.

Algebra.—To end of Quadratic Equations (Colenso's Alg.)

Trigonometry.—Galbraith and Haughton's Trigonometry, Chap. 1, 2, 3, 4, 6, to beginning of numerical solution of plane triangles.

Arithmetic.—Ordinary rules.—Proportion, Interest, Discount, &c., Vulgar and Decimal Fractions, Square Root.

English.—Writing from Dictation.

Chemistry.—Inorganic as in Wilson's Elements, (or the Candidate must take this subject in the Middle year.)

Candidates must be prepared to pass in one or other of the above Examinations at the beginning of the session. Students who have passed in Class 1st or 2nd in the above subjects, in the Intermediate Examination of the University, may be admitted without further examination in such subjects.

3. Occasional Students may be admitted to the Technical Classes upon payment of special fees, (§ VIII.)

§ III. COURSES OF STUDY.

The following are the courses of study arranged for the approaching Session, 1875-76:—

1. *Course of Civil Engineering and Surveying.*

Junior Year.—Ordinary Mathematics of the first year in Arts, (with Honor Mathematics as far as practicable); Chemistry; English Language and Litterature; French or German, Linear Drawing and Projection; Surveying and Mensuration, with use of Instruments; Elementary Practical Mechanics.

Middle Year.—Ordinary Mechanics and Mathematical Physics of the Second and Third Years in Arts (with Honor Mathematics of the Second Year as far as practicable); Experimental Physics; Zoology; French or German; Drawing—Isometrical and Perspective Projection, Levelling; Art of Construction;—Mensuration.

Senior Year.—Mathematical Physics (Honor Course of Third year in Arts, optional.) Experimental Physics; Geology and Mineralogy; French or German; Applied Mechanics; Principles of Mechanism; Drawing—Constructive and Mechanical; Construction; Designing and Estimates.

2. *Course of Mining Engineering and Assaying.*

Junior Year.—Same as Junior of Civil Engineering Course.

Middle Year.—Ordinary Mathematics and Mathematical Physics of 2nd and 3rd year in Arts; Experimental Physics; Zoology, Geology and Mineralogy; French or German; Drawing—Orthographic and Isometric Projection; Levelling; Construction (in part): Mensuration; Use of Blowpipe; Assaying.

Senior Year.—Geology (Honor Course); French or German; Experimental Physics; Drawing of Geological Maps and Sections, and plans of Mines; Mining and Mineral Surveying; Metallurgy; Adplied Mechanics; Principles of Mechanism.

3. *Course of Practical Chemistry and Assaying.*

Junior Year.—Same as above (with Botany.)

Middle Year.—Ordinary Mathematics of Second Year in Arts; Experimental Physics; Botany, (unless taken in the Junior Year); Zoology; French or German; Practical Chemistry.

Senior Year.—Mathematical Physics; Experimental Physics; Geology and Mineralogy; French or German; Metallurgy; Assaying.

OBSERVATORY.

Undergraduates taking any of the above courses may receive instructions in Meteorological observations from Mr. C. H. McLeod, Bac. App. Sc., in the College Observatory.

§ IV. EXAMINATIONS.

COLLEGE EXAMINATIONS.

There will be a Sessional Examination at the end of each year, and also a Christmas Examination, in the same manner as provided for Undergraduates in Arts; but supplemental examinations will not be allowed to students failing in the Professional or Mathematical subjects of the Middle and Senior years, except by special permission of the Faculty of Arts.

UNIVERSITY EXAMINATIONS.

1. *For the Degree of Bachelor of Applied Science.*

Candidates must pass the Sessional Examinations of the Junior and Middle Years, or if admitted in the Middle year, of that year only. They must also pass a final Examination at the end of the Third Year, in all the subjects of that year, in addition to a special examination in Mathematics, in case of those who graduate in the course of Civil and Mechanical Engineering.

Graduates in Civil Engineering of this University may obtain this Degree and a Diploma in exchange for that which they at present hold, upon application to the Corporation through the Registrar, and upon payment of a fee of $3.

2. *For the Degree of Master of Engineering.*

Candidates must be Bachelors in Applied Science of at least three years' standing, and must produce satisfactory certificates of having been engaged during that time upon *bona fide* work in either the Civil or Mechanical Branch of Engineering.

They must pass with credit an examination which will extend over the general Theory and Practice of Engineering, in which papers will be set having special reference to that particular branch upon which they have, during the three preceeding years, been engaged.

The examination will be held once in each year, in the second week of the month of December, and will be partly *viva voce*.

Notice of the intention of a Candidate to offer himself at any examination for this degree must be sent in, together with the necessary Certificates and Fees, not less than two calendar months before each examination is to be held.

3. *For the Degree of Master of Applied Science.*

Candidates must be Bachelors of Applied Science of at least three years' standing, must present certificates of having been employed during that time under competent guidance in some branch of Scientific Work, and must pass with credit an examination in the Theory and Practice of those Branches of Scientific Work in which they may have been engaged. The other conditions as under the last heading.

4. *For the Degree of B. A. with that of Bachelor of Applied Science.*

Undergraduates in Arts who have passed the Intermediate examination may (if qualified under § 1,) take the Middle and Senior years of either of the courses in Practical Science along with the Third and Fourth in Arts, and may in the Third and Fourth years omit Mental and Moral Philosophy and may substitute French and German for Latin and Greek. Spanish may be taken instead of French or German.

In addition to the subjects of the Science course, they will be required to satisfy the Examiners in the following subjects; viz: Mathematics, Natural Science, Experimental Physics and Modern Languages.

Students in Arts desirous of availing themselves of these privileges are required to take a preliminary course of Linear Drawing and Projection in the second year.

Students proceeding to the double degree, will enjoy all privileges with reference to Scholarships, Exhibition Prizes and Honours, in the same manner as Students in Arts.

Such Students may by permission of the Faculty be Candidates for B. A. Honours, and may be allowed to take the Examination for B. A. in their fourth year in Arts, and to take the Examination for the degree in Practical Sciences in the following year or they may graduate in the Science course alone in the fourth year, and graduate in Arts in the following year. In the latter case they shall not compete for medals with the regular Students of the year.

Undergraduates in Arts of the third or fourth years, or Graduates of any University, entering the Department of Practical Science, may at the discretion of the Professors be exempted from such lectures in that Department as they may have previously attended as Students in Arts, but must pass all of the examinations.

The course of apdlied Sciences has furnished since its formation:

BACHELORS.

In civil mechanical engineering	16
In mining and assaying	4
Graduates in civil engineering	16
Total	36

INDUSTRIAL SCHOOLS, OR SCHOOLS OF ARTS AND SCIENCES.

In 1872, the "Board of Arts and Manufactures" was replaced by the "Council of Arts and Manufactures," of which the Commissionner of agriculture and the Minister of public instruction are members.

Since that period, the council has not been idle, but has endeavored to expend, to as much advantage as possible, the funds placed at its disposal by the legislature.

These institutions cannot be too highly recommended. Trades and manufactures are the chief occupation of the majority of our population; and if we desire our fabrics to compete with those of foreign countries, we must have schools in which our youth of the country can recieve a practical education in arts and manufactures.

To the Honorable the Minister of Public Instruction of the Province of Quebec.

In submitting the second annual report of the operations of the council of arts and manufactures, we have to state that the year through we have just passed has been one replete with difficulties, and that these difficulties have been of such a nature as to seriously retard the work in which we are engaged.

Notwithstanding this, the council has prosecuted the work of art education throughout the province, as far as the means at its disposal would allow; schools having been in operation in eight different localities, and, considering that our institution is still in its infancy, the results attained thus far have been exceedingly gratifying.

An increasing desire has been manifested on the part of the working classes to avail themselves of the technical education offered to them, and we feel assured that a superior taste and finish will soon be noticeable in many of our leading lines of manufacture.

During the year new schools have been established in New Liverpool and St. Hyacinthe, and these have been carried on successfully, particularly the former; and it is probable that, during the present year, application will be made from one or two localities, for the establishment of schools of arts and design.

The council has for some time past deeply felt the want of a thoroughly-trained teacher, possessing certificates of competency, to assume the direction of all the schools in the province; and although the funds at the disposal of the council at the present time will hardly warrant the expenditure, they are endeavoring to obtain the services of a director, previous to commencing next winter's operations.

It is exceedingly desirable to have a uniform system of instruction adopted in all the schools and to have the same text books used. This would enable the pupils to be more thoroughly grounded in their work as each one would be compelled to study the elements and fundamental principles, before going at once into that branch to which his inclination would most naturally lead him.

Good results would, we feel assured, follow from the establishment of competitive examinations, which might take place annually under the direction of qualified examiners; and the granting of diplomas and certificates to those obtaining a certain standing would urge the pupils on to greater diligence in their studies.

The subjects taught in the different schools embraced the following:

Geometry,	Chemistry,
Free hand drawing,	Mensuration,
Architectural drawing.	Modelling,
Mechanical "	Water Color Painting.

The progress made by the pupils in many instances has been very encouraging, the drawings particularly being of a very high order of merit.

Herewith is added a curtailed report of the operations of each school.

MONTREAL SCHOOL.

This school was under the direction of the members, resident in Montreal; owing to the Crystal Palace having been wrested from us there was some delay and difficulty in starting, as new forms, blackboards, tables, &c., &c., had to be procured, those formerly in use being detained in the Crystal Palace. The classes, with the exception of, that of chemistry were held in the St. Nicholas Hall Building, which was comfortably fitted up for the purpose. The school was, on the whole, very successful, although there is no doubt that if we could have started earlier the attendance would have been much larger.

The following is a list of the different classes with the attendance at each and the names of the different teachers.

	Total No. of pupils.	Aver. No. of pupils.	No. of lessons.	No. of individual lessons.	Names of teachers.
Free hand Drawing......	134	66	51	3366	Wm. Lorenz.
Architectural "	29	13	25	325	J. R. Poitras.
Mechanical "	48	14	37	522	A. Massy.
Geometry	14	7	25	175	J. T. Anderson.
Modelling	20	12	47	564	E. Cleff.
Chemistry	40	15	30	450	A. Duval.
Water Color Painting...	8	6	19	114	Wm. Lorenz.
	239	133	234	5516	

QUEBEC SCHOOL.

The classes in Quebec were open in the month of October in the building known as "La Salle du Patronage" St. John Suburbs. These classes have been very successful, more pupils desiring admission than the rooms would accomodate: the classes were under the direction of Messrs. Peters, Hamel, Campbell, and Lepage, gentlemen well qualified to perform their duties. During the quarterly meeting of the council in February, the school was visited by the members who expressed themselves as highly pleased with the arrangements of the school and the progress of the pupils. The total number of pupils was 65, with an average attendance of 36, and the total number of lessons 155. and number of individual lesssons 5580.

SHERBROOKE SCHOOL.

This school was opened in December 1874, and remained open till April 1875. The results have been very satisfactory, many of the students acquitting themselves in a manner highly creditable to them, and far beyond the most sanguine expectations of those in immediate control. An entrance fee of $1.00 was imposed upon each student and the proceeds expended in the purchase of prizes, which, after a careful examination of the papers by impartial judges, were awarded to the successful competitors. This school was under the control of Mr. R. Smith, a member of the council residing in Sherbrooke. The total number of pupils was 28, average attendance 24, number of lessons 35, and number of individual lessons 840. The teacher was M. E. Booth.

LEVIS SCHOOL.

This school was opened on the 15th December 1874, and numbered seventy-two pupils, and as some of these had never studied Geometry or Drawing, it was decided to hold two classes—one for beginners, and the other for those more advanced. Owing to the difficulty in securing suitable rooms it was found necessary to place the school outside the town, and this in a great measure prevented the attendance of many who would have otherwise become pupils. It is hoped that, next winter conveniently situated rooms will be secured and the usefulness of the school thus much enhanced. The average attendance was 38, and the number of indivi dual lessons 1634. The school was under the direction of C. W. Carrier, Esq., member of the council, the teachers being Messrs. Beauty and Morency.

SOREL SCHOOL.

This School was opened on the 2nd January and closed on the 1st May 1875. Four lessons per week in Linear Drawing and four in Geometry were given. The regular attendance of the pupils and the zeal manifested by them in their work is to be noted. It is hoped that by an addition of models and drawings relating to Ship-building and machinery, the attendance will be largely increased next year. The number of pupils was 22, average attendance 18, number of lessons 58, and number of individual lessons 1044. The school was under the direction of Mr. A. Beauchemin, member of the council, the teacher being Mr. F. Lachance.

THREE RIVERS SCHOOL.

This school was opened in the first week of October 1874, and was closed at the end of April 1875. The progress of the school was not so satisfactory as was expected, owing to the fact that Mr. R. McDougall, under whose control it was, was absent from Three Rivers during the winter; the illness of the teacher Mr. Capelle, was also a serious drawback. The average attendance during the winter was six.

NEW LIVERPOOL SCHOOL.

This School although only established last winter, has been very successful and shews a record that compares very favorably with that of many, which have been longer in existence. The success has been beyond the most sanguine expectations, the interest manifested by the pupils has been very encouraging, many of them residing upwards of a mile in distance from the school and the attendance being regular throughout the winter. The drawings of the pupils are very creditable indeed, more particularly when we take into consideration that not one of them had ever before received instruction in this branch. The greatest eagerness, has been manifested for knowledge and the progress of this school serves to show in a marked manner what could be accomplished if a sufficient sum of money was placed at its disposal to procure the necessary apparatus.

The total number of pupils was 79, the average attendance 41, number of lessons given 26, and number of individual lessons 1066. The success of the school is entirely due to the untiring energy of Mr. L. J. Boivin, who manifested a constant interest therein, and whose services were appreciated by a presentation and congratulatory address from the pupils.

ST. HYACINTHE SCHOOL.

This school was also established only last winter at the request of a number of residents of the town; the establishment of a number of manufactories having tended in a large measure to increase the working population. The establishment of the school was not without its difficulties, seeing that the pupils had no idea whatever of drawing and very few understood its usefulness. The school was opened on the 21st of October and closed on the 24th of April; the progress made by the pupils was very satisfactory, but the unfortunate illness of the teacher Mr. G. Piret, retarded the work to a certain extent; but it is expected that next year the school will be carried on with renewed vigor, seeing that the difficulties in making a start have been overcome. The number of pupils was 25, and the number of lessons given 24.

The success that has attended the school thus far is due in a great measure to the zeal displayed by Mr. Boucher De la Bruière, who has taken a deep interest in it, since its inauguration.

In extenuation of such deficiencies in this report as may be apparent, we beg leave to refer to the difficulties with which we have had to contend, and to the recent institution of this council, which in the two years of its existence has been able as yet only imperfectly to organize the means necessary to carry out its important functions.

We may say that we hope to secure the permanent establishment of an industrial museum and library of reference, and of schools of practical science and design, of which we would retain the general supervision so that the promotion of our arts and manufactures, which, so to speak, have just been commenced are so important in the present state of this province, might be fostered.

The accompanying statement shews the amounts received and expended up to the date of the annual meeting 11th May 1875. By this it will be seen that our actual expenditure has exceeded our receipts by $3677.30.

The whole respectfully submitted

ADOLPHE LÉVÊQUE,
President.

S. C. STEVENSON, B. A.,
Secretary.

Montreal, 9th October 1875.

DEPOT OF BOOKS, MAPS, &c.

I must again, this year, insist upon the necessity of establishing, at as early a date as possible, a depot of books, geographical maps, terrestrial globes, and other school furniture. Up to this time sufficient importance has not been attached to this scheme, which is however, admirably calculated to give a new impetus to our schools. They are rare, and the price is so high as to discourage even those desirous of obtaining them. By means of depots of which I speak, the price might be reduced one half, which would enable us to compel all schools to provide themselves therewith.

A depot might be made with the secretary treasurer of each municipality, who should be entrusted with their distribution amongst the teachers both male and female, as occasion might require. No pupil would then be retarded in pursuing his studies, through lack of school material, rendered necessary by his continued progress. Every thing would be bought in the name of the municipality, and supplied on application. A slight increase in the tax would suffice to defray this expenditure, and parents would see their children better and at much less cost.

SALARIES OF TEACHERS.

This is a subject to which unfortunately we have to advert every year. We shall never have good schools until we can procure the services of competent teachers, and these competent teachers will not take charge of a school unless they are given a reasonable salary, one that would enable them to support their family and retain the position in society to which they are entitled.

So as to give an idea of the state to which public instruction has advanced in the Province of Quebec, I here give a comparative statement taken from different nations of the number of children attending school in proportion to the population. These statements are based upon the latest statistics and do not go further back than 1870.

PRUSSIA (proper.)

Population			19,255,139

PUBLIC SCHOOLS :

Number of male teachers	30,805		
" Under-teachers	2,557		
" Female teachers	2,815		
		36,157	

PRIVATE SCHOOLS :

Number of male teacher	995		
" Female teachers	688		
		1,683	
Grand Total			37,840

PUPILS : PUBLIC SCHOOLS.

Boys	1,427,191	
Girls	1,398,131	
		2,825,322

PRIVATE SCHOOLS :

Boys	25,286	
Girls	27,406	
		62,692
Grand Total		2,878,014
Institutions of all kinds, such as gymnasiums, schools of arts and manufactures, guardian schools, give a total of		28,484
Male and Female teachers		47,860
Pupils, Boys	1,637,809	
Pupils, Girls	1,517,260	
		3,155,069

To these must be added 6,047 pupils in the universities, and 3,610 pupils attending the 62 normal schools (which gives nearly 60 pupils for each school.)

From these figures it follows that Prussia has one school for every 740 inhabitants, and one pupil in every 6.6 of population.

ENGLAND.

The population of England and Scotland was in 1870, 26,062,721, the number of schools 10,214, and of pupils 2,000,000. England has therefore only one pupil for every 13 inhabitants, and is on this point the most backward of all the protestant countries of Europe, in which the average is from 6 to 7.

UNITED STATES.

In the United States the proportion is one pupil for every five inhabitants; it is the country in which the greatest sacrifices are made for education. The sums devoted to this object greatly exceed similar grants in other countries.

These sums arise from three different sources : from a special fund called the *School fund*, from reserves of land made for that purpose. In the State of Massachusetts this fund amounts to ten millions and a half, to fourteen millions in the state of New-York, and a proportional and often times a larger sum in the other states. In addition there are a special tax and private donations which also amount to a considerable sum.

Education is everywhere regarded as one of the most urgent necessities of the State. The sums granted to it greatly exceed those granted to other objects.

Unfortunately these large sacrifices do not produce the desired results. There are still many persons who lack instruction, without taking into account a large number whose education is very superficial.

Upper Canada (Ontario) may be favorably compared with all countries, as one in which the system of general education is most widely spread and works with the utmost regularity. The last statistics give a little more than one pupil in every 4 of the population, taking the general attendance and one in 8 taking the average. The schools in their various classifications are generally efficient.

The requisite moneys are liberally furnished and are largely increased every year.

The population of that province is for the greater part of english and scotch origin, and nearly all the settlers that have come into the country had a certain amount of education and were accustomed to the usual system of rural and school taxes. Those two elements are completely lacking with us. It is therefore not surprising that our progress is a little slower. For here, we had to create every thing, and to superinduce new habits and those of a kind which tend to appal until the people are taught to understand that the sacrifices to be made by them will insure considerable returns.

Notwithstanding this, we can still compare advantageously with other nations. In fact, statistics establish that we have, in our various institutions, one pupil for every 5.19 of population or 19.26 per cent.

Ontario has 1 in 3.51 or 28.46 per cent.

France has only 1 pupil in 8.7 or 11.44 per cent.

Prussia, as we have seen above, has 1 pupil in 6.6 or 15.15.

England had in 1870, according to the figures we have already given, 1 pupil in 13 of the population, or 7,67 per cent. However, since that time this state of things has been considerably improved. For there, as in many other countries, it has been understood that one of the most effective means of promoting morality and prosperity is the diffusion in as complete a manner as possible of a good and sound education.

OF GYMNASTICS.

Gymnastics played a very important part in the education of the ancients, especially among the Greeks and Romans. The men of those days were consequently more robust and better formed than they generally are to-day.

It is acknowledged that the bodily organisim is strengthened by the even exercise of all the parts that compose it. The muscles are thereby increased in size, strength and suppleness, the bony frame becomes more solid and fits itself more easily to all movements of the body ; digestion and assimilation are active, the blood becomes richer, and carries to all parts of the body fuller life and gives a vigor to the mind which facilitates the development of the mental faculties. *Mens sana in corpore sano.*

We hence see the importance of gymnastics in education, and the urgency that exists of giving it an important place if we wish to form robust bodies and healthy minds.

I conceive that it is hardly possible at least with our present system, to introduce gymnastics into our primary schools. I think, however, that we should, as much as possible, make the children take some exercise, something that would tend to develop their physical forces and agility. But where gymnastics are indispensable, is in our boarding schools, in which children pass from eight to ten years of their life precisely at the time when their physical and mental organisation is being formed. They are obliged to remain seated on a bench during long hours, nearly immovable. How can we expect that at this age, when everything in our nature tends to movement and activity, a similar proceeding should not enfeeble the child if we do not supplement this prolonged repose of the whole system by well ordered exercise, tending to develop and increase their physical strength.

I am aware that at the present day, somewhat more attention is bestowed upon this important subject; still much remains to be done, and I cannot too strongly urge upon the persons who control our educational establishments, to follow the course which nature itself points out. I say the persons in control, whether male or female, for gymnastic exercises are as essential to woman as to man.

There is no doubt that the numerous cases of pulmonary diseases and dyspepsia, which we meet with every day, are largely due to the fact, that in youth no attention has been paid to the forming of our organism after a normal manner.

In Europe the most celebrated physicians, and all persons who are occupied with the well-being of humanity, supported by governments and by public opinion, have in many instances succeeded in introducing gymnastic exercises into schools, even into elementary ones. The good effects of the system will undoubtedly not fail to make themselves apparent on the public health, by rendering each better fitted for the state of life to which he is called.

Let us endeavor as soon as possible to follow the good example shown us in this respect by the Old World.

C. B. DEBOUCHERVILLE,
Minister Pub. Inst.

MISCELLANY.

Little kindnesses.—A little boy had a hard lesson given him at school, and his teacher asked him if he thought he could learn it. The boy thought when his eye glanced over the hard words and strange figures, that it would be too difficult for him, and at first he hung down his head at the teacher's question, but after a few moments' consideration he looked brightly up, and said, " I think I can do it, sir, if you will allow my sister to help me.'

'Oh, certainly, my dear; if your sister will assist you, she may.'

'Oh, yes, sir, she is always so glad to help me.'

That is right, sister, help your little brother; and when you are doing so, you are binding a tie round his heart that may save him in many an hour of dark temptation.

'I don't know how to do this sum; but brother will show me, said another one.

'Sister, I've dropped a stitch in my knitting; I tried to pick it up, but is has run down, and I can't stop it.'

"The little girls face flushed and she watched her sister with a nervous anxiety while she replaced the naughty stitch.'

'Oh, I am so glad,' she says as she receives it again from the hands of her sister, all nicely arranged, 'You are a good girl, Mary.'

'Bring it to me sooner, the next time, and it won't get so bad,' said the gentle voice of Mary. The little one bounds away with a light heart to finish her task.

If Mary had not helped her, she would have lost her walk in the garden. Surely it is better to do as Mary did, than to say, 'Oh, go away, do not trouble me!' or to scold the little one all the time you are performing the trifling favour.

Little kindnesses cost noting, and beget much love.

Fun at home.—Don't be afraid of a little fun at home, good people; don't shut up your homes lest the sun should fade your carpets and your hearts, lest a hearty laugh should shake some of the musty cob-webs there. If you want to ruin your sons, let them think that all mirth and social enjoyment must be left on the threshold when they come in at night. When once a home is regarded as only a place to eat, drink and sleep in, the work is begun that ends in gambling-houses and degradation. Children must have fun and relaxation somewhere. If they do not find it at their own hearthstones, it will be sought in others, and perhaps less profitable places. Therefore let the fire burn brightly at night, and make the home ever delightful with all those little arts that parents so perfectly understand. Don't depress the buoyant spirits of your children; half an hour around the lamp and firelight of home blots out the rememberance of many a care and annoyance during the day, and the best safeguard they can take with them into the world is the unseen influence of a bright little domestic sanctum. For Canadian homes we recommend dancing (without dressing up for it), part singing, and for one to read aloud while the rest do needlework, carving, or drawing. Parents who deny their own inclinations to foster these innocent amusements are to our certain experience, rewarded by sons and daughters who love their homes, a sure sign of their loving their parents themselves.

Useful information.—One thousand shingles laid four inches to the weather will cover one hundred square feet of surface, and five pounds of shingle nails will nail them on.

One-fifth more siding and flooring is needed than the number of square feet of surface to be covered, because of the lap in the siding and matching of the floor.

On thousand laths will cover seventy-six yards of surface, and eleven pounds of lath nails will nail them on.

Eight bushels of good lime, sixteen bushels of sand, and one bushel of hair, will make enough good mortar to plaster one hundred square yards.

A cord of stone, three bushels of lime, and a cubic yard of sand will lay one hundred cubic feet of wall.

Five courses of brick will lay one foot in height of a chimney; six bricks in a course will make a flue four inches wide and twelve inches long; and eight bricks in a course will make a flue four inches wide and twelve inches long; and eight bricks in a course will make a flue eight inches wide and sixteen inches long.—*Prairie Farmer.*

In case of Burns.—If the victim of the accident is a woman, it generally happens her clothes are burning, the first thing to do is to put out the fire, by being very cool yourself, and then be prompt and energetic. Make her lie down on the floor and roll over on the flames until you can come to her assistance. Seize a coat, a blanket, or a piece of carpet, and after covering well your own hands—for another patient will not be needed at such a time—wrap her up and extinguish the flames by smothering them. When the fire seems to be out, drench the patient well with water, else the cinders of her clothes will burn her. Then give her a drink of something warm and stimulating and send for the doctor. In the meantime, if the doctor lives at a distance and it is necessary to do something before he comes, remove the clothes very carefully, cutting and ripping wherever necessary, and cover the burns with soft linen cloths, with a mixture of linseed oil and lime-water, or, if this is not convenient, with milk and water with a teaspoonful of carbonate of soda added to a pint of the mixture. Or, if this is not at hand, use warm water with plenty of soap in it. At all events keeps the parts, in case of either burn ef scald, thoroughly wet until the doctor comes. If the burn be small, you can dress it with some simple ointment—such as common whiting mixed with lard without any salt, or chalk and linseed, or olive oil mixed with vinegar so as to form a thin syrup. This last is a very soothing application. If burnt by lime, use vinegar and water; if burnt by acids, use lime-water, or chalk, or soda.

Light and Animal Organism.—A favorite hypothesis is that the waking state is maintained in a great measure, if not wholly, by the constant summation of sensory stimuli; and that by keeping the centrifugal nerves continually in a state of activity, the waking state reacts upon the processes of assimilation and decomposition throughout the body. This hypothesis rests upon a broad basis of circumstantial evidence derived both from physiological and pathological sources. Flaten has performed a series of experiments to ascertain directly whether stimulation of the retina by light really exerts any appreciable influence on the chemical change going on in the system (*Pflueger's Archiv*, xi., 4 and 5). Rabbits were made to breathe pure oxygen instead of atmospheric air; the carbonic acid given off from their lungs was absorbed by a solution of potash, and quantitatively determined. Light was admitted to, and excluded from their eyes, during alternate periods of 30 minutes; the proportions of oxygen absorbed, and of carbonic acid given off during the intervals of illumination, being compared with those absorbed and given off during the intervals of darkness. The ratio as regards the oxygen proved to be 116;100; as regards the carbonic acid 114:100 thus confirming the results long ago obtained by Moleschott with frogs—results vitiated by the untrustworthy methods of investigation he employed.

Oil as Fuel.—At a recent meeting of the scientific and Mechanical Society at Manchester, an interesting paper on the use of oils for fuel was read, from which we take the following:

In experiments as to the comparative value of coal and oil for the production of heat, a quantity of oil weighing less than five pounds was mixed with water in the manner proposed for us, in a suitable apparatus, and without the aid of artificial draft burnt for fifteen minutes with a flame 34 inches high and 25 wide; a superiority over a similar weight of coal which is self-evident.

We have therefore not only a cheap, but, including foreign sources, as great a supply of fuel in oil as in the stone coal; occupying in transportation less space and more easily handled.

A further, not sufficiently prized, advantage in the use of oil is, that a more constant heat can be maintained, as with additional fresh coal to a fire there is a very considerable and rapid diminution of heat. Secondly being more easily controlled, a single man can mind quite a number of boilers, thereby lessening the present large force necessary. Thirdly, as a great advantage to steamships as preserving an equal calorific power, with much less weight.

Cheery People.—O, the comfort of them! There is but one thing like them—that is sunshine. It is the fashion to state the comparison the other end foremost, *i. e*, to flatter the cheery by comparing them to the sun. I think it is the best way of praising the sunshine to say that it is almost as bright and inspiring as the presence of cheery people.

That the cheery people are brighter and and better even than sunshine is very easily proved; for who has not seen a cheery person make a room and a day bright in spite of the sun's not shining at all—in spite of the clouds, and rain, and cold, all doing their very best to make it dismal? Therefore, I say, the fair way is to compare the sun to cheery people, and not cheery people to the sun. However, whichever way we state the comparison, it is a true and good one; and neither the cheery people nor the sun need take offence. In fact, I believe they will always be such good friends, and work so steadily together for the same ends, that there is no danger of either grudging the other the credit of what has been done. The more you think of it, the more you see how wonderfully alike the two are in the operation on the world. The sun on the fields makes thinks grows—fruits, and flowers, and grains; the cheery person in the house makes everybody do his best—makes the one who can sing feel like singing, and the one who has an ugly, hard job of work to do, feel like shouldering it bravely and having it over with. And the music, and mirth, and work in the house, are they not like the flowers and fruits, and grains in the fields?

The sun makes everybody glad. Even the animals run and leap, and seem more joyous when it shines out; and no human being can be so cross-gained or so ill; that he doesn't brighten up a little when a great broad, warm sunbeam streams over him and plays on his face. It is just so with a cheery person. His simple presence makes even animals happier. Dogs know the difference between him and a surly man. When he pats them on the head and speaks to them, they jump and gambol about him just as they do in the sunshine. And when he comes into the room where people are ill, or out of sorts; or dull and moping, they brighten up, spite of themselves, just as they do when a sudden sunbeam pours in--only more so; for we often see people so ill they do not see whether the sun shines or not; but I have never yet seen persons so cross or so ill that the voice and face of a cheery person would not make them brighten up a little.

If there were only a sure and certain recipe for making a cheery person, how glad we would all be to try it! How thankful we would all to do good like sunshine! To cheer everybody up, and help everybody along! To have everybody's face brighten the minute we came in sight! Why, it seems to me that there cannot be in this life any pleasure half so great as this world would be. If we looked at life only from a selfish point of view, it would be worth while to be cheery persons merely because it would be such a satisfaction to have everybody so glad to live with us, even meet us on the street.

People who have done things which have made them famous, such as winning great battles or filling high offices, often have what are called 'ovations.' Hundreds of people get together and make a procession perhaps, or go into a great hall and make speeches, all to show that they recognize what the great man has done. After he is dead they build a stone monument to him, perhaps, and celebrate his birthday for a few years. Men work very hard sometimes for a whole life-time to earn a few things of his sort. But how much greater a thing it would be for a man to have every man, woman, and child in his own town know and love his face because it was full of kindly good cheer! Such a man has a perpetual 'ovation,' year in and year out, whenever he walks on the street, whenever he enters a friend's house.

'I jist likes to let her in at the door,' said an Irish servant one day of a woman I know whose face was always cheery and bright, the face of her does one good, shure!—*St. Nicolas.*

Great Cyclopædias of the World.—The most voluminous cyclopædia in the English language is that of Abraham Rees (1803-1819), republished, with some additions, at Philadelphia (1810-1824), in forty-one large quarto volumes, besides six volumes of maps, and engravings. This was one of the most costly enterprises ever undertaken by any American publisher; and considering the comparatively small number of book-buyers at the period, it is not strange that it was ruinous to those who undertook it, and that it was finally disposed of by lottery. Recent cyclopædists wisely restrict themselves within much narrower limits. The following is an approximation to the quantity of matter contained in the principal cyclopædias in English which are now before the public:

Rees's Cyclopædia	41 vols.	4to,	40,000,000 words
Knight's English Cyclopædia	24 "	"	26,000,000 "
Encyclopædia Metropolitana	25 "	"	25,000,000 "
Encyclopædia Britannica	21 "	"	21,000,000 "
Appleton's American Cyclopædia	16 "	8vo,	13,000,000 "
Johnson's New Universal Cyclopedia	4 "	"	12,000,000 "
Chamber's Cyclopædia	10 "	"	10,000,000 "
Zell's Popular Cyclopædia	2 "	4to,	7,000,000 "

—*The Galaxy for July.*

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