Technical and Bibliographic Notes / Notes techniques et bibliographiques

The Institute has attempted to obtain the best original copy available for filming. Features of this copy which may be bibliographically unique, which may alter any of the images in the reproduction, or which may significantly change the usual method of filming, are checked below.

- ☐ Coloured covers/ Couverture de couleur
- ☐ Covers damaged/ Couverture endommagée
- ☐ Covers restored and/or laminated/ Couverture restaurée et/ou pelliculée
- ☐ Cover title missing/ Le titre de couverture manque
- ☐ Coloured maps/ Cartes géographiques en couleur
- ☐ Coloured ink (i.e. other than blue or black)/ Encre de couleur (i.e. autre que bleue ou noire)
- ☐ Coloured plates and/or illustrations/ Planches et/ou illustrations en couleur
- ☑ Bound with other material/ Relié avec d'autres documents
- ☑ Tight binding may cause shadows or distortion along interior margin/ La reliure serrée peut causer de l'ombre ou de la distorsion le long de la marge intérieure
- ☐ Blank leaves added during restoration may appear within the text. Whenever possible, these have been omitted from filming/ Il se peut que certaines pages blanches ajoutées lors d'une restauration apparaissent dans le texte, mais, lorsque cela était possible, ces pages n'ont pas été filmées.

L'Institut a microfilmé le meilleur exemplaire qu'il lui a été possible de se procurer. Les détails de cet exemplaire qui sont peut-être uniques du point de vue bibliographique, qui peuvent modifier une image reproduite, ou qui peuvent exiger une modification dans la méthode normale de filmage sont indiqués ci-dessous.

- ☐ Coloured pages/ Pages de couleur
- ☐ Pages damaged/ Pages endommagées
- ☐ Pages restored and/or laminated/ Pages restaurées et/ou pelliculées
- ☑ Pages discoloured, stained or foxed/ Pages décolorées, tachetées ou piquées
- ☐ Pages detached/ Pages détachées
- ☑ Showthrough/ Transparence
- ☐ Quality of print varies/ Qualité inégale de l'impression
- ☑ Continuous pagination/ Pagination continue
- ☐ Includes index(es)/ Comprend un (des) index

  Title on header taken from:/ Le titre de l'en-tête provient:
- ☐ Title page of issue/ Page de titre de la livraison
- ☐ Caption of issue/ Titre de départ de la livraison
- ☐ Masthead/ Générique (périodiques) de la livraison

☐ Additional comments:/ Commentaires supplémentaires:

This item is filmed at the reduction ratio checked below/
Ce document est filmé au taux de réduction indiqué ci-dessous.

10X	12X	14X	16X	18X	20X	22X	24X	26X	28X	30X	32X
					/						

THE CANADA

EDUCATIONAL MONTHLY

AND SCHOOL MAGAZINE.

MAY, 1893.

THE MATHEMATICAL CONDITION OF OUR HIGH SCHOOLS.

BY W. J. ROBERTSON, M.A.

I purpose giving, in as brief a space as possible, some thoughts on the present and past condition of Mathematical studies in our Schools and Collegiate Institutes. What I shall say will be, largely, the result of my own experience and observation, an experience and observation extending over some twenty-five years.

As this paper is to be followed by what I hope will be a full expression of opinion, I do not think it advisable to elaborate the points discussed. I shall therefore content myself with a general outline of the present and past policy relating to mathematical studies, and with a few suggestions which may, or may not, meet with the approval of the meeting.

Twenty-five years ago, as some of you will recollect, the mathematical condition of our Schools and Colleges was characterized by an immaturity and a crudeness now scarcely realizable. Rules and formulæ guided the ambitious student through the greater portion of his career. There was a minimum of theory, and a maximum of practice of a certain kind. Muscle, as well as brain, played an important part in the solution of problems—very often muscle more than brain.

In Arithmetic we struggled desperately with Proportion, Alligation and Position. In Algebra our highest ambition was to solve knotty equations. Factoring, except that of the most elementary kind, was an unknown quantity; while of the Theory of Divisors we were in happy ignorance. I have yet a vivid recollection of the difficulties we struggled through during the first year at the University, when called upon to master Permutations, Combinations, Probabilities, and to traverse the profound labyrinth of Algebraic and Trigonometric series. That first year, with its desperate struggles and flounderings and its unsatisfactory attainments, is burned into my memory. In much the same way through the Honor work of four years at the University we passed. What winning a medal in Mathematics twenty years ago meant, with the clumsy mathematical tools at our disposal, is something the modern honor graduate could scarcely comprehend.

When I began my work as a teacher, I had to acquire what a few years later became the ordinary stock-in-trade of the candidate for a first or

second class certificate. Looking back to that period of ignorance of mathematical methods, and comparing it with the condition of things ten years later, the change seems little short of a revolution. In an educational sense we have exchanged the reaping-hook for the self-binder; the stage coach for the lightning express; the wind-mill for the dynamo and motor. In one respect, perhaps, there was a very partial compensation. We had to work earnestly, if we hoped to make any progress. The axe was dull, and so we had to apply the more strength. Progress was slow, but there was a considerable development of mental muscle. We learned to rely upon ourselves, to fight our way through obstacles, unaided and alone. Nevertheless, we would not return to this primitive condition of Mathematical science, although signs are not wanting that some of the evils of that time are beginning to re-appear.

From this condition of primitive methods, we were gradually rescued, first through the efforts of the late Dr. George Paxton Young, and secondly, through the enthusiasm of his successor in the Inspectorate, Dr. J. A. McLellan. Of the first I may be permitted to say that his presence in the school, as subsequently in the lecture room, was an inspiration to the students to do their best. The teacher found something more than a critic in the Inspector; he was his guide, philosopher and friend. Of his successor, a due regard for his modesty, permits me to say but little. Nor is it necessary to dwell at any length upon the almost magical transformation that took place in the manner and method of teaching and studying Mathematics. The wave of zeal and enthusiasm that spread over the Province, has not yet lost all its force. The memory and impetus of that time still exert a great influence; an influence, however, that is gradually waning.

It has been said that our schools were, for a time, mathematically mad; that the more liberal and humanizing studies of Classics, English and History, were grossly neglected; while Science had scarcely an existence. With this charge I do not propose to deal fully. I may point out, however, that of the three Inspectors at that time, the tastes of one were in the direction of English and History, while another was deeply interested in Classics; so there was an equilibrium of educational forces. If my experience counts for anything, it is that History, while not better taught, was more thoroughly studied than it is to-day. Classics, too, I have reason to believe, received as much or more attention than they do now. It would have been a difficult matter then to find an honor graduate who could not scan a line of Homer. As to Science, in spite of our present elaborate apparatus, and pretence of experimental and inductive study, a more thorough knowledge of Physics was obtained, than is now secured. Not so many subjects were studied, it is true, but those that were studied, viz. Dynamics, Hydrostatics and Heat, were studied thoroughly. But granting that less time and attention were given to Science, English and Moderns than are given to-day, this important fact must be noted, the earnestness and thoroughness with which Mathematics were studied gave, in that one department at least, the most satisfactory and brilliant results. Ontario became famous for the attainments of her sons and daughters in Mathematical studies. Abroad, as well as at home, our young men won renown in that branch of a liberal and sound education. The honor graduate of our University was almost on a par with the post graduate of the best American universities. And this result was largely due to the thoroughness of the

drill obtained in our High Schools and Collegiate Institutes. Nor was this all. Our Public Schools were provided with a class of teachers who understood Arithmetic thoroughly, who were well-grounded in Algebra and Euclid; and, what is more important still, with men able to think clearly, and reason logically. For I hold it as almost axiomatic, that the study of Mathematics is the most effective of all studies in leading to right thinking. I may go further and say that as clear thinking is the first essential to clear speaking and writing, the study of Mathematics is a powerful aid in the production of a good literature. Right thinking, and right action are also closely connected; and so do not deem it paradoxical if I say that Mathematical studies encourage and develop the moral qualities of truth, straightforwardness and simplicity of purpose. The heresies, social and economic, that have such a rank growth in this and other lands, the abounding quack remedies for social ills, would many of them perish, were a better knowledge of the fact that 3 + 2 does not equal 6 abroad.

I regret that my time will not permit me to dwell further on the golden age of Mathematical studies in Ontario. As we all know, there came a change. "A King arose who knew not Joseph." The parallel may be carried a step further. The time came when Mathematical masters were asked to "make bricks without straw." Joseph erected his Mathematical pyramid; Pharaoh gazed at it in mingled admiration and displeasure, and was moved to erect one of English and Science, on which he could blazon his name for all time. To drop these mixed figures of speech, a reaction came. It began with a new administration in which Mathematical representatives found no place. It was no fault of the new Inspectors that they did not appreciate the value of mathematical studies. Nature, inclination, and training alike disqualified them for the appreciation of the stern joy a mathematician feels in meeting and mastering a knotty problem. What they did see and feel was that English and Science were not on a lofty pedestal. The niceties of English grammar were not duly prized; while the study of Science by the inductive method had little or no place in our school laboratories.

Here allow me to say that in the mild criticism that is to follow, I fully recognize the zeal and devotion to education, shown by our High School Inspectors. Errors they have made, I believe, but they are errors most natural to educators with such a pronounced bias in favor of certain studies. They have been unwearied in their efforts to promote what they deem the best for our schools, and this means that their efforts have been thoroughly unselfish.

But, in my humble opinion, under the new administration, and the new regulations, there has been a gradual deterioration in the mathematical work done in our schools, and, as a mathematical master, I feel it my duty to call attention to that fact.

I do not take the ground that an improvement in the results obtained in English and Science might not balance the decline of Mathematics; although it surely is a sorry system of education which "robs Peter to pay Paul." What I do hold is that while mathematical studies are losing ground, the improvement in English and Science shews no marked increase. I have reached this conclusion with some hesitation, and were not the fact vouched for by competent English and Science masters, I would not venture to make the statement.

To a certain extent, my own observation has enabled me to judge of the character of the work done in English and Science. As an examiner in History, both at the Departmental Examinations and at the University an excellent opportunity has been given me to estimate the value of the attainments of our candidates in English. As a teacher of part of the course in Physics, the educational effects of the existing methods, have come under my notice. But I do not wish to draw conclusions from my own observation alone. So when my experience taught me that mathematical studies were losing ground among my own pupils, I was not sure but the cause might be purely local. I soon found that my experience was a very general one; and that from different parts of the Province came the same complaint. I also was informed that the evil had been recognized in our Normal Schools and Training Institutes.

Anxious to reach just conclusions, I took the trouble to make inquiries from some of the Professors in our Colleges, and the teachers in our Normal Schools and Collegiate Institutes. The replies I have received indicate an almost unanimous opinion that a mathematical decline is going on, without any counterbalancing gain in other departments of study. One of the most pronounced supporters of this view is the Principal of the Ottawa Normal School, an educator whose tastes and acquirements are in the direction of English, not Mathematics. One gentleman, it is true, whose experience as a teacher or lecturer, has been but brief, thinks Mathematics have held their ground and bases his conclusion on the fact that the examination papers are as difficult as ever. The experience, however, of last summer shews very clearly that it is one thing to set difficult examination papers, and another to have them answered. In fact, the desolation caused by the rather unusual papers of last year, indicates very plainly that the Mathematical status of our schools has greatly fallen. The question then arises, what causes have been at work to produce this decline.

Before proceeding to examine into these causes, allow me to say that it is not due to the inefficiency of the Mathematical teachers of the Province. More than once the statement has been made by our Inspectors that Mathematics were better taught than any other branch of study. This is from the mouths of our adversaries. The cause or causes must be sought elsewhere; and they can easily be found, for they lie on the surface.

1. In the first place, I would call attention to the imperfect and improper division of work among the different Forms of our Schools. From the time of entrance until the Primary Examination is passed, there is an interval, on the average, of at least three years. In that time let us see what mathematical attainments are expected from the pupils. In Algebra they are expected to go to the end of Simple Equations of one Unknown, in Euclid to the end of the 26th Proposition of the First Book; and in Arithmetic to—well, I hardly know where, unless the whole subject is included.

Passing on to the Junior Leaving studies, we find that one year is presumed to be devoted to them. Now mark the sudden increase in the quantity of Mathematics demanded. Three or four years were required to master Algebra to the end of Simple Equations, now only one year is allowed in which to thoroughly comprehend Indices, Surds, Quadratics, Simple Equations of two and three Unknowns, Square Root, Cube Root, and the Theory of Divisors. In

Euclid three years for 26 Propositions of the First Book; one year now for the remaining twenty two propositions of the First Book, the Second and Third Books, with deductions thrown in as a bonus. The Arithmetic of the Primary is to be continued and concluded. This means that a class of problems in Commercial Arithmetic and Mensuration are to be mastered for which the mathematical attainments and mental powers of the pupils are wholly inadequate.

When the pupil leaves the Junior Leaving behind, he abandons with it, all further study of Arithmetic. But to console him, he is required in another year, to grapple with the difficult and extended work involved in Algebra between the Quadratics of the Junior Leaving and Annuities of the Senior Leaving. He also begins Trigonometry, and is expected to complete the course required for Honour Matriculation. Euclid is extended two Books farther, with the addition of more difficult Deductions.

Now, what strikes the observer most forcibly is the wretchedly small amount of Mathematics required for the first three or four years, and the inordinately large amount for the next two. One must suppose that the Educational authorities expect the passing of the Primary examination to have a magical effect in suddenly enlarging the capacity of the pupil, and in strengthening his power of abstract reasoning. Up to this examination his mathematical training has been purposely limited. Is it not somewhat unreasonable, then, to demand from him, in one year, twice as much as he has been accustomed to accomplish in three years? Is it at all surprising that failures in Algebra and Arithmetic occur so frequently at the Junior Leaving.

2. Again, not only is there a most injudicious division of work, but the order and manner of the work done must be condemned. The introduction of difficult problems in Commercial Arithmetic, and in Mensuration, for the Primary and Junior Leaving is simply irrational. A grave mistake was made when Arithmetic was left off the course of study for the Senior Leaving. The most difficult problems in Commercial Arithmetic and in Mensuration, should be left to the last stages of the High School pupils' training. Mental immaturity and lack of Algebraic and Trigonometrical knowledge alike condemn the introduction of such problems at an earlier stage.

Nor must the manner in which Arithmetic is studied be exempt from blame. From our Normal Schools, Training Schools and Colleges comes the complaint that the students who go into the teaching profession and into the Universities, do not understand the principles that underlie Arithmetical operations. They are beginning to go back to the old vice of leaning on rules and formulæ. Mental Arithmetic, a most valuable training for the mind, is utterly neglected; while the gross educational blunder of encouraging students to solve Arithmetical problems by means of Algebra, is robbing the study of Arithmetic of its chief educational value. One would not be at all surprised to hear that the educational authorities, in their zeal for practical results, should advise the introduction into our schools of a Ready-Reckoner.

3. To the improper division of work among the different Forms, and the wrong methods encouraged in the study of Arithmetic, must be added another cause for mathematical degeneracy. Looking over the values attached to the various subjects on which candidates are examined, one cannot fail to be struck with the evident determination of the Education

Department to discourage the study of Mathematics in our schools. English and Science are thrust forward, almost offensively—Mathematics pushed into the back ground. A few illustrations will make this clear to the uninitiated.

For the Primary examinations, 500 marks are given to English, while 400 are given to Mathematics. This injustice is aggravated by grouping Algebra and Euclid together; the practical effect of which is that the mathematically indolent can manage to scrape through, chiefly by the aid of the 26 Propositions in Euclid. The same discrimination against Mathematics is found in the marks for the Junior and Senior Leaving Examinations. Excellent examples are furnished by a comparison between Algebra and Poetical Literature. For the Junior Leaving 150 marks are given to the former, while the latter is honoured with 200. This, too, is regardless of the fact that to master the prescribed course in Algebra, requires fully twice as much mental effort as that for Poetical Literature. In the Senior Leaving the same system of marking is adopted. Nothing can justify such a glaring injustice. Every Mathematical teacher knows that by far the most difficult and extensive part of the course for the Senior Leaving Examination, is Algebra—nevertheless, it is ranked with Euclid, Trigonometry, History and Geography; and far below French, German, Greek, Latin, Poetical Literature and English Grammar. The consequence is that a candidate can easily pass provided he can secure the necessary one third of the marks in Algebra. Why then should we marvel that the Normal School teachers find their pupils grossly defective in Mathematical knowledge? The result of this policy of undervaluing Mathematics and over-valuing English, Moderns and Science, is analagous to that which follows from the effort to place silver on an equality with gold—the base metal drives the good out of circulation.

4. A fourth cause must now be considered; and this, to my mind, is the most potent of all. It is one which is permeating our whole school system, and it is bearing its fruit in our Public as well as in our High Schools. I refer to the over-crowding of the programme of studies for both Public and High Schools. In our Public Schools it is seen in prescribing such studies as Temperance and Hygiene; and the same tendency crops out in the movement to provide teaching in Agriculture for the sons and daughters of our farmers. When this, the latest scheme for making farm life attractive through the instrumentality of the accomplished third class teacher of urban origin and training, has been successfully carried out, the day is not far distant when we can warm ourselves with the "sunshine extracted from cucumbers." This, however, is a subject for our friends of the Public School section to discuss.

To return to our subject—the overcrowding of our High School programme. This is manifest in the lower Forms where the "fads" have complete sway. Here Calisthenics, Drill, Drawing, Book-keeping, Stenography, flourish at the expense of more important subjects. The time consumed in these studies is, so far as the mental training of the pupil is concerned, largely wasted. His energies are frittered away so that he has but little vigor left for grappling with difficulties such as are to be found in solving mathematical problems. The consequence is, that his knowledge of Mathematics at the end of four years spent in the lower forms, is less than should be attained in two. He begins Junior Leaving work with a knowledge

far too limited, and his course therein is hampered by the superficiality of his knowledge, and by his undeveloped power of independent thinking.

An illustration of the unfitness of the average Junior Leaving candidate to cope with his work, is found in the way he struggles with the mathematical problems in Physics. His study of Physics, has, hitherto, been wholly in the line of definitions, and a few experiments. This of course, is inevitable, when mathematical knowledge is kept at a minimum. So, when problems in Dynamics and Hydrostatics arise for solution, there is perplexity, despair and failure.

After passing the Primary stage, not so many subjects of study are demanded, but the quantity of each is greatly increased, and the time is very much shortened. To state the lengthy list of requirements in Physics, Chemistry and Botany would be a serious encroachment on the time of the Association. Years ago we were content to teach Statics and Hydrostatics to Second-Class Candidates; now, in addition, we must hurry them through Heat and Electricity, as well as what was formerly called Dynamics. The unfortunate pupil emerges from this course much in the same condition of mind as a Cook tourist after being put through the bewildering experience of visiting the sights of Paris and London. He has some faint confused ideas of the laws of motion; a general idea that heat makes bodies expand; and a fixed conviction that in some unaccountable way electricity is revolutionizing the world of enterprise. The Inductive Method of study is certainly a most excellent method; but of what avail, if time is not granted in which to apply it?

And Mathematical studies are not the only sufferers from this overcrowding. History is not properly mastered, and a special inducement to its neglect is afforded by placing all the History and Geography questions on one examination paper. He is a very indifferent mental acrobat who cannot fall without serious injury on one or other of the numerous soft places provided by placing English, Canadian, and Ancient History, with their accompanying Geography, on one paper. This by the way of digression.

The point to which I would most earnestly direct attention, in connection with this subject of over-loading the curriculum, is that it leads in many cases to superficiality of attainments, and confusion of ideas. No one subject is clearly grasped; no one thing is thoroughly understood, and therefore, not appreciated. It is the crying evil of our schools to-day, this lack of thoroughness. It accompanies the student to the Normal School and Training Institute; it haunts him through his University course; it unfits him for the duties of his profession, whether it be teaching, Medicine, Law or Theology; and makes him in his subsequent career, the ready victim of political and social adventurers. But I must hasten on to notice another cause, for which the Education Department is *not* responsible.

5. In seeking for causes of the decline in Mathematical culture, a suggestion was offered by the Mathematical Professor and Lecturer of Toronto University. The suggestion was that students were not willing now to take time to prepare themselves thoroughly for entering on an undergraduate course. Admission to the University had been made so easy, through the numerous front, side and back door entrances, that a very slight acquaintance with Mathematics is all that is necessary. Still further, so many new routes to academical Honors have been opened up in

recent years, by the addition of new graduating Departments, that the ambitious student who cares more for the Honor degree than for the solid attainments which should go along with it, can easily gratify his desire to graduate with honors, without undergoing the painful process of hard-thinking. Hence the early exodus from the ranks of Mathematics to Moderns, and Political Science. The matriculant who has in view the easy road to an honour degree will not worry himself to secure a high mathematical standing, nor, in fact, a high standing in any other Department of study.

Such is one explanation of the evil under discussion. I do not pretend to have exhausted all the causes that are in operation to produce the present untoward tendencies in Mathematics. I might mention the difficulty experienced in teaching matriculants with those preparing for teachers' certificates; a difficulty which is felt most keenly in the Senior Leaving Form. The candidate for a Senior Leaving Certificate is anxious to get through in one year, whereas, the candidate for Honors in Mathematics, requires two years after passing through the Junior Leaving Form. The attempt to teach both kinds of pupils together must necessarily give unsatisfactory results. The withdrawal from our Collegiate Institutes of the preparation of candidates for Grade A and B certificates, and the discouragement given to teaching the honor work of the First Year of the University, have both acted prejudicially on the high standing of our Collegiate Institutes, without securing any compensating advantages.

It remains now to indicate very briefly, some of the remedies proposed for the present evil. From many quarters the cry has come for a mathematical Inspector. Doubtless this demand has originated from the fact that when we had a mathematical Inspector, Mathematics flourished. A mathematical Inspector, it may be said, would carefully guard mathematical interests, when changes are in contemplation by the Education Department. His presence, too, in the schools would inspire both teachers and pupils to do their utmost. Wrong methods would be exposed and discountenanced; while the latest improvements would be introduced.

No doubt there is much truth in these statements, and, were a vacancy to occur in the Inspectorial staff, it certainly would be a wise policy to appoint an experienced Mathematical teacher. But to appoint a third Inspector in order to maintain the equilibrium of High School education is another thing. The duties of the High School Inspector have changed in recent years. He is no longer an inspiration in the School. His functions have become purely administrative. He must have a keen appreciation of the value of the internal arrangements of the school building, of its hygienic qualities; of the equipment of the Laboratory and Gymnasium. Trustees must be stirred up to observe the provisions of the law, at the risk of the loss of the Government grant. Inexperienced teachers must be carefully watched, and their defects noted. These and numerous other duties of a like nature do not demand a mathematician. Nor do the Mathematical teachers of the Province need any special inspiration to induce them to discharge their duties efficiently. Help and encouragement they are glad to have; cold-blooded criticism they can well do without. The detection of the inferior workman and his work is certainly the duty of the Inspector; but we must assume that the best and most approved of modern methods are taught in the Training Institutes

and the School of Pedagogy. So it seems to me that two Inspectors can well discharge all the duties now understood to belong to the Inspectorate.

The remedy must, I think, be found elsewhere. The enumeration of the causes of the present evil tendencies, suggests the direction in which action should be taken to restore the study of Mathematics to its proper place. A better division of the work of the Mathematical course among the different Forms should be arranged. Algebra and Euclid should receive more attention in the Junior classes. To accomplish this, fewer subjects should be prescribed. Students aiming at a University career or the higher certificates, should not be compelled to waste their time on Drawing and the Commercial course. The amount of Science required should be reduced in quantity and its quality increased. The appropriation of marks to Mathematical subjects should be placed on a just basis. There should be a general reduction in the quantity of work demanded for the Junior Leaving; failing which, the course should be so arranged that candidates would be compelled to give two years to it, instead of one.

A great amount of time is now devoted to the Languages and Science —with very meagre results. This indicates that we are grasping at too much; that our students cannot assimilate the mental food we are thrusting upon them. An inordinate amount of time is devoted to English —yet, incorrect spelling, grammatical blunders, and a painful lack of clearness of expression, abound. To me it seems a worse than useless task to endeavor to secure good literary style from pupils whose brains are confused by a multiplicity of studies, and whose thoughts are in a state of constant chaos. We are developing a sham education by aiming to accomplish too much. We are forgetting that while all branches of knowledge have an educational value, when properly taught, and most of them a so-called practical value, it is utterly impossible to teach many of them in our Public and High Schools. Our schools are not fitted to train our pupils in all the Arts and Sciences, and we must limit our projects to what is feasible. If we can succeed in giving a thorough knowledge of the principles which underlie the acquisition of all knowledge; if we can train and develop the thinking and critical faculties; if we can in a measure, instil the love of the beautiful and lofty in literature, of the true and noble in History and of moral worth in thought and action whether of the past or present, then we shall have accomplished something worthy of our vocation; for we shall have done our part in providing the State with citizens at once intellectually strong and morally great.

FRENCH TRAITS.

The British traveller who arrives at Dieppe in the early morning after a tiresome night passage from Newhaven, is greeted by the fishy atmosphere of the land, and the clitter-clatter of "sabots" on the rough stones. The strange language sounding in his ears, and the sight of two feminine-looking Frenchmen embracing one another on the pier, reveal to him that this is a country very different from his own in customs and ideas. He follows his luggage impatiently into the "torture chambers"

of the Government, where keen-eyed officials go through trunks and valises regardless of his feelings or patience, and sighs relieved, when he is at last permitted to withdraw to the cheery refreshment room. The quick little garçon comes with his head on one side and his "café au lait, Monsieur?" and later with his extensive addition of francs and centimes to remind Monsieur that it is the Continent and he must pay accordingly. The courtesy and good nature of servants, and railway officials in France is a recognized fact, and their aim in life seems to be to make you perfectly comfortable while under their care. The exceptions are rare, yet it was our lot to meet one in the person of a railway official while travelling in Belgium. He was a dark, fierce looking individual and had shown himself so unpleasant to our party that as he left the coupé after collecting the tickets, one of the ladies laughingly shook her fist at him. But Mr. Frenchman had been quick enough to observe it and came back with a threatening "Vous me menacez, Mademoiselle?" which amused us afterwards very much. The ride from Dieppe to Paris is a very pleasant one, and an interesting stoppage may be made at Rouen, that ancient capital of Normandy, the resting place of Richard Coeur de Lion, where thoughts of Jeanne d'Arc, the maiden of Domremy, rise up in the old market place.

Norman caps look out of the quaint windows and doors; wooden shoes and blue blouses are at work in the fields, and detachments of blue-coated soldiers march across the squares and streets. The soldiers look so absurdly small, and their uniforms are certainly not pretty. These simple French peasants are in about the same state as their forefathers were two hundred years ago—the same thrifty, quiet, cheerful, kind-hearted people, content to work hard and gain little, strictly obeying the village priest and enjoying the town fetes. It is difficult sometimes to understand their peculiar dialect, even with a knowledge of French, and we despaired in Rouen of ever finding the particular establishment we wanted. After asking gendarmes, old women and children and becoming objects of interest to the entire neighborhood, we hurried along to escape the curiosity of the doors and windows until we sank exhausted "at a pastry-cook, his doorway"—To our astonishment, the very "plump" and "rosy little pieman" of Gilbert's came out of his shop, with his pretty little wife, and a following of rosy imitations, and by dint of much talking and more gesticulating they gave us the desired information.

On the sunny streets are groups of happy little children, playing their games, watched over by the grandfather, in his chair at the doorway, his long white hair falling round the browned and wrinkled face. At Damvilliers, a little farming village in the North West of France, was born once a peasant boy who grew up different from the others, and while working in the fields or at home in the tiny cottage, saw how beautiful this simple peasant life and the landscape around him was. He went when 16 years old to Paris, and devoted his life to art and became a famous painter—This was Jules Bastien Lepage, the peasant painter of France who died about 20 years ago.

It is very bewildering to set foot for the first time in the heart of Paris, Les Boulevardes des Italiens, among gay crowds of richly dressed women and faultlessly attired men. They are sauntering along the asphalt under the trees or chatting merrily at the café tables over sundry small cups and glasses, appearing as swarms of bright butterflies, enjoying the sunshine, and intent on pleasure and

enjoyment. The gayest and most active people in the world, they are the fondest of beautiful and attractive things, childishly pleased with display, and passionately fond of music. Two of our English words have no corresponding ones in the French language. They may never call a Frenchwoman a "dowdy" because no such word exists for them. The poorest milliner, or shop girl, hurrying home in her neat black gown, is as pleasant to look upon as the showily dressed woman reclining so gracefully in her luxuriant carriage.

A story is told of the Frenchwomen of the court of Louis XIV. It was the fancy of the court ladies then to wear a very high headdress, and the King not admiring the fashion endeavored to have it done away with. But no notice was taken of the King's wishes or orders and the fair dames still wore their hair extraordinarily high. One day, a young Englishwoman "une gemille d'Angleterre" appeared at court, wearing a little low head-dress, and immediately the French women rushed from one extreme to the other.

For our word "listener," there is no French equivalent, leaving us to suppose that no native of Paris ever does listen, but talks as quickly and as much as possible. Sitting one day near a group of lively Frenchmen, we noticed that not for a second did the conversation cease, but each appeared to talk for his own benefit. We were opposite a Parisian once in a railway coupé and asked him if he spoke English. "No, I do not speak English" was his answer, with a perfect accent. That was all the English he did know, but he kindly chatted French to us, until we felt quite at home in that language. The café is the true home of many a Parisian, where he lunches and dines, entertains his friends and enjoys his evening game of cards and dominoes. On Sunday an Englishman takes his household to church, but a good Frenchman treats his family to a box at the Opera, or a concert, and dinner at the café.

Just before going to Paris, we had been spending some weeks in a quiet little English town where to read newspapers or write letters, or do anything outside of going to church and walking to the cemetery on Sunday, was very awful and wicked, and to be in this great metropolis so busy with shows and races, cafés full of people, the whole city in her holiday dress bent on pleasure of some sort, was as great a change as it is possible to think of. The streets are thronged with carriages and people and the proud Paris cabman "Monsieur le cocher de fiacre," drives recklessly over the macadamized pavement regardless of people's lives, and indifferent to their efforts to hail him from the crossings. He is of a most objectionable character, demanding high prices, and is obstinate and lazy to a degree. The peddlers of Paris are a very interesting class, and their energy and perseverance are truly admirable. In and out among the café tables they go with tame birds and cheap jewellery, persuading Monsieur that a pair of opera glasses is necessary to his comfort, and Madame that without a flying paper pigeon her son will not be happy. The flower-girls also are a numerous class, and their large bunches of roses and lilies tempt one all along the Boulevards. On one side of the Madeleine church is a flower market that blooms out every morning fresh and beautiful and disappears mysteriously in the afternoon. We visited it one morning and could not admire enough the rich masses of bloom and the size and beauty of the plants, and in the afternoon on going again there was not the faintest trace of anything resembling a market, The tents were folded up, and it seemed as if the stools and

stands, as well as the old women and girls had "silently stolen away" to reappear next morning.

If Paris is the great Caravansary of the world, it is also the home of many thousands of students whose lives are lives of patient endeavor and hard work. There are 5000 medical students alone on the left bank of the river. From eight until eleven o'clock in the morning they must be at the hospitals, and at twelve the lectures commence and are not over until five or six o'clock. There is work again in the evening, and only the nights for private study. Pasteur is one of the workers of Paris, and from morning until night he bends over glasses and tubes experimenting and testing, carrying on the work of science and discovery. Under the laboratory are hundreds of animals on which he has experimented and in his menagerie which he visits every morning is represented almost the whole of the animal kingdom. The very air of Paris seems to stimulate one to accomplish something, and no one is idle in this great city.

The French are a fête-loving nation, and on such occasions, the city goes wild with excitement. The 14th of July is a great day in Paris, to commemorate the anniversary of the Republic. From early morning the citizens are astir making preparations for the day's festivities and no business is transacted nor shops opened. Shows of all sorts parade the streets, stilt-walkers and peddlers pass under the windows, and in some parts of the city it is unsafe to venture on account of the riot and confusion. In the afternoon a review of the soldiers is held and the Bois de Boulogne is thronged with carriages of all descriptions, humble and gorgeous ones and spectators of every rank gaze on the President and the soldiers. The cafés are crowded to overflowing and all Paris comes out in her gala attire and drinks to "la Liberté et la France." As the shadows grow deeper, and the darkness falls over the city, the bridges and boats on the Seine gleam out in myraids of colored lights, and the Tour Eiffel and the Trocadero are brilliantly illuminated. Gorgeous fireworks delight the people, and music sounds in all directions at the street corners, large platforms are erected for dancing and all Paris dances that night to the honor of the Republic. "Il n' y a Paris" is echoed in all hearts and surely no nation in the world is more patriotic than the French. They love their bright land and gay, energetic life, and sigh after and long for it wherever they may be.

L. A. T.

THE TEACHING OF MATHEMATICS—*Continued.*

BY PROFESSOR W. H. H. HUDSON, M. A.

In order to preserve this continuity, it is essential that the old, the known, must be soundly known and firmly grasped. The pupil should have to unlearn nothing as he advances. The earlier teaching should be designed so that the later can be easily joined on to it. On this account it is desirable that the teacher should have a grasp of subjects beyond what he is actually teaching, that he may prepare the way for the future. It is a mistake to ask an ignorant teacher to take an elementary class.

Thus the teacher of arithmetic should be watchful to assist the transition to algebra, and the teacher of algebra, should frequently bear in mind the subsequent study of the Differential Calculus.

In arithmetic, subtraction should be taught as a shopman gives change because this smooths the way for the improved long division. The highest digit of the multiplier should be used first in the multiplication of whole numbers, because this facilitates the approximate multiplication of decimal fractions. Arithmetic may be taught so as to prepare the student to pay regard to dimensions in mechanics, and in the treatment of circulating decimals either sound ideas may be given, facilitating the acquirement of the important doctrine of limits, or confused ideas may be allowed to be formed retarding the pupil's progress and throwing additional difficulties in his way. It were better not to touch this part of the subject at all than to do this; in fact, in accordance with the first law of teaching, if the subject is beyond the pupil's comprehension the teaching of it should be deferred. The particular instance quoted, however, is quite intelligible at a much younger age than is often supposed.

Mathematics are sometimes thought to require operations of the mind different from those employed in other studies. [11] It is said not to encourage the art of observation. As we all know, this is not the case. The teacher should take opportunities of exercising this faculty, and should ask his pupils to notice distinctions, and when they have discussed these distinctions and described them by a clumsy periphrasis, when the *thing* has thus become known, the *name* "binomial," "homogeneous," or whatever it is, may be given: there are many opportunities for lessons in classification based on observed distinctions.

Another common mistake is to suppose that mathematics do not admit of reasoning from analogy; on the contrary, the good teacher bases his pupil's apprehension of mathematical method upon the analogy which he guides them to observe in the mode of solution of similar problems.

Inductive reasoning is also said not to appear in mathematics. On the contrary, the mathematical teacher will often lead his pupils by particular examples to guess by induction a general formula, and then he will be able to shew them how to verify their guess, and ascertain whether their induction is justified. They will sometimes guess wrong, and thereby learn to distrust an unverified induction.

The use of experiment to ascertain whether a proposed theorem is likely to be true, is another instance of the application of a mode of investigation often thought to be foreign to mathematics.

Another subject most intimately connected with mathematics is language. One of the aspects of algebra and the differential calculus is distinctly linguistic. It is a valuable exercise for the pupil to translate his symbols into the English language. Clear and exact language is requisite in order to state mathematical problems, and the necessity of using it constitutes one of the difficulties of the learner, but it is a difficulty in the overcoming of which mathematics give much of the intellectual benefit which is supposed only to be derived from the study of a foreign language. The power of stating a physical problem in the language of the differential calculus is an acquisition worth having, even if the subsequent solution of the problem is at present impossible.

After the three great laws of teaching, the Law of Understanding, the Law of Sequence, and the Law of Continuity, some minor maxims may be adduced.

[11] Of observation, experiment, induction, analogy, the mathematician knows nothing." Sir W. Hamilton.

(1) *Principles are more important than methods and formulæ.*

Mathematics are built upon a certain number, not very large, of axioms and conventions. The axioms give rise to no difficulty, except to the metaphysician; all believe them as soon as they understand the language in which they are expressed; but it is necessary for the teacher to see that the pupil does understand this language.

The conventions must be laid down authoritatively; the pupil must, here as elsewhere, understand what they mean; but he is not, in most cases, an adequate judge of their propriety. He will often think them inconvenient and improper: but he is not in a position to set his jndgment against that of the scientific world.

A pupil may think, and, judging from what I have seen, many seem to think that the absence of a sign between two letters ought to denote addition instead of multiplication, that *a b* should mean *a* and *b* and not *a* times *b*. An algebra could no doubt be built up with this convention instead of the usual one. We will listen to any qualified person who may develop such an algebra, and show us, if he can, its greater convenience. But we will not listen to our pupils who are not qualified. We may try to give them some reasons for the convenience of the notation we ask them to adopt, but we cannot be sure that we can convince them; for they have not the knowledge, even if they have the power, to form a judgment on the question.

We should not disguise from them, however, that this is a convention, the convenience of which we ask them to take upon trust from us. We do wrong if we lead them to think that these conventions are on the same footing of necessity as axioms. I fancy that a mistake of this kind is sometimes made in the early teaching of arithmetic. If we allow our pupils to believe that 12 must mean twelve and could not possibly mean seven or ten, we confuse in their minds the distinction between the necessity of axioms and the arbitrariness of conventions.

Upon axioms and conventions are based certain doctrines which we call *principles*, such as the fundamental propositions of algebra. These principles, few in number, in their turn form the bases of methods and processes inumerable.

To teach each of these latter separately without system or co-ordination is an impossible task; the task of teaching mathematics is rendered feasible by referring to general principles. This should be done, not only at the outset, but also whenever mistake or misunderstanding occurs. A mistake other than a mere slip, to which all are liable, generally implies a misunderstanding or confusion about some fundamental principle; for its correction the fundamental principle should be referred to.

The object of teaching being to give power, not merely to impart a knowledge of facts, or facility in the conduct of process, a mistake which shows a defect of reasoning at some point, whether in the understanding of the principle or in the application of it—even slips arise from a momentary eclipse of the reasoning faculties due to a want of concentration—such a mistake should be made the opportunity of endeavouring to give a firmer grasp of fundamental principles so as not only to prevent the same or similar mistakes in future, but even to prevent dissimilar mistakes by strengthening the mental power.

Methods, therefore, do not constitute arithmetic, nor is algebra a system of formulae; behind these are the general principles of the subject:

these are not only the first notions derived by intuition from experience, but they include certain intermediate doctrines gathering up in the compass of a few propositions a vast and bewildering multitude of particular applications.

In any special case what the learner has to do is to select and combine the appropriate principles: this is the valuable exercise; the power of doing this is freedom, the mere following out of a process prescribed by a rule, is slavery. Nevertheless, there are methods and processes so important as to deserve special attention; these the learner should be guided as far as possible to discover, or, at least, make his own, by intelligently perceiving how they flow from the general principles of the subject. Methods and formulae have, therefore, a place, a true place, in arithmetic and algebra, a pace in subordination to principles, useful when superfluous, mischievous when necessary.

Another maxim is—(2) *Make slow progress with firm steps.* Mathematics admit of being so minutely subdivided, that the steps can be accommodated to the stride of the pupil. No pupil should be asked to take a step that is greater than his stride, but he should be asked to take his step firmly, and the teacher should ascertain that each step has been firmly taken before proceeding to the next. It is not desirable, especially in the beginning, that many steps should be taken in one lesson; the subsequent pace will be all the greater for initial slowness. New ideas require time to dwell in the mind in order to take root there; they need to be reinforced by exercise and application. Moreover, the young are not capable of the sustained attention requisite if much is attempted in one lesson. Mathematics, especially geometry, though requiring concentrated attention, need not, in its early stages, demand a prolonged effort; this is one of the circumstances that makes geometry so peculiarly valuable for early training. The same is true of the beginnings of arithmetic; care must, however, be taken, by cross-examination, to ensure that verbal memory does not conceal ignorance of principle. Algebra needs more prolonged attention, and is, therefore, studied after the powers of the mind have been strengthened by geometry and arithmetic.

At the age at which numbers are first learnt, one number is sufficient for one lesson, but then something more about it than the name should be learnt; for instance when we come to 1 more than 9, the child should be taught not only that its name is ten, but should be guided to find out that it is $2 + 8$, $3 + 7$, &c., that its half is 5, its fifth part 2, that it is $3 \times 3 + 1$, and so on. In this way, though the number twenty be slowly reached, a far sounder basis of arithmetic may be laid, than by teaching the child to count to a hundred, and the difficulties of notation, and of vulgar fractions will be well-nigh smoothed away.

Again, in the commencement of geometry one definition or one proposition may be ample for one lesson: this will require but a very short time; this time may be employed in a way to develop mental power in a manner which a whole book learnt by heart is incapable of doing.

Although slow progress is to be recommended in the inception of mathematical study, some progress should be made each time, something new should be taught each lesson; the tortoise, however slow, constantly moving, comes to the goal at last. The practice of keeping a pupil back until he is what is called "perfect" in what he has been already taught, is one not to be commended. Exercise on what has been learnt must be done to emphasize what has been taught,

to enable the pupil to feel that he understands, and to assure the teacher of this fact; but it is not necessary that the pupil should acquire such facility as never to make a mistake before proceeding. The higher parts of arithmetic and algebra themselves afford exercise in the lower.

Nor is the practice of setting a number of exercises all precisely alike in method and difficulty one to be commended. It cultivates a dull, mechanical habit, tending to divorce the understanding from the work of the student, and is thus contrary to the first law of teaching. Exercises should rather be arranged on the plan of a ladder, each perceptibly rising, in some minute particular it may be, above the preceding. The rungs of the ladder may, and for some pupils must, be placed very close together.

Examples should be employed in order to guide the pupil to discover a method that is yet unknown to him. These can scarcely be too simple; they should be first oral, afterwards written. Successive examples, almost identical may here be used to facilitate the pupil gathering for himself what the method is—making his own rule, in fact. After the method is once grasped, as much variation should be thrown into the examples as the knowledge and power of the pupils permit.

The next recommendation I will make is—(3) *Vary non-essentials*. In geometry, for instance, change the letters of the diagram, invert the diagram as to the right and left or up and down, or place it askew; take care that it does not illustrate only a particular case. Vary the language of explanation; do not permit a reproduction either of your phrases or those of the book; encourage the pupil to use his own language. It is not a real knowledge that can only find expression in a set form of words. In arithmetic sometimes use vulgar, sometimes decimal fractions, in the same sort of questions; in explaining local value, do not adhere to the scale of ten. In algebra we should not confine ourselves to the use of particular letters, and we should guide our pupils to see that the general propositions of algebra are true for expressions of any complexity. It seems superfluous to emphasize this direction, but experience tells me that it is needed. I have known a pupil who thought he knew that $(a+b)(a-b)=a^2-b^2$, puzzled by $[\sqrt{(1+x)}+1][\sqrt{(1+x)}-1]$, not realizing that a might be $\sqrt{(1+x)}$ Is it not also a common mistake to "cook" quadratic equations so that they shall always have rational roots?

We should be ever ready to invent new plans and systems of teaching; there is a great charm in novelty, and many little devices succeed for a time just because they are new. A system when old and stale, even if intrinsically better, is often not so efficacious as an inferior one when new.

This leads to the next piece of advice—(4) *Make a programme, but don't be a slave to it.* It is well for us to make a programme, and to consider beforehand how much we mean to get through in a term or in a lesson. But, as the unforeseen always happens, our system should be sufficiently flexible to permit of variation.

Moreover, but this I put forward with some uncertainty, there are occasions when the interest of our pupils is particularly excited, when they are capable of more vigorous or more prolonged attention than usual; may we not take advantage of these opportunities to go ahead of our programme, even to take something out of its natural order, to strike while the iron is hot? I perceive a danger in this—the danger of desultoriness. Cool reason would seem to say that our eager pupil must be told that now is the proper time to treat of the subject

in which he is at the moment interested. But such a snubbing is apt to destroy his interest altogether, so that it will be not forthcoming at the right time. It is entirely a matter for individual discretion when and how far to vary a programme that has been thoughtfully planned. All I say is that it must not be regarded as invariable. The variableness by no means neutralizes the advantage of having made it.

All the earliest teaching, and much of the later, should be oral. Oral and written teaching have each their peculiar advantages and peculiar difficulties. Oral teaching should be mainly catechetical; the sermon style is quite unsuited to mathematics The persistent silence of a solitary student is sometimes too much for the eagerness of the teacher, and he may be thereby induced to make the mistake of telling the pupil what the pupil is capable of finding out for himself. Telling is not teaching. It is an advantage of corresponding teaching, which somewhat mitigates the grave defects of that mode, that the pupil is compelled to produce something for himself. Again, a class, especially a class of girls, is sometimes only too willing to let a forward pupil answer for all, and there is considerable difficulty in inducing some of them to speak. It may be wise in such a case to make the timid pupil begin by repeating the answer of her companion, and then to require her to put it into her own words.

The common practice of the elementary schoolmaster of so framing his question that it requires but a single word to answer it, is one against which I must protest, although it is so general as to induce the belief that is prescribed by authority. In my opinion this practice deserves to be suppressed like the other "missing word" competitions.

In the oral teaching of arithmetic, the teacher should seldom be satisfied with the right result: he should ascertain how it has been obtained. Possibly it has been obtained in a sound though clumsy manner; perhaps by performing mentally the process which would have been written down. In these cases a further lesson is needed. The methods appropriate to mental arithmetic are not those commonly used in written. The right result may be a mere guess or it may have been whispered by a neighbour. Not only in spoken, but also in written arithmetic and algebra, the answer is the least important part of the matter; but is absolutely necessary that the answer should be right. The habit of attending to the answer only should not be formed by teacher or pupil. The worship of the answer is idolatry. The greatest difficulty of all is the want of desire to learn; this has been alluded to. When it takes the extreme form of the hatred of knowledge [12] for its own sake, it is simply insuperable. Why people should not want to learn mathematics is a question that would carry us too far from our subject, which is how to teach and to avoid mistakes in teaching those who do want to learn. A main difficulty arises from that chain-like connection of the parts of Mathematics which, properly employed, facilitates the learning of it. A weak link in the mathematical chain breaks under the stress that the attempt to make further progress imposes upon it. A student, for instance, who has been allowed to use the sign—without understanding it, who has been contented with a mere "rule of sign," can never be trusted, can never trust himself, not to trip in the use of it. Consequently he cannot follow a

[12] Proverbs i, 22, 29.

blackboard demonstration, cannot simplify expressions correctly, is perpetually hampered by what he thinks are trifling mistakes, mistakes primarily due to a want of proper attention to signs when he was first introduced to them, and his infirmity is now rendered difficult to correct on account of that very familiarity with the signs which, in accordance with the proverb prevents their receiving respectful consideration.

One who has understood thoroughly the relations of length, area, and volume, experiences exceptional difficulties when the more complicated notions of mechanics are presented, involving the further conceptions of time and mass. It is a cruel thing to teach a person arithmetic without giving him the advantage of a rational study of square and cubic measures, or to limit his geometrical teaching as to exclude the discussion of similar figures.[13] A valuable training is missed, and the want of this knowledge seriously impedes, nay, even sometimes entirely prevents further progress. All that has been said of the usefulness of so teaching the early subjects as to prepare the way for the later, may be repeated as causes of difficulty in teaching the later subjects when the way has not been so prepared, and of still greater difficulty if the earlier subjects have been so taught as to obstruct the acquisition of later ideas.

A practical difficulty is sometimes the infrequency and length of lessons; what is wanted for young beginners in mathematics—I suspect that it would be best for all subjects—is frequent short lessons. Some pupils get, say for geometry, two hours a week; now, if this were in four lessons of half-an-hour each, or even six lessons of twenty minutes each, progress would be rapid and the time would be ample; but when it is in two lessons of one hour each, much of the time is necessarily wasted on account of the incapacity of the pupils for prolonged mental exertion. There should be short lessons with full attention.

Another difficulty of mathematical teaching arises from too great dependence on text-books. The order in which a writer groups the various parts of the subject, is not always that in which the learner can most easily assimilate and digest the matter. Oral teaching overcomes this difficulty which is one of the more advanced rather than of the elementary teaching, for the schoolboy rarely reads a text-book.

I will conclude with a few remarks on *Examinations*. It will probably be argued against me, that the rational teaching I have recommended may be all very well in itself, but it "won't pay" in examination. To those who are inclined to hold this opinion I would say, Make the experiment. After a fair trial, sufficiently long continued, see if boys and girls, whose understanding is kept alive during the whole of their lessons, who are never taught names that do not correspond to ideas in their minds, nor to learn by heart what they don't understand, who are taught to refer to fundamental principles rather than to imitate processes in arithmetic and algebra, who are taught to regard geometry as a chain of reasoning that they are expected to understand and to use for themselves—see if such pupils do not utterly defeat in any well-ordered examination the pupils whose only idea of learning is learning by heart.

Nevertheless, examinations may be so conducted as to oppose the efforts of the teacher. A paper in geometry for instance, which consists of nothing but bald propositions, without the slightest variation in their statement

[13] London University Matriculation, used as a leaving examination.

from that of some accepted version of Enclid, is ce tainly very discouraging to intelligent teaching. I think we should make earnest efforts to get examinations of this class improved. I beg your sympathy for the efforts that the Association for the improvement of Geometrical teaching is making to induce Oxford to improve these papers

The best examinations are those in which there is active concert between the teacher and the examiner. The teacher should prescribe the character of the examination, and the field over which it extends; the actual questions proposed are all the better for being somèwhat different from those to which the pupils have been accustomed.

The real answer to the objector who maintains that teaching confessedly bad must be adopted in order that the pupils may pass examinations is that it is, or ought to be, no concern of ours whether the pupil passes or not. Where we have the power of withholding the pupil from the examination, we should exercise it whenever we know that he does not know his subjects. Where we have not the power, we are not responsible. It is not the examination so much as the preparation for it that is at fault. Examinations are good if we do not prepare for them.

What we have to do, that for which we are responsible, is to teach to the best of our ability. The pupil in the examination room has to answer the questions to the best of his ability. It is no disgrace either to us or to him that someone else answers them better. It is a disgrace both to us and to him that we should strive to enable him to answer the questions without understanding the subject the knowledge of which they are intended to test; and we can hardly claim to be doing our duty to the best of our ability if we wittingly so teach as not to give him the full benefit that the study of mathematics is capable of affording.—*The Educational Times.*

METHODS IN TEACHING.

THE method of teaching will vary with the nature of the subject to be taught and with the age of the children receiving instruction in that subject. The right method takes into account the process of the growth of intellect in children. Three periods in school life are generally indicated which are marked by three distinct stages of intellectual and physical development. The method applicable at one stage will not do as well at another. Great judgment and discrimination are necessary on the part of the teacher as regards matter and method, especially in elementary instruction where he has to form the mind of the children. No doubt acquisition of knowledge must be to a certain extent the scope of teaching, but in the earlier stages of instruction the educative value must take precedence; and therefore the method of imparting is of very great importance in primary instruction.

During infancy the child becomes acquainted with the external world, and his senses are in a state of constant activity. He is constantly making discoveries, and making progress more and more into the "regions of the hitherto unknown" to him. By the acquisition of new facts, and by their combination with those already known, the child gradually acquires knowledge and corrects errors into which he may have fallen. These processes of the child in his own acquisition ought to be the guide for the teacher. This is expressed in various forms and all may be summed up in one rule, "Follow Nature."

This is the process by which children learn when left to themselves. But when the child is placed in charge of the teacher, the latter, while trying to make the child an instrument in his own instruction, smooths the way and renders the work of the child lighter and more interesting. If the method of instruction is rightly chosen with due regard, as has been said, to the matter and to the receptive capacity of the children, the latter are taken from the known to the unknown by gradual steps that render acquisition of knowledge and cultivation of the power a thing of easy and gradual growth. The right method contemplates teaching any branch of instruction by a series of lessons carefully arranged and graduated like the steps of a ladder, one step leading to another, till the end is reached. The teacher may attempt all these; but one condition must be fulfilled so that all his endeavours may bear fruit, *i.e.*, the regular attendance of the pupil. It unfortunately happens that in most of our elementary schools much of the efficacy of teaching is lost by the irregular attendance of pupils. The rules for examination under the results systems are partially to blame. Half-a-day's attendance of a pupil is taken as a whole day's attendance for purpose of eligibility for the examination of a pupil. For the cultivation of the powers it is essential that any scheme of lesson worked out by a teacher is fully grasped by the pupil and that no intermediate steps are lost. If regular attendance is secured, for which the earnest and active co-operation of the parent is essential, especially in the case of little children, the teacher will find it his duty to resort to the various means at his disposal to promote their attention and diligence in connection with their school work.

Strictly speaking there are only two methods of instruction, the Inductive and the Deductive methods. These two methods have also been called the Analytic and the Synthetic methods. The use of these latter terms has been condemned by nearly all writers on education on the ground that great confusion exists as to their precise meaning, and "different authors have not come to an understanding as to the use of these terms." In the application of the Inductive method, the teacher starts with facts, and having made his pupils observe and test them, classifies them and leads the pupils to a law. By the Deductive method the teacher starts with truths, rules and definitions, explains and makes them understood, and then passes to the application of these rules, &c. to the particular cases that fall under the rules. These two methods are not always used exclusively in teaching, they frequently intermix, each being introduced to test and confirm the work of the other in the minds of the children. These being indicated as the fundamental methods of teaching, we should consider in what manner the knowledge is to be transmitted to the pupil. The method may be inductive or deductive; but it will make a great difference as regards the impressiveness of the instruction which of the following forms of communicating knowledge to the pupils be adopted. The teacher may by means of a continuous uninterrupted discourse, state by either method what he has to say; or he may, by means of questions and suitable hints and suggestions, lead the pupils to comprehend what is placed before them. Hence we may indicate two subordinate methods, the method of Exposition and the method of Interrogation.

Each of these methods has its own advantages and disadvantages in relation to its sphere of application. While one is the suitable method to resort to, another is to put a square thing in a round hole.—METHOD *in Madras J'n'l of Ed.*

MISTAKES AS TO THE MODERN LANGUAGES.

BY PROF. F. V. N. PAINTER, SALEM, VA.

BY modern languages, as used in this article, are understood French and German; but the same remarks will apply to Spanish and Italian, and also to English when studied on the Continent.

1. It is a mistake to suppose that a modern language can be learned in a few weeks or months. From time to time we hear of new methods which profess to accomplish this result. Of course some methods are better than others. But a moment's reflection will show that no method, whatever may be its claims, can do anything more in six months than give the student an encouraging start. A modern language consists of an immense vocabulary, representing the ideas and culture of a high civilization. The mastery of such a language, if it be possible at all, is the work of a life-time; and any adequate knowledge of it must be the work of years.

2. Another mistake is to maintain that any one method is to be used at all times and under all circumstances. In teaching modern languages, as in other spheres of human effort, the means should have some relation to the end. Though a thorough knowledge of a language includes the ability to read, to write, and to speak it, any one of these three particulars may for special reasons, be aimed at. If the fluent use of a small every-day vocabulary is desired, careful, and continued grammatical drill is not necessary. If reading the language is specially aimed at, small conversational exercises should give place to a study of the forms and structure of the language. Furthermore, the age of the student should have consideration in deciding the question of method. It is a loss of time to attempt to teach adults in the same manner as children. Without linguistic training and the power to take in abstract statements, children learn best by concrete, oral practice. But adults readily comprehend generalizations and principles, which they would learn in practice only after weeks or months.

3. It is a mistake to think that native teachers are the best. This belief is based on the supposition that conversational ability is the chief requisite in a teacher. Without underrating this ability, it may safely be said that other attainments are more necessary. To say nothing of the personal factor in the teacher a good knowledge of English is indispensable. An acquaintance with the difficulties of a foreign language, as learned through actual study, is very desirable. Without this twofold knowledge, the teacher will hardly be able to enter into full sympathy with his pupils, and to awaken a proper interest in his work. Besides this, only the American teacher is likely to make his instruction harmonize with our ideas and methods of education. As a rule, the American teacher, provided he has made adequate attainments in the language he proposes to teach, will give the best results.

4. It is a mistake to believe that a modern language can be learned without a teacher. To be sure, any person of good attainments in English or in Latin and Greek can master French or German grammar without much difficulty. He can learn also to understand the written pages without the aid of a teacher. But when it comes to pronunciation, which may justly be regarded as an indispensable element in acquiring a language,

his effort is apt to be a lamentable failure. The reason of this is obvious. Both French and German contain sounds unlike anything in English; and these sounds are to be learned, not by written rules, but by imitation.

5. It is a mistake to suppose that the modern languages are not disciplinary. This mistake, far less common now than fifteen years ago, becomes obvious when the effect of language study upon the mind is duly considered. The study of language trains the attention, cultivates the memory, and develops the judging and reasoning powers. In these particulars there is not much difference among the cultivated Indo-European family of languages. The thorough study of any of them gives substantially the same results. In addition to this, the study of languages, as soon as it reaches literature, brings to the mind a store of fact, thought, and feeling. Discipline passes over into culture. And in this particular, the modern languages, including the mother tongue, are without a rival.—*The School Journal.*

THE TWO SCHOOLS.

AS soon as the human race achieved civilization it discovered two things —that some men had a power to lift others to higher regions of thought, and that it was essential to impart a knowledge of written language and computation. These two are not necessarily related, and in the early days they were wholly separate. Every nation had its "wise men;" there were those who, like Socrates and Plato, without fee or reward imparted their conclusions concerning the great problems that thrust themselves forward when men had leisure to think. But these men dealt with manuscripts, for the problems were too vast for one age to handle alone; the conclusions of preceding generations were sought. The idea of teaching writing and computation had a commercial basis; it was done to promote the usefulness of the individual. There was no attempt in the early days to make learning the alphabet and the digits result in an elevated or improved character or mode of life.

As time has gone on, it has been seen that the existence of a body of men who shall follow in the footsteps of the philosophers, who shall present the problems of life to minds in a formative stage, and who shall be able to lift youth into the higher regions of thought, is absolutely necessary. It has cost the world a great expenditure of time and money to find this out, but it may be asserted that the civilized nations of the earth are determined to provide the means of enlightenment for the oncoming generations; and if there is close scrutiny given to the trend of thought it will be seen that more is meant than enlightenment—a good deal more. The advanced school aims at implanting right thinking and right living. There is another school that aims to follow the paths beaten out 2,000 years ago. The best example of this to-day on the earth is the Chinese nation; the arts of writing and computation are extensively taught, and yet human progress and happiness are stagnant. The true human foundation was discovered 3 000 years ago; the Semitic nation had the best conception of education as well as of religion: "To know wisdom and instruction, to perceive the words of understanding—to give to

the young man knowledge and discretion." This is in the language of long ago, and it is the utterance of an oriental mind, and hence it differs immensely in its statement from what the Western mind would say to-day in technical, but well-understood phrases.

These two schools of thought are in the field to-day: There are those who declare the business of the teacher is to cram certain information down the throat of the pupil; there are those who conceive the work of the teacher to be to direct the pupil in his search for knowledge—knowledge that shall form a part of his "life." ("Take fast hold of instruction, for she is thy life."—Prov. iv. 13.) The discussions concerning education turn on these points. Men differ and join different schools of thought somewhat according to their conception of the facts before them, but temperament is quite a factor; the ruling idea of life is another. One who teaches in order to get a living is likely to adopt the Chinese conception of education; one who lives to teach will assuredly choose the other. One would realize God's thought of man; the other, man's idea of man. One makes quantity the goal; the other character—or a normally-built mind. One runs its sounding line into motives; the other into facts. One turns to God's book—the field of nature; the other begins with man's discoveries. One values the child; the other what the child has accumulated. One begins as the Creator begins, and humbly attempts his work; the other ignores the fact that the Infinite speaks to each heart in the universe. The Chinese school or the Semitic, which? One who has looked over the literature of education for the past century with care cannot but conclude the latter is as sure to rule as that religion that originated out of Semitic thought is destined to spread from pole to pole. —*New York School Journal.*

ARITHMETIC IN THE SCHOOLS.

BY PROFESSOR WILBUR S. JACKMAN.

IT would be most interesting to scan the pages of the history of education to find how it is that arithmetic gained the prestige it has so long enjoyed. The reason is clear. The magnificent achievements in science, through the application of mathematics, of such men as Kepler, Newton, La Place and others gave to humanity such splendid ideas of the members and forces of this universe, and rendered our knowledge of them so clear and definite, that the world has ever since been awed almost into worship of even the means they employed. Think of the richness which mathematics possessed for such a man as Newton! His every calculation fixed for him a star in the heavens; it set the time and places of the planets, and measured the force which holds them swinging forever in their orbits. By the aid of mathematics, Newton was able, more than any other man from the dawn of creation down to his day, to penetrate the remote recesses of this universe and to read the secrets of the Almighty.

Those in the past who gave mathematics its place of honor among studies were driven to the study by their thoughts about the universe. By means of mathematical calculation their distinct notions became clear

and definite ideas. So should it be with the pupils in the public schools; all thought studies actually demand mathematical work that thought itself may become clear. It is the function of form and number study—that is, of the mathematical element in education—to give accuracy and exactness to ideas; to render hazy notions clear, and to evolve the definite from the indefinite. The man who says that he can go through any and all walks of life without this mathematical element as safely as he can with it is most blindly and grossly self-deceived. Nearly all, if not all, the failures of life come to us because at some point in the train of our calculations our ideas were not exact. The reason for our neglect in this direction is that we were not led to see the value of such accuracy in quantitative work when in school. The long isolation of number work from everything else has not only been hurtful to all other subjects thus deprived of its assistance; it has proved to be terribly self-destructive. It requires but a passing glance at any arithmetic that one may pick up to see that the subject matter in arithmetic is as bad or perhaps worse than it ever was in the case of reading, drawing or writing. It is not exaggeration to say at least ninety per cent of all the exercises given in any natural arithmetic fall into one or other of the two classes: First, those which deal wholly with abstract operations, and second, those which deal with material absolutely outside the experience of the pupil. A few examples will illustrate this point. Open any arithmetic and count the weary pages of such problems as "What is ⅓ of 6? ⅔ of 9? 4 + 8? 13 − 4 = ? ⅓ + ⅙ = ? ⅙ ⅐ + = ? 2⅔ —¾ = ?" *ad nauseam.* It serves no purpose for the teacher to say that he or she can create and sustain an interest in such work. Everyone, doubtless, has been very much interested in just such problems, but if they are of intrinsic value, then why is it that all interest in them is lost the moment the pupil reaches the years of reason and accountability? A subject of intrinsic value never loses its interest.

Turning now to the class of problems which deal with material beyond the experience of the pupil, the same dreary waste of pages may be found. It is within the bounds of truth, perhaps, to say, that nine-tenths of all the so-called concrete problems found in our arithmetic deal with questions of values. Now it is universally conceded that, while adult man willingly subjects himself to the laws which the necessities of his social relations place upon him, the child does not recognize any such bans. And since his notion of business necessarily develops much later, it follows that his idea of value under ordinary circumstances must be late in maturing. This is merely the statement of a fact with which all are more or less familiar. An average third-grade boy on the south side of a building on a warm spring day would not exchange his pocketful of marbles for a corner lot unless he saw immediate prospect of reconverting it into marbles again. And yet that same boy through all time has been expected to solve problems relating to the sale of lands and estates with all the ease of a real estate agent of long experience. Of course it will be maintained that the notion of value must be developed. This is true, but let no one deceive himself by supposing that he is developing the idea of value in his pupils when he is having them solve abstract problems in which incomprehensible values are handled. This fatal mistake of filling arithmetics with purely abstract problems, and also the so-called concrete problems which deal with incomprehensible material, has reduced the learning of arithmetic on the part of the pupil to the memorizing of a

string of disconnected exercises which cannot be remembered or applied because they are not associated in the mind with any intrinsic thought, and it has driven the instructor to employ a vast multitude of catchpenny devices for the purpose of teaching a few very simple processes. It is one of the greatest monstrosities of modern education that the application of processes so few in number, and so simple as those in arithmetic, should be so little known and so poorly understood by both pupil and teacher. —*The Educational Review for January.*

NOTES FOR TEACHERS.

THE SCHOOL CURRICULUM.—If we do not come in the course of a few years to some understanding of what constitutes a good high-school course, it will be because we cannot interpret the teachings of experience. Almost every study and every method of instruction is on trial somewhere. The American high school has much greater freedom of movement than the grammar school, and it has to a large extent availed itself of this freedom. When, however, we are assured by those who have tried one system that the results are in the highest degree satisfactory, and by those who, strongly disbelieving in this system, have tried one very different, that their own results are almost ideal, we may reasonably conclude that the lessons of educational experience are very hard to read, or else that there is no great difference in methods and studies in secondary education. Men whose feelings are strongly enlisted in favor of a particular system will be slow to see that it is not entirely satisfactory; while how to compare fairly the results of different methods is one of the most difficult problems of education. So much depends upon the individual himself that, under any system, pupils will grow up to be men and women who will play their parts in life very much according to their abilities. Stimulus and example count for so much, also, that it is better to have a poor course of study with the living force of a great teacher behind it than a faultless curriculum with mediocre instruction.

In the present condition of American education there can be no great harm, indeed, there may be considerable advantage, in having quite a variation in the high-school courses designed to fit pupils directly for life. But the practical advantages of having a uniformity in the requirements for admission to college are very great. Almost every college has some peculiarities in its requirements; and when a school has to prepare pupils for several colleges, as most schools do, it is almost sure to give them a poorer preparation than if they were going to a single institution. It is remarkable that colleges do not have a course whose requirements for admission are the subjects taught in secondary schools in courses which are not classical. Colleges which desire a large number of students bid for them with special or technical courses, or with courses whose requirements for admission are not very substantial. Colleges would largely increase their number of students and do real service to the cause of education, if they offered a course of study such that the requirements for admission would be the subjects ordinarily taken by students in secondary schools who have no definite intention of pursuing their studies further.

In all our discussion of the read

justment of the school curriculum, it is well to remember that society is being constantly modified, that we are living in a period of rapid and often unforeseen changes, and that, as education is to fit men to live the life of their time, all arrangements must be more or less provisional. If we are seeking for an ideal curriculum, we shall fail, as the wisest men in all the ages past have failed. A healthy discontent with our present circumstances and work is wise, but it is also wise not to be too discontented. No practical system of education produces ideal results, and it is very easy to criticise present work from an ideal standpoint. The reformer in education always has the advantage. The actual results produced by present arrangements are not as good as they might be; and, as the substitutes proposed have not been subjected to the crucial test of actual practice with the weak and stubborn minds of children, it is easy to predict that under the new system there will be no friction, and that the calculated results are sure to be obtained. This is a time of progress and of great pedagogical activity; but we must not, after all, expect too much of it. Any arrangement of our work will not greatly change the mind and character of the child, which is our permanent factor of resistance. The path of the schoolmaster in this generation and in the next is sure to be set with thorns.—*Prof. Roland S. Keyser, in the School Review for March.*

NEGLECTED EDUCATION.—As the subject is of great interest to the true teacher we subjoin the following extract from an address recently delivered by Dr. Arthur MacDonald, a specialist connected with the United States Bureau of Education, having special charge of the data in regard to education as related to the abnormal and weakling classes. His remarks abound with useful hints and suggestions:

Now, education in the narrow sense of mere intellectual instruction is not sufficient to reform children who spend one-fourth of the day in school and three-fourths on the street or with criminal, drunken or idle parents. But are there not reform schools? Yes, but no provision has been made for the little children. Not a few of the inmates of reformatories come there practically incorrigible, and the testimony of prison wardens is that some of the most hopeless prisoners are graduates of the reform schools. The fault is not in the reform schools, but in allowing children to live the first years of their life in surroundings that almost predestine to crime. Reformatories are expected to erase the indelible criminal impressions made upon children from birth, or before, till the age of six. Instead of deserving criticism the wonder is that reformatories do as much as they do. In brief, it is useless to expect any great decrease in crime, especially habitual crime, until very young children are properly cared for; that is, until they receive the moral and social education of a home or home-like institution. This is the foundation of all prevention of crime. But much remains to be done after a child has had this good start, for there are still dangers of falling into crime. The method of prevention from this stage on consists in moral, mental and physical training, in other words, education in the true sense.

The criminally inclined are specially weak in moral impulse and below the average in intellect and physique. The education of the will is the main factor, but the training of the intellect and sentiments are necessary to this end. The remedy, therefore, for crime must be general, gradual and

constant; there is no specific. Every reformatory is a school in which emphasis is laid upon moral and industrial habits, which in the young become, as it were, a part of their nervous organization. This is shown by the fact that moral individuals when hypnotized unconcsiously resist evil suggestions. When passion, perplexity or temptation causes the loss of self-control then it is that good habits implanted in childhood and woven into the constitution overcome evil and criminal impulses. The force of habit is as strong for good as it is for evil. One of the principal facts brought out at the late National Prison Congress, at Baltimore, was that all prisons should be reformatories. All men, no matter how old in crime, can at least be improved and benefited. That is to say, the best prisons of the future will be reformatory prisons, and the main means of reform will be the inculcation of good mental, moral, physical and industrial habits; in other words, education.

PUBLIC OPINION.

MANNERS.—Mr. Ruskin once said that, in his judgment, what is commonly called Education is little better than a training in impudence. Without doubt the manners of our children leave much to be desired, and we constantly need to be reminded that the school ought to be the place for the formation of right habits as well as a place of instruction. The aim of education, according to Locke is, "Health of Body, Virtue, and Good Breeding," and with us it should be a "habit of good action under a sense of duty." And of good action the obedience, courtesy, and self-control which constitute good manners form no inconsiderable part. It is impossible for any system of training to guarantee them, but the child can be guided and led into those habits without which they are impossible. "Use can almost change the stamp of nature;" the right habits must be formed in childhood, for no virtue comes to man by nature. If good manners have not been acquired in youth, it is extremely difficult to acquire them in after-life, and such as may be subsequently put on have the appearance of ill-fitting clothes.

But when all is said we must depend ultimately upon the teachers: "As is the teacher, so is the school." If the teacher will remember that in every detail of organisation and management the moral end should be the end in view, if he will be careful always to present a good model—for it is by imitation that the child begins those habits which are to form the basis of its character—if he realize that we look to him not merely to produce what Mr. Goschen has termed "saleable knowledge," but "the building up of the kingdom of God in the heart of every child," then these minor morals to which we have referred would cause us no anxiety, for the greater includes the less. This may seem a counsel of perfection, but the highest profession—and there is none higher than that of educating children—must have a high ideal. Discipline must depend upon the moral authority of the teacher, and in exercising his authority his commands must have no taint of personal feeling or convenience, but be entirely dependent on the moral purpose of his profession; as, for instance, in the words of Herbart, "we must never censure so as to cause a boy to lose his self-respect."

It would, however, be unfair to overlook the fact that want of courtesy

and reverence is largely due to the spirit of the age. Freedom to develop as one *likes* is destructive of that reverence which has been called the the alpha and omega of education, and without which we may look in vain for gentle manners. "Obedience," after all, as Carlyle said, "is our universal duty and destiny, wherein those who will not bend must break." And the task of the teachers will be enormously facilitated when men have come again to realize that "true liberty inscribes upon its shield the knightly motto, 'Ich dien.'" It would be well alike for teacher and scholar if upon the walls of every school these words were found, and those of Lacordaire, "Write above the word 'liberty,' 'obedience;' above 'equality,' 'hierarchy;' above 'fraternity,' 'veneration;' above the august symbol of rights, the divine symbol of duty."—*The School Guardian.*

ARE YOU DOING YOUR SHARE?—Our public school teachers are expected to do too much. In Canada more than in any other part of the world I imagine they are doing it reasonably well, yet the danger must not be overlooked of expecting them to do it all as far as the education of youth is concerned.

Take table habits for instance. No schoolmaster or schoolmistress can attend to them. Boys and girls are permitted to eat in the most outrageous fashion by their parents. Greed, wastefulness, a dozen different vices may be checked at the table, though those who make their dinner table the occasion when unkind things are spoken are making a great mistake. They think if they send their children to a good school on week days and Sunday, if they hire music teachers and dancing masters they have done their duty. It is what is left for the parents to do that is being most neglected, and I should be delighted if some greater educational authority than myself would raise his voice in denunciation of this damnable proxy system which is day after day making the boys and girls of this country the factory product of public and Sunday schools. What is to become of the individuality of the parents, of the race, if we are to entrust every educational department of life to somebody else?

And right in line with this is the fact that the father who reads his newspaper at home after dinner should talk to his children about what is happening, to keep them posted on men and the motives which govern them, on women and the ruin which overtakes them if they cease to be what they should be. Bless us all, is the fireside of the past vanishing before what someone has called the "hole in the floor?" Are we doing everything mechanically, co-operatively, cheaply, and forgetting the duties that are supremely individual and absolutely necessary?

It may be said that all parents cannot be educated, yet all parents have some education. Never was a man or woman so rough and rude that he or she had not attractive qualities of some sort. If they only teach this they are doing something to prevent the output of our schools from being a factory-made article. It is not the child who is just the same as everybody else who succeeds in the highest degree; it is the child who is himself, or herself, who bears the impress and has the halo of a loving care and of a widening influence in some direction, of a parent. In this new country perhaps we have done the best that we could. Illiteracy is rare and nice culture is equally rare, but we must try to rise superior to it, and the question that I am pressing is, are we taking the proper means to do so? I have seen college and university professors in this city who have not a

cultured manners as an attentive waiter in a restaurant. We must try to be attractive. It is not simply a question of obtaining a pretty veneer, but no matter how good the inside of us may be we must not be repulsive on the outside ; we must know how to act, how to talk, and we must have something to say. The age of rudeness in speech and conduct is past. Genius can always be appreciated, no matter if the man possessing it is unattractive; but there is very little genius, and the idea of our schools and our homes I imagine should be that the commonplace person should be made as good and genuine and as attractive as possible, and the hope of accomplishing this must be based on home training more than on school teachers. — "*Don*" *in Saturday Night.*

GEOGRAPHY.

THE FIRST TRANS-ATLANTIC STEAMSHIP.—At the meeting of the Canadian Institute of the 17th December last a short paper on ocean steam navigation was read by me, in which I proved by incontrovertible evidence that the first ship to cross the Atlantic under steam was constructed in Quebec by Canadian owners. Since that date two articles on the subject have been published in the United States which appear to me especially to call for notice.

First in *The Popular Science Monthly*, of the City of New York, for January (page 424), second in *The Illustrated World's Fair* for February (page 447), published by authority in connection with the Columbian Exposition at Chicago. In both publications the memorable voyage of the Canadian steamship "Royal William" is entirely ignored, and the claim is again advanced that the first vessel propelled by steam across the Atlantic was the "Savannah," built in the United States.

Having learned from *The Popular Science Monthly* that the "Log of the 'Savannah'" was to be found in the publications of the Smithsonian Institution at Washington, on application for it I have obtained a copy through the courtesy of the Secretary.

The report on the "Log of the 'Savannah'" is by J. Elfreth Watkins, Curator of the Section of Transportation and Engineering. It commences as follows :—"The first voyages of a steamship across the Atlantic were made in 1819, by the 'Savannah' an American vessel carrying the American flag, and manned by an American crew. It seems eminently proper to preserve an authentic record of the events connected therewith in our national archives, particularly since the original log-book of these voyages is in the collection of the United States National Museum."

I have examined Mr. Watkins' report with care, and I find myself in no way called upon to modify the opinions expressed by me in the paper read before the Canadian Institute. The log contains no single fact to place the "Savannah" in a better light in the history of steam navigation than I have felt it my duty to assign to it. So far as the log furnishes information it confirms the view I had formed that the "Savannah" was practically a sailing ship.

During most of the period of the voyage from Savannah to Liverpool she was propelled by wind and not by steam; on her homeward voyage steam was not employed. I correctly stated in my paper that a contrivance set in motion by steam had been used for giving motion to the ship in smooth water when the wind failed.

The additional power consisted of paddles capable of being folded together and removed from the ship's sides and stowed on deck. The report of Mr. Watkins confirms the views held that the propelling contrivance was of a makeshift or temporary character. We meet entries in the log denoting the fact, such as "got steam up, and it came to blow fresh; we took the wheels in on deck in thirty minutes," (p. 629). "8 a.m.—Folded up the wheels and stowed the wheels," (p. 629). "At 8 a.m. took off the wheels in 20 minutes," (p. 632). Likewise in the statement of Capt. Steven Rogers, the sailing master (p. 637), we learn that the vessel was brought from steam to canvas in 15 minutes, by the watch. The character of the machinery is confirmed by the publication of the account book, which contains a record of the original charges made against the "Savannah" for its construction by the proprietors of the Speedwell Iron Works, New York, (pages 618 to 621). The total cost of the machinery is shown to be $3.704.50, while the ship alone cost about $46,300. On the return of the "Savannah" from Europe to the United States all the machinery was removed and sold for $1,600, and applied to other uses, furnishing the undeniable proof that its application to the purposes for which it had been designed had not been successful.

The log shows that the "Savannah" left the City of Savannah on May 22nd, for Liverpool, and that she used her paddles for a few hours in the smooth water of the river; when the pilot left the vessel, they were unshipped and not again put in place until May 30th, when they were worked for ten hours. Mr. Watkins furnishes a summary of the several occasions on which the paddles were at work during the whole period of the voyage to Liverpool on the following dates, (p. 633).

Got Steam up.	*Shut Steam off.*	*Hours.*
May 30th, 8 a.m.	May 30th, 6 p.m.	10
June 1st, 8 a,m.	June 2nd, 2 a.m.	18
June 6th, 8 a.m.	June 6th, 12 p.m.	16
June 9th, 8 a.m.	June 9th, 12 m.	4
June 11th, 10 a.m.	June 11th, 12 p.m.	14
June 16th, 8 p.m.	June 17th, 2 p.m.	18
Total hours.....		80

I take this opportunity of correcting a mistake into which various writers on the subjects have fallen, and which I have myself repeated in the absence of better information. It has been frequently stated that the "Savannah" was driven by steam on *eighteen* days of her voyage. According to the log, the engines were worked on *eight* separate days, not *eighteen*, and on no occasion for a whole day of 24 hours. Mr. Watkins' points out that the ship "came to anchor off Liverpool, 29 days, 11 hours, from Savannah, during which time the vessel had run under steam eighty hours." That is to say, the "Savannah" used her paddles as a means of propulsion 3 days, 8 hours, —on a voyage of 29 days, 11 hours.

The "Savannah" remained in the port of Liverpool several weeks, then proceeded to the Baltic, calling at Stockholm, St. Petersburg and Copenhagen, before she returned to the United States. I copy the following from a brief account of her voyage from the Baltic to Savannah in Mr. Watkins' report (page 635).

"The homeward passage was a stormy one; heavy winds, rough sea, gales and storms being almost daily noted in the log. The engines were not used during any part of the return trip until the 30th of November (the fortieth day alter leaving Arendale, Norway), when Capt. Rogers 'took on a pilot inside the bar,' and at 10 a.m. anchored in the Savannah River and furled sails on the flude tide, got under way with steam and went up and anchored off the town. Thus the 'Savannah' safely and triumphantly returned to her home port."

The publication of the log of the "Savannah," makes it clear beyond all question that the ship did not make the first or any voyage across the Atlantic by steam power. The "Savannah" had a primitive contrivance such as has been described, by which the vessel could be propelled by steam in quiet water, but she was constructed for navigating the open ocean as a sailing ship only, and as such she practically made both outward and homeward voyages. The history of the "Savannah" gathered from the publication issued by the Smithsonian Institute shows that she was designed originally for a sailing ship; that after her construction was completed, shifting paddles to be driven by steam were added; in 1819 she crossed and recrossed the Atlantic, the double voyage occupying about 70 days, of which period the vessel was only three days and eight hours under steam. The "Savannah" posed as a steamship one season and was then divested of her machinery, after which as long as she remained afloat she ran between New York and Savannah as a sailing packet.

The claim set up for the "Savannah" to the distinction of being the first ship propelled across the Atlantic by steam is thus swept away. I have already submitted irrefutable proof that the actual pioneer of trans-Atlantic steam service, and the forerunner of the Cunard and other magnificent vessels of that class, was beyond all question the steamship "Royal William," a steamship designed by a native of the city of Quebec, constructed in the ship-yard under the shadow of the Citadel, and sent to sea by the enterprise of Canadian merchants.—*Sandford Fleming, C. M. G. in The Quebec Gazette.*

AN ECLIPSE OF THE SUN.—The English and French are making great preparations for observations of the eclipse of the sun, which will be visible in Africa and South America. One English expedition will start for Africa arriving at Bathurst on April 2, just a fortnight before the eclipse comes off. Another one will go to Pernambuco in Brazil. The French will send an expedition to Joel, Africa, and Harvard college, one to Chile. This eclipse will be one of the longest and most important of the century.—*The School Journal.*

THE HEART OF THE TREE.

AN ARBOR DAY SONG BY H. C. BUNNER.

What does he plant who plants a tree?
He plants a friend of sun and sky;
He plants the flag of breezes free;
The shaft of beauty, towering high;
He plants a home to heaven anigh
For song and mother-croon of bird
In hushed and happy twilight heard—
The treble of heaven's harmony—
These things he plants who plants a tree.

What does he plant who plants a tree?
He plants cool shade and tender rain.
And seed and bud of days to be,
And years that fade and flush again;
He plants the glory of the plain;
He plants the forest's heritage;
The harvest of a coming age;
The joy that unborn eyes shall see—
These things he plants who plants a tree.

What does he plant who plants a tree?
He plants, in sap and leaf and wood,
In love of home and loyalty
And far-cast thought of civic good—
His blessing on the neighborhood
Who in the hollow of His hand
Holds all the growth of all our land—
A nation's growth from sea to sea
Stirs in his heart who plants a tree.

—*The Century for April.*

To cultivate kindness is a great part of the business of life.—*Dr. Johnson.*

Better a little chiding than a great deal of heart-break—*Merry Wives of Windsor, v. 3.*

EDITORIAL NOTES.

EDITORIAL NOTES.

The Convention of the Education Association for Ontario, 1893, was a great success. Every one present and competent to judge from personal experience admitted this fact without any hesitation. In every department there was a good attendance, and in making this statement, we do not forget the fact that the Association is now composed of every class of workers in public and private education. The College and High School department was particularly strong in numbers, ability and experience.

The Heads of Colleges and Universities were missed from this, the great educational gathering of the year. These gentlemen limit very much their own usefulness and weaken the work of the graduates of their Universities by not being present to co-operate in every way with the earnest workers of Ontario in the important interests of education.

The question which commanded most attention from the Departments was that of the programme of studies. All the Departments join in saying that there are too many subjects on the programme of studies.

The public school men, whether inspectors or teachers seem to think that the entrance examination to the High Schools should be on the work assigned to the fifth class and not on the subjects of the fourth class in the public schools. The cry from all quarters is lack of scholarship.

This deficiency is said to be found also in our graduates, at least in those of them who desire to become teachers. What is the cause of this lack of preparation for the work of life? Too much hurry: Drive. The Public School teacher is driven to pass his pupils through the entrance examination to the High School. The High School master is driven to prepare his pupils to pass departmental examinations to get certificates or the matriculation examination. The result is, general dissatisfaction.

The masters in our High Schools, when they consider their own work, are ill at ease; the professors in our colleges are sure much better work should be done by them under different conditions.

In our educational work, if it is to be worthy of ourselves, we must have more thoroughness—wider culture; we must have less specialism, less drive.—We must have scholarship; schools must have skilled teachers. But let us not forget these are precious and very costly things. To have these, the ripe fruit of human effort, requires time, ability and larger expenditure of money than Canada has hitherto seen. In public estimation, material wealth must consent to take third or fourth place.

There are many things more valuable for humanity than those things which bulk, at bulk, at present, largely to the eye of the public. "Man does not live by bread alone."

We draw attention to the Educational tour in Europe announced in this issue. It certainly affords to teachers an opportunity of increasing their knowledge and widening their culture. In a lecture given recently to the teachers of Toronto, Principal Grant said, "By all means visit first the old historic lands in order to see and learn what man has done." In Germany, Italy and Switzerland every step is replete with interest as regards the past, as well as pleasure in the present.

A word might be said as to the cost of the excursion. Every arrangement has been made to secure the greatest possible return for the expenditure involved, and those who avail themselves of it will have no responsibility and all the pleasure.

SCHOOL WORK.

SEAFORTH COLL. INST.

Primary Class—March 1893.

EXAMINER—C. CLARKSON, B.A.

(*a*) "Mighty victor, mighty lord!" etc.

1. Write down this number from memory. Punctuate carefully.

2, Explain the relation of this part to the whole poem. Do this first with reference to the symmetrical structure, second with regard to the connection of thoughts. Try to be brief and clear.

3. Explain the general meaning of the passage by reference to English History. Do this line by line.

4, Select 10 words and give their etymology and their exact meaning as here used by the poet.

5. Name and explain every figure in the passage, and state the effect each figure is intended to produce on the reader.

(*b*) Quote a Sonnet and (6) point out its metrical structure and state (7) the general laws to which it conforms.

8. In your sonnet show how the leading idea is developed by stating precisely what the leading idea is, what rhetorical principle is used to expand and impress the idea, and how it appeals to the reader's emotions by its truth and beauty.

(*c*) By means of quotations and remarks establish (9) the distinction between Epic and Dramatic poetry. (10) What element is common to both? Give examples.

(*d*) Quote from memory some lines—4 at least—from poems which come under the following heads:

11. A fragmentary poem, which resembles a broken monument.

12. An imaginative poem that sounds like a riddle or a fairy tale,

13. A melodious poem with a veiled meaning.

14. A poem in which the sublime and the ludicrous are conjoined.

15. A poem founded on human interest and full of pathos.

(*e*) From the *Trial Scene* quote a few lines containing:

16. A touch of sublimity;

17. A stroke of wit;

18. A sally of humor:

19. A piece of sarcasm;

20. A prose passage.

NOTE—12 questions questions only to be attempted—9 marks for each.

CLASSICS.

By PRINCIPAL STRANG, Collegiate Institute, Goderich.

1. Translate idiomatically.

(a) Militibus permisit si opus esse arbitrarentur uti hoc facerent.

(b) Legatum certiorem fecerunt Gallos oppidi oppugnandi consilium cepisse.

(c) Accedebat quod montem ab hostibus teneri nobis persuasum habebamus.

(d) Majori tamen parti placuit, hoc reservato ad extremum consilio, interim rei eventum experiri.

(e) Nonnullae hujusmodi sententiæ dicebantur ut impedimentis relictis eruptione facta ad salutem contenderent.

2. Give idiomatic Latin equivalents for 'to fight a battle,' 'despairing of safety,' 'he thought he had no reason to fear an attack,' 'your safety depends on your valour,' 'to take possession of the heights which commanded the camp,' 'supplies could not reach them owing to the blockading of the roads.' 'other fresh men took their places,' 'they surrounded and slew the barbarians.'

3. Change to *oratio recta*, "Si velit suos recipere, obsides sibi remittat."

Translate chapter 16 into good idiomatic English.

1. *Totius.* What other adjectives form heir genitive in this way?

2. *Aliquid consilii.* Give a list of other neuter pronouns or adjectives similarly followed by the genitive?

3. *Reciperent.* Account for the mood.

4. *Quo conservaretur.* Why *quo* rather than *ut?*

5. *Quo proelio, reliquum tempus.* Give the corresponding plural forms.

6. *Vendidit.* Derive. What compounds of *do* are of the third conjugation?

7. *In quos.* What difference between Latin and English idiom does this exemplify?

8. *Jus legatorum.* Explain the reference.

9. Distinguish *relĭqui* and *relīqui*; *dĕdi* and *dēdi*.

10. Give all the infinitive forms of *cogerent*, and all the participles of *reciperent*.

11. Translate into Latin (*a*) when this town is taken we shall have no place to betake ourselves to. (*b*) The barbarians promised to observe the rights of ambassadors very carefully. (*c*) We have no means of defending this place against the barbarians.

QUESTIONS ON CÆSAR.—BOOK III.

Translate chapter 10 into good idiomatic English.

1. *Gerendi.* Is this the gerund or the gerundive? Give your reasons for thinking so.

2. *Supra.* Why this word rather than *antea*?

3. *Equitum.* Is this a subjective or an objective genitive? Why?

4. *Rebellis, defectio.* Distinguish clearly. To what would *tumultus* (*servili tumultu*, Bk. 1, chap. 40) be applied?

5. *Hac parte neglecta.* Expand into a Latin clause,

6. *Incitabant putavit.* Account for the change of tense.

7. Compare *novis, celeriter, latius.*

9. *Mobiliter.* How are adverbs usually formed?

9. Exemplify from the chapter the formation of nouns by affixes.

10. Write the participles of *odisse*, the present infinitive passive of *facta* and *neglecta*, the perfect indicative of *intelligeret*, and the present subjunctive of *datis*.

11. Translate into Latin (*a*) We must not overlook these parts.

(*b*) You will not be allowed to detain Roman knights.

(*c*) We are all naturally fond of these things.

MODERN LANGUAGES.

EXERCISES IN ENGLISH.

(*a*) Not once or twice in our fair island story,
The path of duty was the way to glory
He that ever following her commands,
On with toil of heart and knees and hands,
Through the long gorge to the far light has won
His path upward, and prevailed,
Shall find the toppling crags of Duty scaled
Are close upon the shining table-lands,
To which our God Himself is moon and sun.

(*b*) We revere, and while we hear
The tides of Music's golden sea
Setting towards eternity,
Uplifted high in heart and hope are we,
Until we doubt not that for one so true
There must be other nobler work to do
Than when he fought at Waterloo,
And Victor he must ever be.

Tennyson.—"Death of the Duke of Wellington."

1. Write out in full the clauses of (*a*) to which the following words belong, *he, prevailed, are,* classify each and give its relation.

2. Classify the following words and give the syntactical relation of each, *once, following, on, upward, scaled, close, Himself.*

3. Classify each of the preposition phrases in (*a*) according to its grammatical value, and give its relation.

4 Point out and explain any figures occurring in (*a*).

5. Express as clearly as you can in your own words, and without figurative language, the meaning of the last seven lines of (*a*).

6. Write out in full each of the subordinate clauses in (*b*), classify, and give the relation.

7. Classify the following words and give the grammatical relation of each, *settling, uplifted, high, for, one, there, victor.*

8. Form as many derivatives as you can from each of the following, *heart, revere, doubt, true, noble.*

9. Exemplify the difference between

Inflection, Derivation, and Composition, using the words *high* and *work* as simple forms.

10. Exemplify the different grammatical values the words *long*, *far*, and *shining* may have.

11. Justify the use of *shall find* instead of *will find* in (*a*).

Point out any grammatical errors and misused words in the following sentences, and make the necessary changes.

(*a*) I meant to have asked him what hotel they were stopping at.

(*b*) If he don't come before seven I will have to go alone.

(*c*) Neither he nor Tom were willing to go without I would pay their fare.

(*d*) Judging from their report the Committee has taken a different view of the case to the one generally held.

(*e*) Whom did you say looked kind of surprised?

(*f*) Sometimes he would lay awake half the night, thinking over the events that had transpired during the day.

Point out any thing faulty in the construction of the following sentences, and make the necesssary changes.

(*a*) I'll leave a prescription to rub the arm with.

(*b*) He had been planning to make his escape for a long time.

(*c*) Clergymen are more apt than those of any other profession to fall into this habit.

(*d*) It is most efficacious when taken asting and mixed with water.

(*e*) He started for the fair next morning, accompanied by the good wishes of the household and the colt.

(*f*) Our information comes from a gentleman living on W. street, and who is strongly interested in such matters.

(*g*) This belief is based on two suppositions which are tacitly taken for granted, but both of them as I hope to show are erroneous.

(*h*) The student is allowed to select any five of these, thereby giving him a much better chance of success.

Point out the ambiguity in each of the following sentences.

(*a*) That alone will convince me.

(*b*) He will lose no time in doing that.

(*c*) He had written directions for each case.

(*d*) She and I think differently.

(*e*) Have you forgotten how much you owe her?

(*f*) I left him to finish my work.

(*g*) I don't like to do it for that reason.

(*h*) I could tell you of some more noted instances.

(*i*) She gave her money for that very purpose.

(*j*) They left the city unharmed.

(*k*) Most eminent physicians have held that view.

(*l*) It's strange how little things of that sort affect him.

(*m*) He would have died if I hadn't given it to him.

(*n*) I understand how to teach it better than I once did.

(*o*) He acted so as to leave that impression.

(*p*) He isn't to be frightened in that way.

(*q*) My appearance had nothing to do with it.

(*r*) It looks as much like a wolf as a dog.

Express the following in simple and natural language.

(*a*) I embrace the opportunity to address a few observations.

(*b*) They were making preparations to proceed to the sanctuary.

(*c*) The operatives were demanding additional remuneration.

(*d*) The conflagration was assuming proportions of considerable magnitude.

(*e*) They had donned the habilaments of grief.

(*f*) Purchased from an itinerant vendor.

What are the chief requisites of a well constructed sentence? Criticize the following sentence, and show how it may be improved by breaking it into two and partly reconstructing it.

"He did not take his refusal to heart, but within a week became acquainted with

a young lady in the neighborhood, who was past what might be called the marriageable age, but who wanted to marry for the sake of a home, and having proposed to her, was accepted."

EAST MIDDLESEX PROMOTION AND REVIEW EXAMINATIONS.

Grammar—Time, 2½ hours.

LIMIT OF WORK.—The sentence, clause, and phrase. Classification of parts of speech. Analyais and parsing. The first twenty-six essons of the authorized text-book.

Insist on neat and legible writing. One mark off for every mistake in the spelling.

1. Analyze as fully as you can.

(*a*) Careful farmers till their fields well.

(*b*) Slowly up the steep hill the old horse limped.

(*c*) Me an idle boy you never more shall meet.

(*d*) Trust me.

(*e*) In the year 1492 Christopher Columbus, an Italian by birth under the patronage of the Spanish Court, discovered the American continent. (4)

2. Supply the ellipses; copy the sentences in full; underline the supplied words:

(*a*) ———goes to our school. ———go to our school.

(*b*) ———opens at nine o'clock. ——— open at nine o'clock. (4)

3. Copy the sentences, choose and underline the right word:

(*a*) She sings | sweet / sweetly | ; the rose smells | sweet / sweetly |

(*b*) The fox | saw / seen | the boy before the boy | saw / seen | the fox.

(*c*) I | did / done | all the problems | correct / correctly |

(*d*) He had | went / gone | home before the storm | came / come | on.

4. Rule three columns heading them (1) joining words, (2) asserting words, (3) names. Arrange the words in the following sentences in the columns.

Some large old pear trees bear fruit every year, and this one has sometimes so heavy load that the branches break badly. (14)

5. Arrange in three columns headed *Qualifying*, *Quantifying* and *Pronominal*, the adjectives found in the foregoing sentence, and further distinguish the pronominal adjectives by writing after them—*poss*, *dem.*, *inter.*, *rel.*, or *indef.*, as the case may be. (9)

6. Expand the following abbreviated compound sentence into four simple sentences;

John and Katie go to school, and help their mother in the evenings. (8)

7. Copy the dependent clauses in the following complex sentences, tell what words the *noun* clauses are the subject or object of and what words the *adjective* and *adverb* clauses modify:

(*a*) I bow to those who bow to me,

(*b*) That the prisoner is guilty of the charge is doubtful.

(*c*) The boy was standing where he is now when I first saw him.

(*d*) That is the exact spot where I found the knife which you lost.

(*e*) Where he is buried is not now known. (21)

8. Tell what words each of the phrases in the following sentences modifies and whether it is used as an *adverb* or an *adjective*:

The path to the gate is bordered with flowers. In the evening the French children across the road come here to play with us. (10)

Count 100 marks a full paper; 33 minimum to pass.

Literature.

NOTE.—Juniors will take the first *five*, Seniors last *five*, questions. Neatness, 6 marks for each class. Value, 100.

1. Give fully in your own words the lesson story in *one* of the following:—The Farmer and the Fox, The Heroic Serf, The Otter. (10)

2 "Meek-faced anemones, drooping and sad;
Great yellow violets smiling out glad!

Buttercups' faces beaming and bright;
Clovers, with bonnets—some red and some white." (10)

(a) Fully explain, by writing each line separately in your own language, the description here given of the four flowers named. (12)

(b) Show the meaning and suitability of the following as used in these lines:—"Meek-faced," "sad," "yellow," "smiling," "beaming," "bonnets," "white." (14).

3. (a) Give the title of the four poems which begin thus:—

"I've a guinea I can spend."
"Faintly as tolls the evening chime."
"It was a summer evening."
"O Mary, go and call the cattle home." (8)

(b) Give the substance of any *one* of them. (12)

(c) Quote accurately as to *form* and *language*, three verses from any *one* of them.

4. (a) In the lesson entitled "A Narrow Escape," give what particulars you can respecting the person who forms the chief subject.

(b) Substitute words of your own for "Here he met with an adventure which nearly terminated his earthly existence."

(c) "The frenzied animal seized him by the shoulder." Give the meaning. How and why frenzied?

(d) "The shock caused a momentary anguish." What shock? Compare the meaning of "anguish" as here used with its meaning in "His anguish at the death of his child was intense." (5×4=20)

5. Give words opposite in meaning to the following words, retaining as far as possible the verbal form, that is to say, noun words for nouns, etc.:—Backward, Slope, Slowly, Pleasure, Delicate, Plentiful, Fiercely, Assist, Active, Cunning, Seldom, Leisure, Within, Odd, Approached, Swiftness, Bleak, Longer, Comfort, Pursue. (20)

6. "Though the road be long and dreary,
And the goal be out of sight,
Foot it bravely, strong or weary:
Trust in God, and do the right." (6)

(a) Give the title of the poem from which this verse is taken. (2)

(b) Fully explain "road," "long and weary," "goal," "out of sight," "foot it," "strong or weary," "the right." (14)

(c) Rewrite the stanza in good prose, showing that you clearly understand the meaning of all the parts. (6)

7. Give (a) the title of the four poems which begin thus:

"The splendor falls on castle walls."
"Under a spreading chestnut tree."
"By Nebo's lonely mountain."
"Whither, midst falling dew." (8)

(b) Give the substance of any *one* of these poems. (10)

(c) Quote accurately as to *form* and *language*, three verses from any *one* of them. (10)

8. (a) Fully describe the thermometer under the following heads:— (1) How constructed, (2) How graduated, (3) Uses. (9)

(b) Explain as used in the lesson: "temperature," "expansion," "bulb," "freezing point," "boiling point," "zero." (12)

9. "Thou'rt gone; the abyss of heaven
Hath swallowed up thy form; yet on my heart
Deeply hath sunk the lesson thou hast given." (9)

(a) Of whom or what are these lines written? (3)

(b) Explain "abyss of heaven," "swallowed," "thy form," "sunk." (8)

(c) "The Lesson." Give the lesson referred to, in your own words. (4)

TRIGONOMETRY. (1892)

SENIOR LEAVING—*Continued.*

2. *(b)* $\sin(90^\circ+\alpha)=\cos\alpha=\frac{12}{13}$

$\cos(90^\circ+\alpha) = -\sin\alpha=-\frac{5}{13}$

$\sin(180^\circ-\alpha)=\sin\alpha=\frac{5}{13}$

$\cos(180^\circ-\alpha)=-\cos\alpha=-\frac{12}{13}$

3. *(a)* $\sin 7^\circ + \sin 11^\circ = 2 \sin \frac{11+7}{2} \cos \frac{11-7}{2}$

$\cos 3\beta + \cos 5\beta = 2 \cos \frac{3\beta+5\beta}{2} \cos \frac{5\beta-3\beta}{2}$

$= 2 \cos 4\beta \cos \beta$

$= -2 \sin n\alpha \sin 3\alpha$

$\cos\phi - \sin\delta = \cos\phi - \cos\left(\frac{\pi}{2} - \delta\right)$

$= 2 \sin \frac{\frac{\pi}{2} - \delta + \phi}{2} \sin \frac{\frac{\pi}{2} - \delta - \phi}{2}$

3. *(b)* $\sin 10^\circ . \cos 50^\circ = \left\{\frac{1}{2} \sin (50+10) - \sin (50-10)\right\}$

$= \frac{1}{2} (\sin 60^\circ - \sin 40^\circ)$

$\cos \frac{5}{2}\delta . \sin \frac{3}{4}\phi = \frac{1}{2}\left\{\sin \left(\frac{5}{2}\delta + \frac{3}{4}\phi\right) - \sin \left(\frac{5}{2}\delta - \frac{3}{4}\phi\right)\right\}$

$\sin 7\alpha . \sin 5\alpha = \frac{1}{2}\left\{\cos (7\alpha - 5\alpha) - \cos (7\alpha + 5\alpha)\right\}$

$= \frac{1}{2}(\cos 2\alpha - \cos 12\alpha)$

$\sin (\alpha+\beta) \cos (\alpha-\beta) = \frac{1}{2}\left\{\sin 2\alpha + \sin 2\beta\right\}$

$\cos \left(\frac{\pi}{2} + \alpha\right) \sin (\pi - \alpha)\ \frac{1}{2}\ \left\{\sin \left(\frac{\pi}{2} + \pi\right) - \sin \left(\frac{\pi}{2} - \pi + 2\alpha\right)\right\}$

$= \frac{1}{2}\left(\sin \frac{3\pi}{2} - \sin 2\alpha - \frac{\pi}{2}\right)$

4. *(a)* Bookwork.

(b) $\cos \alpha = \cos \beta . \cos \gamma + \sin \beta . \sin \gamma . \cos A$

$\cos \alpha = \cos \beta . \cos \gamma + \sin \beta . \sin \gamma (1 - 2 \sin^2 \frac{A}{2})$

$\because$ $2 \sin \beta . \sin \gamma . \sin^2 \frac{A}{2} = \cos \beta . \cos \gamma + \sin \beta . \sin - \gamma \cos \alpha$.

$\because$ $2 \sin \beta . \sin \gamma . \sin^2 \frac{A}{2} = \cos(\beta - \gamma) - \cos \alpha$

$\because$ $2 \sin \beta . \sin \gamma . \sin^2 \frac{A}{2} = 2 \sin \frac{\alpha - \beta + \gamma}{2} \sin \frac{\alpha + \beta - \gamma}{2}$

$\because$ $\sin \beta . \sin \gamma . \sin^2 \frac{A}{2} = \sin \frac{\alpha - \beta + \gamma}{2} . \sin \frac{\alpha + \beta - \gamma}{2}$

$\cos \alpha = \cos \beta \cos \gamma + \sin \beta . \sin \gamma . \cos A$.

$\cos \alpha = \cos \beta . \cos \gamma + \sin \beta . \sin \gamma . (2 \cos^2 \frac{A}{2} - 1)$.

$\because$ $2 \sin \beta . \sin \gamma . \cos^2 \frac{A}{2} = \cos \alpha - \cos (\beta + \alpha) . \gamma$

$\because$ $2 \sin \beta . \sin \gamma . \cos^2 \frac{A}{2} = 2 \sin \frac{\alpha + \beta + \gamma}{2} \sin \frac{\beta + \gamma - \alpha}{2}$

$\because$ $\sin \beta . \sin \gamma . \cos^2 \frac{A}{2} = \sin \frac{\alpha + \beta + \gamma}{2} . \sin \frac{\beta + \gamma - \alpha}{2}$.

CONTEMPORARY LITERATURE.

Mrs. Catherwood's delightful story of "Old Kaskaskia" is all too short, being concluded in the April number of the *Atlantic Monthly*. Two collections of hitherto unpublished letters appear in this issue, those of William Hazlitt and those written by Henry Pelham, dealing with Boston affairs from 1770—1775. A plaintive and somewhat odd short story is "Miss Tom and Peepsie" by A. M. Etwell. "Betwixt a Smile and a Tear" is a graceful prose paper by Edith M. Thomas.

Admirers of Phillips Brooks will be grateful to the *New England Magazine* which in its April number publishes "The late Bishop's Dedicatory Sermon in Trinity Church." "Some Historical Aspects of Domestic Service" is an interesting paper by Lucy M. Salmon. Lynn R. Meekins is the writer of a clever short story, "On Municipal Politics." Buffalo is the city dealt with in this number. The article is by F. J. Shipard and is fully illustrated.

Littell's Living Age of April 22nd is as usual a collection of the best from many magazines. The conclusion of the interest-

ing paper "Three weeks in Samoa" is given. "The Financial Causes of the French Revolution" by Ferdinand Rothschild is from the Nineteenth Century. Mrs. Walford has a short story entitled "A Little Disappointment." There are several charming travelling papers such as "Ortegal to St. Vincent" and "Social Traits of the Dutch in Java."

For those who admire the stories of Rosa Nouchette Carey a rich treat is provided in the May *Lippincott*, which contains "Mrs. Romney," a novel in her usual style. The third of *Lippincott's* notable stories is "A Pastel" and is by Cornelia Kane Rathbone. There are no less than four poems in the number, one of which "A Cry from the Dark," by Louise Chandler Moulton, is especially worthy of mention. There is a notable article entitled "New St. Louis," by James Cox.

The April number of the *Eclectic Magazine* is a particularly interesting one, containing more light matter than usual. There is a long poem, from the National Review, of Alfred Austin and one entitled "The Laborer," by George Meredith. "Queen Mary's Holdfast" is an excellent short story from Blackwood's, and "Rain Clouds" is a gay little farce by W. R. Walkes. Along with these are more serious articles, among which may be mentioned "Poetry and Politics" and "The Inadequacy of Natural Selection."

"The Architecture of San Francisco," by the artist Ernest C. Peixotto, will appear in the May number of the *Overland Monthly*. The number also contains three interesting short stories and articles on "Silk Culture," "Sheep Shearing" and the "Silver Question."

In the department, Literature of Missions, in the April number of *Missionary Review of the World* there is an excellent article entitled "Brahmanism, Past and Present" by Prof. T. M. Lindsay. All the departments are exceedingly well edited, and the whole number bears testimony to the excellent work of its projectors.

The month's portrait in the April *Book Buyer* is that of Hyppolyte Taine, of whose life also there is a short sketch. Further on there is a charming picture of Kate Douglas Wiggin which cannot fail to capture those who have not already been captured by her witty and delightful tales. The Boston and English news and all the literary notes and queries are as interesting as usual.

A short story of historical interest in the May *Wide Awake* is "Petit Pere Felix," by the Canadian writer Grace Dean McLeod. The present is an especially good number, introducing its young readers to such excellent subjects as "Hartley Coleridge," "Ten Years Old" and "Golf, the Coming Game," by Hugh S. Hart. "The Raven and the Ring" is a pleasing narrative poem by Celia Thaxter. The *Wide Awake* furnishes its readers hearty laughter from the gay little stories found at the end.

The timely and interesting subject of University Extension is discussed by M. G. Brumbaugh in the March number of *Education*. The fifth of a series of papers on the "Scottish School of Rhetoric," by A. M. Williams, also appears.

Two excellent practical articles are those on the "Study of Local History" and "The Use of the King's English" by W. M. Thayer. The contents of the usual departments are full and varied.

BOOKS RECEIVED.

The Foundations of Rhetoric, by A. S. Hill, Professor of Rhetoric in Harvard University, (New York, Harper Bros.) $1.10.

We take pleasure in calling the attention of teachers (and we may be allowed to say parenthetically that all teachers, whatever their special duties, should be teachers f English) who have not already seen it, to this new and helpful book.

The author, whose Principles of Rhetoric is one of the best of the countless American text-books on the subject, has prepared this book to meet the demand for something

more elementary and still more practical. Taking as his starting point Swift's definition of a good style as "proper words in proper places," he naturally devotes the most of his space to the principles governing the proper choice, arrangement, and number of words to be used in writing. The application of these principles he illustrates by numerous examples culled from the exercises of students, and from current literature. Indeed, the chief value of the book to most teachers lies in the ample supply of fresh material for critical use, and in the fact that throughout the book, as a rule, Professor Hill gives side by side with the original and faulty form his suggested improvement.

In addition to the parts on words and sentences there is an introductory summary of the most important grammatical facts and principles, and a concluding chapter on paragraphs. The value of the book is further increased by a good index.

Exercises in English, by H. I. Strang, revised, with additions, by G. R. Carpenter, associate professor of English in the Massachusetts Institute of Technology. (Boston D. C. Heath & Co.)

A new edition of a little book known to most Canadian teachers. The original edition, which was republished a few years years ago by Heath & Co. on the unsolicited recommendation of Professor Joynes, has been largely used and very favorably spoken of by American teachers. It seems, however, that to adapt it more particularly to the wants of the New England schools, certain changes and additions were thought advisable. These Professor Carpenter, at the request of Mr. Strang and the publishers, undertook to make, and the result of his labours as seen in the edition before us, has been to add materially to the usefulness of the book.

The latest issue of *Classics for Children*, (Ginn & Co., Boston): is "Don Quixote." The Translation used is John Ormsley's, somewhat abridged by the Editor, Mabel F. Wheaton.

Messrs. D. C. Heath & Co., send us two recent issues of their *Modern Language Series*. (25c. each). These are "Bruno's Les Enfants Patriotes and Assollant's Une Aventure du Cèlébre Pierrot. Both are carefully edited and annotated, with vocabularies.

English History in a Nutshell, brief rhymes on the reign of each English Sovereign, first published eight years since by the Century Co., has just been re-issued by the American Book Co. (60c.) The illustrations are interesting. We make room for a specimen rhyme.

"His Son Edward Sixth in fifteen-forty-seven.
For six shining years rose, a star in our heaven,"

The Canada Publishing Company has just published a *Manual of Drawing*, which will be found of great practical assistance and importance to teachers and pupils. It has been prepared, at the request of many students and teachers by J. H. McFeaul, M.D. Author of the "Public School Drawing Course" and formerly Drawing Master in the Provincial Model School. Carefully detailed instructions are given, methods of teaching drawing described, problems solved etc., etc.

A communication on English in our High Schools, from Mr. Wm. Houston, M.A. Conductor of Teachers' Institutes, reaches us too late for insertion in this issue, it will appear in our next.