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THE CANADA
EDUCATIONAL MONTHLY
AND SCHOOL CHRONICLE.

SEPTEMBER, 1879.

THE EDUCATION OF GIRLS, AS CONNECTED WITH THEIR
GROWTH AND PHYSICAL DEVELOPMENT.*

BY N. ALLEN, M.D., LL.D., LOWELL, MASS.

ONE of the most encouraging signs of the times is that the attention of the public is being directed more and more to physical improvement. There are undoubtedly serious objections to some of the ways in which this interest is manifested, especially as connected with athletic sports and games. The matter here may be carried too far for the physical and moral interests of those engaged in them. Where this improvement is most needed is in early training in the family, combined with an educational system. Physical improvement should become a leading object both in the family and in the school, and, through all the stages of education, the culture of the body should go hand in hand with that of the mind. It should be made to apply especially to those who need it most, whose organization is weak and defective—where some parts are imperfectly developed or not well balanced, and there is lack of strength and

harmony of function. There should be in all schools a system of gymnastics or physical exercises of some kind, wisely adapted to the varied wants of the pupils.

In advocating a more strict observance of the laws of health and life, and objecting to the present modes of education, it should be distinctly understood that no one department of mental culture, no particular mode of teaching, neither the higher education of woman, nor co-education, are here singled out for criticism; neither is it intended to oppose or object at all to female education; but on the other hand, we advocate the highest possible mental culture for girls that is compatible with their whole organization—that harmonizes with both the physical and mental systems. This constitutes the only sure basis or foundation for all true culture, and its laws are the certain tests of its correctness and success; for, guided by these laws, there is no theory, no experiment, no failure.

In making application of the princi-

* Abstract of a paper read before the American Institute, at its fiftieth annual meeting, July 10th, 1879.—From the *Sanitarian*, N.Y.

ples here laid down, reference will be made more especially to girls, as both in the family and in the school they are less provided with the means for physical development than boys; while, considering the nature and objects of their organization, it is far more important for girls. Within a few years the education of girls has been pressed with great energy, especially in New England. In cities and large villages girls are sent annually to school from five years of age to sixteen or seventeen, with the exception of ten or twelve weeks' vacation each year. In small towns and rural districts the amount of schooling is less, perhaps from one-half to two-thirds as much as in cities. While great stress is laid upon the kind and number of studies, and the standard is raised in the meantime higher every year, scarcely any attention is given to the growth and development of the body. With rare exceptions there is no system of gymnastics or calisthenics provided in schools for girls, and, generally speaking, no regular or systematic exercise that is adapted to promote their highest physical development.

Once it was customary for the girls in our New England families to do a great deal of domestic labour: commencing quite early, they were trained up to it, year after year. Some part of this labour was hard, and its performance made a severe tax upon the muscles. In this way the constitution of girls became strong and vigorous, capable of much endurance. Besides, schools were formerly continued only about half the year, and then, in the intermediate time, girls found abundance of exercise in work. One of the most unfortunate events that ever befel any people was the change in feeling and opinion that came over our New England women in regarding domestic work as menial and degrading. Had this notion been confined to hired service—for that only which received re-

gular pay—this injury would not have been so great. But this notion or sentiment has gradually been taking possession of the minds of our New England women, especially girls, until domestic labour, wherever performed, is considered degrading—is not fashionable—and any other kind of work or business is preferred.

These views have not been confined to the cities, nor to families "well-to-do in the world," but have pervaded all classes everywhere, so that very few of our New England girls are trained up to thorough domestic work. Now, no exercise or employment can be found which is so well calculated to develop strong, vigorous, and healthy constitutions in girls as household work, commenced early, and trained up to the performance of the more laborious parts of it. At the present day it is only the lighter kinds of domestic work that girls are called upon to do, and not those harder portions that develop and strengthen the muscles, that harden and toughen the constitution. As girls are now sent to school after six or seven years of age, and kept there five or six hours a day, with lessons imposed which they are obliged to learn more or less at home, there is but little opportunity to attend to household duties. Education is considered by parent and teacher as paramount to everything else; the growth and development of the body, strong and vigorous muscles, a sound and healthy physical system, are practically regarded as of but little consequence.

What, now, are some of the results of this neglect of physical exercise and supreme devotion to mental pursuits? Let us inquire what are the teachings of physiology on this subject. A fundamental principle of this science is that growth and strength depend upon *exercise*; and, of course, those parts or organs which are most exercised will receive most nutrition. *Exercise* is a

primary law of existence. There may be some growth in parts of the body without much exercise, but it cannot be continued long in a vigorous and healthy manner.

There is what may be called a normal growth—a regular order—in which all parts of the body should be so exercised and nourished that every part, in its own time, may be increased in vitality and strength. If the laws regulating this divine order—this natural growth—are not observed; if certain parts are unduly cultivated, while others are greatly neglected, the consequences must be very injurious, and perhaps ultimately disastrous. This is very well expressed by a distinguished female writer in the following language: "During youth the development of the body must be the first care; its strength, its beauty, the complete establishment of every function, the first conditions for its harmonious growth, must be our ruling principle. There is no possibility of avoiding this necessity—this primary predominance of the material organization: it is Divine law; every violation will bring its own punishment; and woe to the people or the race where this order is systematically inverted: disease, vice, and rapid degeneracy will inevitably mark its history." Because these evils do not follow at once, their danger does not seem to be apprehended. Such is the nature of those evils, resulting from the violation of physical laws, that their effects are not fully witnessed in one generation, but are developed more and more by the laws of inheritance. It may require several generations for their development, but unless the causes are removed, these evils are certain to come, just as sure as any penalties attached to the violation of the laws of the Almighty.

From six to sixteen years of age girls are confined closely to school, except about twelve weeks' vacation each year. No systematic provision

for physical culture is made at the school, neither is there sufficient exercise taken outside for a proper and healthy development of the body. These ten years constitute also the principal time in life for the growth and development of all parts of the system. The period from twelve to sixteen is especially a critical time in the growth and health of girls. These years in the high school or seminary are crowded with most difficult studies, combined with examinations, reviews, and exhibitions, which make a tremendous strain upon the brain and the nervous system.

In examining the effects of such a course of study, the laws of physiology must be our guide. If we should consider, in all its bearings, the relation of the mind to the body through life, it would seem as though the latter should receive as much attention during these ten years as the former. It is a question whether by such a course the great objects of existence might not, in a larger measure, be secured. It is a fact that many young people who grow up in the country, with very limited schooling, excel in scholarship and attainment those trained in the schools of the city. It is also a fact that, where the half-time system of schools has been conducted a long series of years, the pupils (working half of the time) have made as much progress in learning as those attending school all the time.

That we may obtain more definite views of the effects of education as now conducted, let us consider some of the physiological changes produced by it. The muscles and the brain constitute the two leading forces in the human system, and may be represented by the motive and nervous temperaments. It is of the highest importance that these two temperaments should both be fully developed and made prominent in the growth of the body; otherwise the organs included in the other two

temperaments will never attain their proper growth and complete development.

The muscles constitute by far the largest portion of the body; they grow only by exercise, and become strong and healthy only by much exercise. Thus they receive their proper share of nutrition, increase in size and strength, and gradually obtain that most important quality—fitness for work and power of endurance. This exercise of the muscles must commence early, and be continued year after year, so that the fibres of the muscles, by repeated extension and contraction, become hardened and toughened; their possessor can then work, and hold on without being tired; will have what is called *great power of endurance*.

On the other hand, where there is deficient exercise and a want of proper growth and development of this temperament, the muscles are pale and weak, soft and flabby, they have not sufficient vitality and strength to carry on in a healthy and vigorous manner the machinery of the whole system. The muscular temperament, when well developed, receives a large supply of blood, and constitutes the leading agency in causing a free and equal circulation of blood through the whole system; whereac, when the muscular power is weak, there is a great tendency to frequent congestion—especially in the internal organs—which prepares the way for much weakness and many diseases.

Besides, this muscular power, in large supply, is needed to obtain good blood by a more vigorous action of the lungs and stomach; no one thing is more important for good health than a free and equal circulation of the blood. This muscular power can be obtained only by a great deal of exercise when young; and no substitute by friction, stimulants, or other human devices, can be found to replace

it. Individuals deficient in this power labour through life under great disadvantages.

One of the most important agencies in producing changes in the system is *heat*. While the primary source of heat arises from combustion, produced in the process of converting nutrition into blood, the muscles have much to do with it in two ways: 1st, in an active circulation of the blood through all parts of the body, thus diffusing warmth with the blood—the greater the muscular power, the better the circulation; and, 2nd, by the muscles themselves acting as generators of heat in their power of extension and contraction, called animal heat of electric currents—the larger the muscular development and the more highly vitalized it is, the greater is the amount of heat produced by exercise. Such an organization is very important to a people living in a cold climate, or one subject to sudden changes of temperature. What inconveniences, what disadvantages, what sufferings must individuals be subjected to through life who have not, within their own persons, such powerful generators of heat and warmth! Clothing to any extent, and artificial heat from whatever sources, afford poor substitutes. Nature, in its normal state, makes the best provisions for warming the body.

There is another agency holding an intimate relation to the muscles which is of vital importance. The nervous system has three great centres in every individual where nerve force is generated. The brain is the nervous centre for the mind, the spinal marrow is the centres for the muscles, and the ganglia, so called, form the nervous centres for the internal organs. Nervous influences emanate from each of these centres, and, while each class of nerves has its own specific work to do, and the functions of one cannot be transferred to another, they hold, indirectly to each other, most intimate

relations. There is this peculiarity in the nerves that have their seat in the spinal marrow: they are composed of two classes—nerves of motion and nerves of sensation,—which extend to every part of the system. These nerves are constantly brought into action in all kinds of exercise, and, as the muscles compose so large a portion of the body, these nerves are very abundant; the motor nerves are indispensable to anything like healthy organization. It is by the use of these agents that motion and life are kept up in the body.

Suppose, now, that for a series of years the individual takes but little physical exercise; these motor nerves soon lose their strength and power, and the balance between the nerves of motion and sensation is destroyed. And not only this, but, as the nerves centering in the spinal marrow lose in vitality, while the activity of the nerves centering in the brain and ganglia is constantly increasing, the balance of power between these different *classes* is also destroyed. Whenever this balance or harmony of function is once lost it is not easily regained. As the strength and power of these *voluntary* nerves become much lessened from inactivity, the individual is subjected more and more to the influence of the nerves of sensation, which have been over-exercised, and not unfrequently become morbid and irritable. The ganglia, the sympathetic nervous system, under whose influence the organs of the body grow and live, will share also in the undue activity imparted to the other centres by the inaction of the muscular system. No description or language can express fully the terrible effects of these changes in the nerves from a healthy and normal state to one artificial and diseased.

Many girls may go through the whole course of education—the high school, the seminary, and the college—may shine as scholars in every de-

partment of learning; but what can we say of their constitutions—of their physical stamina? Has not the mind or brain been educated too much, altogether, at the expense of the body?

These evils are of such a character that physicians only can judge fully of their nature and extent. It is a fact that there has been, within twenty or thirty years, a great increase of diseases among New England women, of such type and character as could originate only from an excess of nerve tissue or the want of a well-balanced organization. Headaches, and neuralgia in all its diversified forms, hysteria and neuroses in great variety and intensity, have multiplied. Some of these complaints are accompanied with excruciating pain and long suffering, as they are found difficult to treat and almost impossible to cure. When a person of an intense nervous temperament breaks down in health, the invalid condition is apt to continue months or years, and sometimes for life. With such an organization, combined with a want of physical stamina, medicines and sanitary agencies do not so readily afford relief; neither can we call to our aid so fully the recuperative powers of nature. There is no class of complaints so complicated in their nature, so obstinate in treatment, and so doubtful of cure, and at the same time accompanied with so much suffering, as nervous diseases.

There are one or two features connected with this extreme development of nerve tissue which call for special notice. It happens not unfrequently, with persons possessing this organization, that when all their wants are not gratified, when overtaken with disappointment, or overcome by trials, the nervous system becomes irritable and morbid; the disposition and temper of mind are at the same time changed. Without sufficient muscular force, or the control of the voluntary

nerves, such persons become anything but pleasant or agreeable companions.

Another feature in such an organization is its strong tendency to mental derangement. The reason and the will have no controlling influence; the balance in the mental faculties is destroyed; and the individual, composed, as it were, of a bundle of nerves, is governed by mere caprice, whims, or the delusions of an emotional nature. Our lunatic hospitals contain at the present day many just such persons.

Again: We have stated that when in the course of education, and as a result of it, there is a great predominance of the nervous temperament and a lack of the muscular, the internal organs of the body do not stand so good a chance for growth and development. As a consequence, these same organs suffer in weakness and become liable to disease; the lungs from consumptive complaints; the stomach from indigestion and dyspepsia; the bowels from costive habits; and the reproductive organs from a variety of weaknesses and diseases. The heart also suffers in its action for the want of muscular power, and it cannot force the vital currents so well throughout the whole system.

The diseased condition of all these organs originate more or less from the want of muscular power, and this defect comes from neglect of the kind and amount of physical exercises which should have been taken while the body was in a state of growth and development. But an excessive cultivation of the brain, or the mind has, directly and indirectly, done its full share in producing these evils.

To confirm this statement we might summon a great number of witnesses, but must be content with the following: Mary J. Studley, M.D., now connected a long time with the State Normal School for Girls at Framingham, Mass., writes thus: "It has been

my privilege, for more than twenty-five years, to be intimately associated with young women, either as teacher in the school-room in the earlier years, or as medical practitioner or teacher of hygiene, during the latter ones, and every day's added experience only confirms me in the position I have occupied from the first relative to the various forms of nervousness which affect our sex. That position affirms that the best possible balance for a weak, nervous system is a *well-developed muscular system*. Weak, shaky, hysterical nerves always accompany soft, flabby muscles, and it is a mournful fact that the *majority of the young women* whom I meet in schools are notably deficient in muscular development."

The fact here stated brings us to one of the most serious evils in the present modes of education. While it cultivates the mind and stores it with knowledge, training the mental faculties to their highest extent, and capacitating them for the greatest happiness, it develops, at the same time, an organization which, unless it has health, the means and ability to be gratified, becomes susceptible of immense suffering, both of body and mind. It may be said that such a result cannot be prevented, especially in some cases, but, alas! they are altogether too common, and are likely to increase more and more unless some radical reforms are effected.

In describing the defective organization of American women, says Elizabeth Blackwell, M.D.: "We need muscles that are strong and prompt to do our will, that can run and walk indoors and out of doors, and convey us from place to place, as duty or pleasure calls us, not only without fatigue, but with the feeling of cheerful energy; we need strong arms that can cradle a healthy child and toss it crowing in the air, and backs that will not break under the burden of household

cares—a frame that is not exhausted and weakened by the round of daily duties. We need muscles so well developed that shall make the human body really a divine image, a perfect form, rendering all dress graceful, and not requiring to be padded and filled up and weighed down with clumsy contrivances for hiding its deformities; bodies that can move in dignity, in grace, in airy lightness or conscious strength; bodies erect and firm, energetic and active; bodies that are truly sovereign in their presence, expressions of a sovereign nature. Such are the bodies we need; and exercise, the means by which the muscular system may be developed, assumes then its true position as of primary importance during the period of youth. It is the grand necessity to which everything else should submit." This is strong language, but none too strong; the description will be heartily approved by all medical men who comprehend fully the powerful influence of the muscular system.

Such an organization as is here described has two great advantages: 1st, the self-possession and conscious power which it gives a woman; and 2nd, the commanding influence which such a physique everywhere has over others. There is a power, a charm, a magnetism in the female form or organization, when clothed with all the elements of beauty, which no language can describe.

But such a development of the whole person is not easily obtained; it certainly cannot be by performing the lighter kinds of housework, by a short walk now and then, by occasional gymnastic exercises, by a little croquet playing, by any amount of piano playing, or attention to music, to embroidery, drawing, painting, etc.

In no part of female education is there so much need of reform as in physical culture. If the standard of scholarship is to be raised higher and

higher in all our schools for girls, and no greater attention is to be paid to the laws of health and life, grave consequences may well be apprehended.

If this educational pressure were confined to a few individuals, there would not be the same danger; but when the great majority of our New England girls are thus crowded, its effects become widely extended and far-reaching. The remark has been made, "Educate a woman and you educate a race." This saying is full of meaning, and capable of different interpretations. Its meaning or application must depend upon the term "educate"—how and in what way it is done. This "educating" should have reference to the future, as well as to the present; to the body, as well as to the mind; for the highest developments of brain and nerve tissue alone will never go far toward educating a race—in fact, it will inevitably run out.

God has established, by the laws of inheritance, most intimate relations between one generation and another. As yet these laws are very imperfectly understood, but enough is known to show that they depend upon certain conditions, which must be carefully studied and taken into account. These conditions and laws cannot be ignored or set aside with impunity.

Said President Eliot, a few days since, in addressing the Alumni of Harvard University: "Now, everything depends with us and in the learned professions upon *vigour of body*. The more I see of the future of young men who go out from these walls, the more it is brought home to me that professional success, and success in all the learned callings, depends largely upon the vigour of body, and that the men who win great professional distinction have that as the basis of their activity." Now, if young men must depend for success in life upon the "vigour of the body," is it not equally important for young

women, who are to be their competitors in the learned professions, and in various departments of business, and

what is still more important, who are to be, in the broadest and fullest sense, the "educators of the race?"

CORPORAL PUNISHMENT.

BY RICHARD LEWIS, HEAD MASTER, DUFFERIN SCHOOL, TORONTO.

ENTER a protest against the exercise of corporal punishment in the school, (1) because it fails in its objects, and (2) because it degrades the teacher.

The end of all punishment is the happiness of the pupil and the well-being of society. The intellectual improvement of the pupil renders punishment necessary only when his will conflicts with that improvement. But the want of education in after life is visited by other penalties, none of them taking the form of corporal punishment; and the more the school-punishments for neglected studies can be made to assimilate with the penalties of ignorance which inevitably follow in after life, the more shall we make the offenders appreciate the necessity for education. Now there is no relation between the infliction of bodily pain and the consequences, social and personal, that fall upon ignorance. A severe whipping may make a pupil study a lesson better for a time, but it does not make that pupil any more a lover of study. Possibly the dislike is strengthened because he looks upon the study and not his own indolence as the cause of the penalty; and so long as the teacher inflicts torture, the study and the teacher come to be regarded as the enemies of his peace. It is not my purpose at present to indicate better methods as substitutes for this, too often the most favoured, because the easiest, kind of

punishment. It no doubt does secure a temporary reform. But the effect of all the finer influences which higher minds do exercise over their pupils, the cultivation of the love of study both for the social advantages and the personal delights of a cultivated mind which it brings, is lost. The result of such enforced studies is seen in the fact that, outside of a profession, few who have had the best advantages of a public or high school education continue to be students after they begin the work of life—the sustenance of the body and the acquisition of wealth.

But it is in the moral consequences that the corporal punishment fails the most and produces the worst results. The infliction of such punishment is most common where order is violated, and when any moral law has been transgressed. Most parents and many teachers generally regard "a good whipping" as the best cure for a bad disease. It has even been urged that whipping is justifiable in the school because it has been found to have the best effect upon criminals in jails. Of course such advocates for whipping forget that it is not criminals we have to deal with, but youth, with all its capacities for good which it is the high privilege of the teacher to strengthen and develop; and secondly, it is in all cases questionable if the whipping of young or old criminals does effect good. Whenever pain is arbitrarily inflicted by power, the

sufferer in some form resents. He silently, or with curses not loud but deep, submits. The criminal may be hardened beyond hope, and society in its defence may fright him into submission; but that gives no proof of reformation. In a lesser degree it is the same in the school. Your corporal punishment will not exorcise the spirit of theft, or lying, or brutality, or impurity, out of a bad nature. The cane or the whip will only make the offender more secret in his bad habits. He will conceal his vices, but no whipping will make him love the opposite virtues. The effect therefore is never an advantage to virtue, even when the motive has been disinterested—when the teacher has inflicted the punishment in the spirit of a philanthropist and for the public good. But the probability and the danger is that corporal punishment, in the greatest number of cases, is inflicted under feelings of temporary irritation or of the heaviest anger, and that therefore personal resentment, more than a sense of duty, prompts it. Hence the evil and the danger. The personal resentment is *seen* by the pupil and therefore no moral good results. The offender is taught to conceal, not to reform; and the teacher, under the influence of anger, may inflict serious injuries on the culprit and render himself liable to the penalties of law and to public disgrace.

I am not denying here the expediency of corporal punishment in certain circumstances, under our imperfect social organizations. It is urged, and I do not utterly oppose the necessity, that it is practised in jails, in the army, and in the navy. I have considered its aspect in jails; and in the army and the navy the fact that corporal punishment, which once had as strong advocates in those institutions as it even now has in schools, is now greatly diminished, and motives for good conduct, rather than penalties for

bad, are encouraged, gives evidence of the reformation in that direction.

But this view of the question brings me to the second grand objection I have to corporal punishment in the school-room. *It degrades the teacher.* In the jail, the army, and the navy, it is not the governor of the jail, or the commanding officer, who inflicts the punishment; it is the vilest criminal or the lowest official. The commanding officer would throw up his commission and the governor would resign his office before he would degrade himself by whipping an offender. The teacher stands in the same relation to his pupils that these officers do to their charges, and the degradation is similar if not equal. The consequences of imposing this degrading duty on the teacher have been felt through all ages and in every country. In past times we have been subjected to the sneers and contempt of ignorance, because while enlightened views of our duties had animated thoughtful minds, the masses have looked upon us as objects of fear and coercion to children. Parents frighten their children with the terrors of the schoolmaster's whip. "Take care—you'll catch it when you go to school," is no uncommon threat held out to refractory children, and owes its existence to the fact that we have too often deserved the reputation it suggests.

But it degrades us. The parent who will hold up the teacher as an object of fear will not hesitate to hold him up as an object of contempt or ridicule. Hence the personal insults to which teachers are frequently subjected—ridiculed, called names, or mocked for any personal defects; and this without regard to sex, or age, or services. Mark the respect with which the clergyman is received. The probability is that if children were to speak of their clergymen as they are allowed by ignorant parents to speak of their teachers they would be rebuked for

committing a heinous sin. I shall not endeavour to show how all this recoils in very justice on parents, but I lay much of this wretched training to the charge of corporal punishment.

The office of the teacher is to instruct and discipline in knowledge and duty. But where pupils refuse to obey or violate moral law, then it is the duty of the parent to aid the teacher. If then the case justifies and demands corporal punishment, the parent is the proper person to inflict that punishment. It is the duty of the parent to compel the attendance of a truant child; it is equally the duty of the parent to compel the refractory child to submit to the just regulations of the school, and especially to compel and encourage respect for the authority of the teacher. That respect should in no degree be less than that demanded and encouraged to be shewn to the clergyman. It is no degradation in the parent to chastise his own child. Its necessity may be evidence of bad management, but the authority is vested in him—and only in him—by the highest authority, and, as the parent, it is not so likely that he will exceed what is right as the teacher. Examples will occur where parents refuse to attend to these their special obligations. But my experience convinces me that

such cases form a small minority. The sanction of school authorities, trustees, and inspectors, and above all of public opinion, must unite to support every teacher who desires to expel corporal punishment from his school, and demands the aid of the parent when the child becomes refractory. When parents refuse or fail to secure the necessary obedience, then we may be assured that corporal punishment inflicted by the teacher will also fail. Then the State must interfere. Then the parent is unfit to govern his household, and in self-protection the State must take the charge from the parent if it wishes to save society from criminal consequences.

I press these views on the consideration of my fellow-teachers. The reform lies in their power. A unanimous resolve by them to expel all corporal punishment from the domain of their labours would lead to all necessary co-operation to secure from authority, by better regulations, what is supposed to be secured now by whipping; and the extinction of a degrading and unmanly duty would be one of the steps by which the best relations between teacher and pupil would be strengthened and ennobled, and the office of education respected and elevated.

THE COST OF RAISING A BOY.—The heaviest tax that can be imposed upon a nation is one that is paid in human lives. From whatever point of view the subject may be regarded, this conclusion is irresistible. If we look at it according to purely economical considerations, we may obtain very remarkable results. It has been estimated that an actual money cost of £300 is incurred in raising a boy, cradled among the poorest classes, from birth to manhood. It does not require us to ascend very high in the social scale before we find that this estimate must be trebled. If we take what we may call the cost price of the human unit at any definite time, say at £500 on arriving at maturity, the producing power of the unit in question will bear some relation to that sum; the more costly and careful education pro-

ducing, as a rule, the more valuable result, as to productive power. If the labourer who earns 14s. or 15s. a week adds £50 per annum to the wealth of the country, the physician, the scientific military or naval officer, the barrister, or the engineer, may look forward to the time when his yearly labour will be worth more than a hundred times that amount, even if appraised only by the price he is actually paid for his time. Taking any producing individual, whether valued at £50 or at £5,000 per annum, at any period of his career, no income tax to which he can be subjected can approach in its pressure the extravagant tax of death. For the payment of that tax at once annihilates the total earning power of which there was, until that moment, a fair mathematical expectation.—*Popular Science Monthly.*

THE PROGRESS OF EDUCATION IN ENGLAND.

MR. FRANCIS PEEK, in an article under the above title in the *Contemporary* for August, gives some interesting facts and statistics illustrative of the great advance made in elementary education in England during the last half century, a few extracts from which may be of interest to our readers. "The earliest movement towards a system of national education," he says, "may, perhaps, be said to date from 1832, or about the time of the passing of the Reform Bill. The position of the country at that time is, perhaps, fairly represented by the City of Manchester, where, out of a population of 200,000 only 11,000 scholars were found attending school, although the number of children needing education was over 34,000. Thus about two-thirds of the population were growing up in entire ignorance." The quality, too, of the education that was given, as described in a report of the Statistical Society in 1834, was miserable in the extreme. Half of the schools were the so-called "Dame-Schools," kept by females or old men "whose only qualification for this employment seemed to be their unfitness for every other." Generally these schools were held "in very dirty and unwholesome rooms, frequently in close, damp cellars, or old, dilapidated garrets;" most of them had but two or three books among all the scholars, while the terms of tuition varied from twopence to sevenpence per week. Nor were the common day-schools, "kept by private adventure teachers," much better.

Further evidence of the deplorable state of educational affairs is found in

the fact that in 1838 only nine out of every hundred criminals were able to read and write, their leading characteristic being "a heathenish ignorance of the simplest truths of religion and morality."

The Government at last took the matter in hand, making grants in aid of education and contributing towards the building of schools. By 1868 "almost every parish church had a school attached to it, while various Nonconformist bodies, especially the Wesleyans, were also actively providing for the education of the poor." In 1870 Mr. Forster's Elementary Education Act was passed, providing that every child should receive a certain amount of education, and making parents responsible for their children's attendance at school.

At the time of the passing of this act, Mr. Forster stated that voluntary effort had provided 11,000 day and 2,000 night schools. There were 1,450,000 children on the registers, the attendance being very irregular, and averaging only 1,000,000. "Only two-fifths of the children between the ages of six and ten years, and only one-third of those between the ages of ten and twelve, were receiving even this insufficient amount of education;" the standard being very low in the inspected schools, and probably lower in those uninspected. "In Birmingham, Leeds, Liverpool and Manchester, with an estimated population of 1,500,000, the average attendance in elementary schools was 124,000," while in four such towns in Germany 250,000 children would have been found attending schools daily for eight

years. As to the quality of popular education, in Birmingham and Leeds with a population of 600,000, only 530 pupils passed the sixth standard, which was lower than the *lowest* Saxon or German standard. "In England only 20,000 in a population of 20,000,000 passed the sixth standard; in Old Prussia, 380,000 in a population of 19,000,000 passed every year."

Mr. Peek gives a brief account of the provisions and working of the Elementary Education Act of 1870. It divides the country into school districts, in each of which, unless sufficient school accommodation is provided within a certain time by voluntary effort, a School Board is elected by the ratepayers, and is empowered to build schools with funds borrowed from the Government, repayable in 50 years at $3\frac{1}{2}$ per cent. The Boards appoint local managers to schools and Divisional Committees to enforce the regular attendance of the children. They have power to raise funds by levying a rate over the whole district, and to charge fees to the parents. Both Board and Voluntary Schools receive Government grants according to the excellence of the pupils. Each Board decides whether the education in its schools shall include religious instruction or be altogether secular; denominational teaching, however, being prohibited in any case. There were fiercely fought battles at the first formation of most of the boards on this question of religious instruction, the introduction of which into the schools was vehemently opposed by the Nonconformists. The advocates of the "Bible in the School" triumphed almost everywhere,—in the London School Board by a majority of five to one. It is still open, nevertheless, for a parent to require that Biblical instruction shall not be given

to his child, but secular lessons instead.

By way of contrast to the gloomy description he has given of the condition of elementary Education in England in 1834, Mr. Peek adds the following accounts of the results of the Government inspection in the year ending 31st August, 1877. There were then inspected 15,187 day-schools, "containing 22,033 departments, under separate teachers, and furnishing accommodation for 3,653,418 scholars. There were on the registers the names of 3,154,973 children; 1,100,000 being under seven years of age, 1,929,000 between seven and thirteen, and 125,000 above thirteen years of age. 771,000 passed the prescribed examination without failure in any one of the three subjects—reading, writing, and arithmetic. In addition to the day-schools, 4,733 night-schools, having 57,000 scholars above twelve years of age were recognised as efficient by the Government. Of these 57,000 scholars, 48,000 were examined, and out of every hundred scholars, eighty-seven passed in reading, sixty-nine in writing, and fifty-eight in arithmetic. To carry on this education, 24,841 certificated teachers were at work, these teachers being mainly supplied from forty training colleges, containing over 3,000 students. We find, also, that 270,000 children were presented for examination in specific subjects, and that, of these, 45,000 passed successfully. Grammar, elementary geography, and history, which up to 1876 were treated as specific subjects, are now included in the ordinary work of the schools, and, in 1877, formed (with needlework) part of the examination of more than a million scholars. Ordinary school-drill is also part of the work in every good school, and in 1,178 day-schools military drill is systematically taught to the boys."

RECREATION FROM AN EDUCATIONAL POINT OF VIEW.*

BY GEO. J. ROMANES, M.A.

COMING now to the large and important class—children. It seems a mere commonplace to say that children ought to be allowed to run about and romp and play as much as ever they like or can. Yet this commonplace is far from having a common place in the usages of modern society. Among the upper classes children are much too frequently restrained from taking their full amount of natural play, either by preposterous ideas of genteel decorum, or by the respect due to expensive clothing; while among the lower classes the playground is too often restricted by the limits of the gutter, and even in the parks we too often witness the melancholy spectacle of children still a long way from their teens acting the part of nurse to still younger members of the family. To remedy these evils in the case of the upper classes there is nothing to suggest, except that fathers and mothers should cease to regard their children's clothes as of more importance than their children's health, and learn to estimate at its due value the responsibility of fostering the most precious of their possessions—these living, feeling, loving little ones whose capacities of life-long happiness are being moulded by their parents' wisdom, or destroyed by their parents' folly. In the case of the lower classes the *crèche*, or public nursery, where abundance of romping play is permitted, deserves the most strenuous

encouragement. Children of all classes will play as they ought to play if only Nature is allowed to have her course without let or hindrance from artificial restraints.

But, as the only object in rearing children is not that of making them healthy animals, some amount of artificial restraint is necessary when the time of systematic mental training arrives. Nevertheless, as bodily health is the most essential condition even to mental training, the most fundamental principle which ought to guide the latter is that of supplying it with the minimum cost of the former. Yet in school life this fundamental principle is almost universally disregarded. So long as the general health of a school is maintained at a level compatible with work, and not below the level that declares itself by conspicuous "break-downs," so long nobody cares to reflect whether the system of school discipline is in all particulars the best for maintaining the general health at the highest possible level. I will not wait to consider the disgraceful food which, even in many of our better-class schools, is deemed sufficiently good for growing children to thrive upon; nor will I wait to inveigh against the system of competition which, when encouraged beyond moderate limits, acts as a baleful stimulus to the very pupils who least require to be stimulated. But, confining my remarks to the one particular of punishment, I should like to put it as a question of common sense, whether it

* From an article on "Recreation" in the *Sept. Nineteenth Century*.

would be possible to devise any mode of punishing school children at once more fatuous, more pernicious, or more opposed to every principle of science and morality, than are the modes which are now most generally in vogue. Consider for a moment the practice of giving "impositions." It is not supposed that copying out a stated number of lines is an economical way of gaining information, so that even the plea of imparting instruction cannot be advanced as a benefit to compensate the evil of the method. And this evil is a very serious one. The object of all our methods in education ought to be, as much as possible, to economise effort; the mental energies ought, as it were, to be nursed, so that by their exercise they should lay up the largest possible store of information. But the mental energy which is expended in writing out an imposition is wholly, or almost wholly, profitless; and the amount of energy so expended is considerable—especially in the case of long impositions. For the whole punishment of writing out an imposition consists in the *tediousness* of the process; and tediousness, by the painful class of emotions which it arouses, is the most wearisome or exhausting of the influences that consume the nervous energies. It may therefore be said that in whatever degree the writing of an imposition is a punishment, in that degree are the nervous energies dissipated in a wholly useless manner. Therefore, to say nothing of the actual time that is wasted in the writing of impositions, or of the slovenly style of handwriting which this mode of punishment induces, my great objection to the mode of punishment is that, by consuming the nervous energies in a wholly profitless manner, it stands in direct antagonism with all the principles that I am endeavouring to inculcate. And still more foolishly wrong does this method of punishment become when

it is united, as it generally is, with another and still more objectionable method—I mean the custom of imprisoning children during playtime with the express purpose of denying them healthful recreation. To shut up a child already weary with work in an empty school-room under a depressing sense of disgrace, is something worse than cruel; to a child it is a wrongful injury that does not admit of being justified by any argument; and, in running counter to all the principles both of physiology and of education, it is a sin against society. In most cases the time during which a child is thus confined is the only time in the twenty-four hours that there is an opportunity afforded for any recreation at all; so that, when the weary time of solitude is over and school again meets, the unfortunate victim resumes work with energies doubly exhausted. Even if a child had the stamina of a man, it would be impossible that mental work resumed under such circumstances could be profitable—the faculty of memory being quickly affected by mental fatigue. But, as a matter of fact, owing to the great rapidity of physiological changes in a growing organism, a child has much more need of frequent exercise than has an adult; so that, whether we look at the matter from a sanitary or from an educational point of view, I think it is impossible too strongly to condemn the practice of confining school-children during playtime.

Of course I shall be asked what modes of punishment I would suggest as substitutes for the two which I have thus so strongly condemned. This question, however, I am not careful to answer. Even if it is true that there is a difficulty in providing other and efficient modes of punishment, I should not feel the difficulty to justify the maintenance of modes that are so clearly injurious. But, merely for the sake of giving an answer, I may

say that, in the case of girls, experience derived from many of the higher-class schools shows that discipline may be maintained, either without any punishment at all, or else by such kinds as are more nominal than real. The difficulty in the case of boys is no doubt greater, but not, I think, insurmountable. Many kinds of punishment may here be devised which go upon the principle, not of denying muscular exercise, but of enforcing it. Extra drills or other compulsory exercise during play-hours are modes of punishment greatly to be preferred to those involving sedentary confinement, although I do not pretend to insinuate that compulsory exercise in the way of punishment has the same recreative value as voluntary exercise in the way of play. For my own part, I have no hesitation in recommending corporal punishment as on all grounds greatly preferable to the protracted, tedious, heart-sickening, and health-breaking systems which, in the name of Humanity, are coming more and more into general use. But, however great the difficulty of devising or substituting other modes of punishment may be, I feel sure there can be no reasonable doubt that the modes which are at present so largely in fashion ought to be universally abolished.

The above remarks of course apply almost exclusively to boys' schools; and, looking to boys' schools as a whole, nothing much more remains to be said of them in connection with recreation. The John Bull spirit of this country is in favour of allowing schoolboys to play the hardy and vigorous games which require all the muscles to be brought into active service. The case, however, is widely different in girls' schools; so, before concluding, I should like to add a few words with special reference to them.

School-life is the time when, most of all, healthful recreation is needed. It is then that the organism, being in a

state of active growth, most requires the purifying and strengthening influences of muscular exercise to be in frequent operation; and the development which the organism, during the years of its growth, receives, is carried through its life as an unalterable possession. Yet in the majority of girls' schools how miserable is the provision that is made for securing this development! Even in our higher-class schools the whole mechanism of their discipline seems to be devised with the view of stemming the healthful flow of natural joyousness by the barriers of tedious monotony. On all sides a school-girl is shut up in a very prison-house of decorum; every healthful amusement is denied her as "unladylike;" she is imperatively taught to curb her youthful spirits in so far as these may sometimes be able to struggle above the weight of a mistaken discipline; she is nurtured during her growth on the unhealthy soil of *ennui* in a depressing atmosphere of dullness; and, as too frequent a consequence, she leaves school with a sickly and enervated constitution, capable perhaps of high vivacity for a short time, but speedily collapsing under the strain of a few hours of bodily or mental activity. Now all this is the precise reverse of what school-life ought to be. The only aim of most of the higher girls' schools seems to be that of turning out pupils with a superficial knowledge of a variety of subjects, with such accomplishments as they may be able, by hard practice, to acquire, and with a well-drilled sense of the part that a young lady is to play in the complicated tragedy of etiquette. Now it is no doubt sufficiently desirable that girls, and especially young ladies, should be well educated; but, in my opinion, it is of far greater importance that school-girls should leave school with the maximum of bodily vigour that a wise and judicious nurture can impart, than

that they should do so with minds educated to any level that you please to name within the limits of natural possibility. I should therefore like to see all girls' schools professedly regarded as places of recreation no less than as places of education—as places of bodily, no less than as places of mental culture. And if this is considered too strong a statement of the case, it must at least be allowed that far more permanently beneficial work would be done by girls, both at school and after they leave it, if more permanently beneficial play were allowed. At present in most schools, with all indoor romping sternly forbidden as unladylike, and all outdoor games regarded as impossible recreations for girls of their age and social position, the unfortunate prisoners are restricted in their exercises to a properly prison-like routine—a daily walk in twos and twos, all bound by the stiff chains of conventionality, with nothing to relieve the dull monotony of the well-known way, and one's constant companion being determined, not by any entertaining suitability of temperament, but by an accidental suitability of height. Could there be devised a more ludicrous caricature of all that we mean by recreation.

Do we want to know the remedy? The remedy is as simple as the abuse is patent. Let every school whose situation permits be provided with a good play-ground, and let every form of outdoor amusement be encouraged to the utmost. Schools situated in towns, and therefore unable to provide private play-grounds, might club together and rent a joint play-ground—care, of course, being taken that the social standing of all schools which so club together should be about equal. Some such arrangement would soon be arrived at by town schools if parents generally would bestow more thought on the importance of their children's health, and turn a deaf ear

to all the qualifications of a school, however good, which does not provide for the proper recreation of its pupils.

Of course I shall be met by the objection that, by encouraging active outdoor games among schoolgirls, we should rub off the bloom, so to speak, of refinement, and that, as a result, we should tend to impair the delicate growth of that which we all recognize as of paramount value in education—good breeding. I can only say I am fully persuaded, by the results I have seen, that such would not be the case. The feelings and the manners of a lady are imparted by inheritance and by the society in which she lives, and no amount of drilling by schoolmistresses will produce more than an artificial imitation of the natural reality. Therefore, once let a girls' school be a little society of little ladies, and we need never fear that active play, natural to their age and essential to their health, will make them less ladylike than does the stiff restraint of the present system. Rather would active play, during the years of bodily growth, by developing the co-ordinated use of all the muscles, tend to impart through after-life that grace of easy movement which we all admire, but the secret of which is truly revealed only to the children of nature.

So much, then, for bodily recreation in girls' schools. As regards their mental recreation, I should begin by recommending less mental work. In most of the higher-class girls' schools, as in boys' schools, a great deal more work is required than it is either judicious or desirable to require. The root of this evil is that a girl's education is usually made to terminate at the age of seventeen or eighteen, and, as a consequence, she is expected to gain during these early years of life a sufficient amount of book-learning to serve for the rest of her days. In many cases it is, no doubt, unavoidable that a girl's education should end when she

leaves school; but I think that, in all cases, education ought to be less arduous than it is in many of our girls' schools. Even if education is to end with school-life, it is better that it should end with a little knowledge thoroughly acquired, than with a confused and half-forgotten medley of many subjects. Not that I advocate speciality and depth of knowledge for girls. On the contrary, I think that the aim here ought rather to be that of generality and width—languages, elementary mathematics, geography, history, art, science, and English literature being all taught, but taught superficially, or without much detail, and in as entertaining a manner as possible. The point, however, which I desire chiefly to insist upon is this, that school-girls ought not to be made or encouraged to work beyond their strength. In most girls' schools competition runs very high; and I am quite sure that in very many cases the aim of the schoolmistress ought to be to check its undue severity, rather than to stimulate that severity by competitive examinations. I have myself known many cases of girls sitting up late, rising early, and working all day to win their coveted prizes—a state of things which is a sufficiently crying evil even in boys' schools, but which is a still worse evil in girls'—worse because the *physique* of a girl is usually less robust than that of a boy, and because the school-girl is doomed to a smaller amount of outdoor exercise.

Now if less time were consumed in girls' schools by mental work, more time would be allowed for mental as well as for bodily recreation. And, if the time thus gained were judiciously expended, I believe that, even as a matter of mental culture, more would be gained than lost. Suppose, for instance, that some time in every day were set apart for mental occupation of a voluntary kind—a good library of general though selected literature

being provided for the use of the pupils, and the cultivation of art being allowed to rank as "mental occupation." In this way the more intellectual of the pupils would be able to receive that culture which only general reading can impart, the more artistic would be able to improve themselves in their art by additional practice, and even the unstudiously disposed would find in a standard novel a kind of reading less distasteful than Euclid.

And here while treating of mental recreation among girls, I may add that school-life is the time when provision ought to be made for mental recreation in after-life. Be it observed that mental recreation is impossible unless there is a natural and more or less cultured taste for some branch or branches of mental work. Indeed the capacity for such recreation is clearly proportional to the degree of such culture—an idealess mind being incapacitated for obtaining any *variety* of ideas. Hence the great importance of width of cultured interest, and the consequent duty of the heads of schools to ascertain the mental predilections of their pupils individually, and in each case where such a predilection is apparent, to bestow special attention on its culture. If this were more generally done, I am convinced that the gain to their pupils in after-life would be enormous. We are living in a world teeming with interest on every side, but to make this interest our own possession we require a trained intelligence. It ought, therefore, to be one of the first aims of education to supply special training to special aptitudes, whereby the mind may be brought *en rapport* with the things in which it is by nature fitted to take the most interest, and in them to find a never-ending source of mental recreation. If this method were more universally adopted in girls' schools, ladies as a rule would be supplied with more internal resources of mental ac-

tivity and cease to be so dependent for the stimulation of such activity on the mere excitement which is supplied by the external resources of society. But as it is, whether in the concert room, the picture gallery, the library, or the country walk, it is of most ladies literally and lamentably true, that "having eyes they see not, and having ears they hear not, neither understand." Most ladies have a natural taste for some one or other of the many lines of intellectual activity, and if this taste were developed in early life it would grow with the knowledge on which it feeds, till in mature life it would become an unailing source of pleasurable recreation. Yet in most cases such a taste in early life is not so much as discovered. For instance, how seldom it is that we meet, even among musical ladies, with any knowledge of harmony!—and this simply because they have never ascertained whether the study of harmony might not be to them a study of absorbing interest. Or, again, how very rare a thing it is to meet a lady who has even a superficial acquaintance with any of the sciences; and how vast is the paradise of intellectual enjoyment from which multitudes of intelligent ladies are thus excluded! And similarly with all the other lines of intellectual pursuit for which a certain small amount of rudimentary initiation is required in order to ascertain whether they are suited to individual taste. So that, as I have said, one of the most important aims of a girl's, and also of a boy's, education ought to be to ascertain and specially to cultivate the branch of knowledge in which most interest is taken. Let us not suppose that by following this advice there is any danger of imparting to young ladies that singularly objectionable and not very easily definable character which is most tersely and intelligently conveyed by the word "blue." No one can have a more in-

terse dislike than I have of the cerulean tint; but wherever I have seen it, I have always been persuaded that it is the previous character which has tinted the learning—not the learning which has tinted the character. Only let a lady be a lady, and nothing but envious ignorance can ever venture to breathe the objectionable word, while cultured refinement in the opposite sex will always discover in the culture of a lady that only which adds to her refinement.

I have now said all that I feel it desirable to say on the principles and the practice of recreation; and I will conclude by adding a few words on what I may call the ethics of recreation.

Health may be taken as implying capacity for work, as well as to a large, though to a less absolute degree, the capacity for happiness; and, as duty means our obligation to promote the general happiness, it follows that in no connection is the voice of duty more urgent than it is in the advancement of all that is conducive to health. By maintaining our own health at the highest point of its natural efficiency, we are doing all that in us lies to secure for ourselves the prime condition for work—that is, the prime condition for benefiting the community to whatever extent our powers may be capable. And, similarly, by promoting the health of others, we are, in proportion to our success, securing to the community a certain amount of additional capacity for work on the part of its constituent members, as well as increasing the individual capacity for happiness on the part of all the members whom our efforts may reach. Therefore I take it that, if we regard this subject from an ethical point of view, it is clear that we have no duty to perform of a more grave and important kind than this—thoughtfully to study the conditions of health, earnestly to teach these conditions to others, and strenuously

to make their observance a law to ourselves. Now of these conditions one of the most important is suitable recreation. For this is the condition which extends to all classes of the community, and the observance of which is, as we have seen, an imperative necessity to every individual who desires to possess a sound working mind in a sound working body. Hence I do not hesitate to say that one of our most weighty duties in life is to ascertain the kinds and degrees of recreation which are most suitable to ourselves or to others, and then with all our hearts to utilize the one, while with all our powers we encourage the other. Be it remembered that by recreation I mean only that which with the least expenditure of time renders the exhausted energies most fitted to resume their work; and be it also remembered that recreation is necessary not only for maintaining our powers of work so far as these are dependent on our vitality, but also for maintaining our happiness so far as this is dependent on our health. Remembering these things, I entertain no fear of contradiction when I

conclude that, whether we look to the community as a whole, or restrict our view to our own individual selves, we have no duty to discharge of a more high and serious kind than this—rationally to understand and properly to apply the principles of all that in the full but only legitimate sense of the word we call recreation. Again, therefore, I say if we know these things happy are we if we do them. And if we desire to do them—if as rational and moral creatures we desire to obey the most solemn injunction that ever fell from human lips, “Work while it is day”—we must remember that the daylight of our life may be clouded by our folly or shortened by our sin; that the work which we may hope to do we shall be enabled to do only by hearkening to that Wisdom who holdeth in her right hand length of days, in her left hand riches and honour; and that at last, when all to us is dark with the darkness of an unknown night, such Wisdom will not have cried to us in vain, if she has taught us how to sow most plenteously a harvest of good things that our children’s children are to reap.

LET US STUDY THE CHILDREN.

BY MRS. R. R. BIRD.

DID you ever wish, O mother! as you have read or heard of the wonderful Kindergarten system which Froebel, the child-lover, has inaugurated into the educational world, that there was a Kindergarten within easy reach for your own little ones?

You need not again wish it; there is one within easy reach; your own hand may touch it, your own eyes behold it. It may spring up right within the walls of your own home, if,

—if,—you will but consent to be a child among your children, knowing them and learning of them, having the text for your guide and inspiration, “And a little child shall lead them.”

What a blessing to little humanity is the system which Froebel has set forth! It is an oasis springing up in the hitherto dreary waste of the school-life of children; and as the germs of vegetable life are sometimes borne

from afar,—now in the plumage of migrating birds, now on the crest of an in-coming wave, and now on the wings of the flying gales,—so from that green spot in the desert have the germs been borne into many quarters, sprung up and yielded abundant fruit, until at last its influence seems to permeate the whole educational world.

Friedrich Froebel may be termed the great reformer in the realm of education; and,—with all due reverence may I say it,—as Christ, the Great Reformer, knowing what was in the heart of man, began his work of reform in the spiritual realm by stooping to the level of humanity, and there finding in humanity itself,—in its impulses and aspirations,—the links of the chain of Divine love which unites man with his fellow-man, and binds him at the same time to God above him, so Friedrich Froebel, acquainting himself with little children, with the laws of growth of their little bodies, hearts, and minds, began his work of reform in the realm of education by finding in the irrepressible activities, the boundless curiosity of children, and the infinite interest which they take in everything, the chains which bind them in love to the truths that lie around them, and lead them to thirst for those that are above and beyond them. In fact, Froebel but strove to carry on the work which Christ began when He took little children in His arms and blessed them. Christ saw in a little child what none else had ever seen. When He said, "Ye must become as little children," He turned the key which unlocks all the treasures of the kingdom of heaven. Froebel but caught the refrain and wafted it on, to be caught up and wafted on again by all lovers and teachers of children.

Shall we not become his disciples, doing all we can to further the great work? His doctrine is not a narrow one, applicable only to the compara-

tively few who may have access to all his books and the use of his gifts and occupations; but its spirit is of broad application, finding room wherever there are children to be trained and taught. Wherever there are children to be trained and taught, and a mother true, earnest, loving, sympathizing, studying the laws of growth of their little bodies, minds, and hearts, there may grow a Kindergarten.

Yes, we mothers may all have our Kindertagens if we only will. If not able to carry out the letter of Froebel's teachings, we may, at least, catch the spirit of them and infuse it into the home-life of our children. We may not have access to all of his works, nor the advantage of his gifts and occupations, technically so considered; yet if we will consent to be a child among our children,—to be with them upon that blessed "you-and-I" level, from which springs all knowledge of them, all sympathy with them, and which is the main-spring of the influence we may wield over them and the inspiration we may breathe into them,—we need not lack the apparatus for teaching them. It will spring up all around us. Whatever attracts the notice of children, and to which their attention may be drawn,—their games, their books, articles of clothing, furnishings of the table, household furniture, household pets, and out-of-doors, all natural objects with which they daily come in contact,—all may lend their aid in ministering to their love for knowledge and in still further creating a taste for it. It needs but the earnest, loving touch of a mother's hand,—herself filled with a power of appreciating wisdom, with sympathy for the children, and with a knowledge of their little needs and capacities,—to make even the commonest things within their grasp gleam and glisten with golden grains of knowledge.

But did you know,—O mothers

who pride yourselves upon your well-kept houses!—that where the prescribed laws of perfect housekeeping exist there will not live a Kindergarten? Beware of fettering the limbs of your little ones by weaving around them too early the fine threads of which your well-constructed house-keeping-web, with its lines and angles of geometrical accuracy, is composed. Your children will soon see that their life-blood of freedom is surely to be drawn out from them, will fly and buzz around a little while and then wisely seek more attractive quarters.

A Kindergarten may spring up and flourish in a perfectly-kept *home*, but not in a perfectly-kept *house*. There must be a compromise between house-keeping and home-keeping. If there be a strife for the mastery, let the former yield the point to the latter. Perfect housekeeping is the swallowing-up of individual comfort, individual freedom, individual action, into one groove laid out by the whim and wishes of one whose word must be law; while home-keeping looks after the comfort, freedom, habits, and wishes of each individual member of the household by the introduction of those charming little irregularities which give some homes such an attractive, free-and-easy atmosphere.

In the intricate machinery of a well-kept home, the wonderfully flexible hands stoop gladly to the happy, noisy children; reach up in loving tenderness to the feeble grandfather; embrace indulgently the rough, rol-

licking school-boy; yield considerately to the all-too-busy, care-worn father; relax mercifully for "the manservant and maid-servant;" and stretch out hospitably to the "stranger within the gates." And this by a beautiful spirit of compromise,—of each bending to the other, and by all working together in quiet consideration of one whose heart,—ever-cheery, ever-loving, ever-lenient, ever-sympathizing, ever-merciful, ever-generous, is the motor which moves and controls the whole.

In the sunshine of such a home will our own children like to bask, and to it will others wend their little footsteps to find that freedom which is their light and life, as surely as the leaves of window-plants all turn themselves toward the sun to drink in their light and life.

Let us then be sure to prepare such a home-soil that we may have a Kindergarten. Our own children may form the nucleus, and around it will cluster all the little playmates, who will find themselves gravitating,—some at one time, some at another, now here, now there,—toward our happy little centre; and while we shed the atmosphere of our influence and the dews of our teachings upon our own little ones, all the other followers will unconsciously breathe in the atmosphere and drink in the dews.

And thus having our Kindergarten, we ask: What shall we do? where shall we begin? *Let us study the children.* "A little child shall lead them."

—*The Primary Teacher.*

STRAY NOTES ON EDUCATION.

BY "CLANCAHILL," HAMILTON.

IT is a generally conceded maxim that "Knowledge is Power,"—not that dormant knowledge which, like the wealth of the miser, or the buried talent of the faithless steward, lies uselessly hidden from the light; but that active, vigorous knowledge which, by due circulation, benefits the general community without at all depreciating its own value. Nor is it the false knowledge of the scientist, who, carried away by his own conceit, seeks to ignore the agency of a Supreme Being in the system of creation, and to blast man's hopes of future happiness by placing his origin and destiny on a par with the brutes of the field; but the sublime knowledge of the Christian that exhibits the imprint of the Almighty hand in every phase of nature, and teaches mankind that the reward of a well-spent life is an eternity of bliss in the home of the Sovereign Good.

In some of the callings of life the acquisition of knowledge is an actual necessity, in others it is an invaluable assistant, and, in every instance, the truth of its power-possessing properties can be fully proved. Numbers of young people daily deceive themselves with the idea that as their intended occupations are not among what the world calls "the learned professions," there is no occasion for their becoming scholars. This is a great mistake, for, influenced by this opinion, hundreds have risked their prospects in a state of ignorance that dwarfed their usefulness into that of mere machines, or confined their occupations to the drudgery of "hewers of wood and

drawers of water." Had they possessed themselves of that learning they formerly treated so lightly, with what a wealth of discovery and improvement they might have enriched their respective occupations, as well as have added materially to their worldly condition? It is to be hoped that the time is not far distant when the value of a good education will be proportionately appreciated by the postulant for the plough of the farmer, the anvil of the smith, and the professor's chair.

GRAMMAR AND LITERATURE.

The true philosophy of language may be summed up in three words: correctness, power, and beauty. Correctness of expression can be acquired, not by a mere memorizing of grammatical definitions and principles, but by a just perception of their utility, with a power to grasp their force and application. It is not enough, for instance, to know that a verb is a word that expresses "existence, condition or action," one must also have a definite idea of the office of the verb, otherwise there would be a likelihood of classifying as verbs only such words as naturally express the functions contained in the definition. In the sentence "Dost *thou* me?" the word *thou*, in its nature a pronoun, is invested with the properties of the verb—emptying the fact that almost any word in English can be verbalised. This will go far to prove that, in the study of grammar as well as of anything else, it is the spirit of the principle and not a formal comprehension

of its words that carries true knowledge. Educational circles are filled with schemes of analysis and treatises on "How to Parse," exhibiting skillful mechanism, it is true, but telling little or nothing of their utility or profit. The *how* is duly considered, but the *why* is neglected, and so it is left to the teacher's generosity or to the student's own intelligence to develop the idea that parsing teaches that words, like the trees of a forest, have their relations and distinctions, their respective uses and properties, and that analysis furnishes the grammarian with a knowledge of the framework of human thought expressed, as valuable as that possessed by the skilled surgeon in regard to the human body. Good sense must go hand in hand with correct formation. The question "Is it reasonable?" should even have preference of "Is it grammatical?"—for it is unnecessary to prove that a sentence may be strictly grammatical but be woefully illogical.

Decorations, chaste or ornate, are as allowable in language as in painting, in architecture, or in any other human art. Rhetoric, with its figures, beautiful, captivating and inspiring, is the color-fount of language, supplying the material for a word picture as attractive as the fairest gem of the studio. The prose writer's lofty conceptions, the poet's sparkling creations, the thrilling periods of the orator, and the philosopher's bold syllogisms, are alike beautified by a discriminate use of the flowers of rhetoric. Grammar may teach propriety of expression and Logic reason, but Rhetoric alone has the power to rouse the feelings and awaken the sense of the beautiful. Logic may say in a commonplace manner: "They moved with the utmost speed, and their strength was exceedingly great;" but how vivid and striking the statement becomes when Rhetoric speaks: "They were swifter than eagles, they were stronger than

lions." A remarkable sentiment once uttered by Napoleon I. forcibly illustrates the power and beauty of rhetoric: "The life of a happy man is a silver ground studded with stars of jet; the life of a miserable man is a dark ground with a few stars of silver."

MATHEMATICS.

The Greeks called mathematics "learning" *par excellence*; and if we consider the profundity and precision with which it invests the successful student we must acknowledge that there is a strong germ of truth in the statement. Arithmetic, as the most generally useful of the mathematical branches, merits the most attention. The multiplicity of rules with which old mathematicians filled their text books, clogged rather than freed the road to arithmetical knowledge, as tending to make the operation merely mechanical, and to exercise the student's memory rather than his perception. The comparatively recent introduction of the "Unitary System," as possessing the power of centralizing all arithmetical principles, has received considerable approval. And very properly so, for when the student has been once trained to the exercise of original ideas he will derive more real profit from his work than from the study of the aggravating formulas and crotchets of the older systems. Algebra extending the principles of Arithmetic and quickening the thinking powers is an invaluable assistant by which to reach the higher branches of mathematics; while Euclid, with its invaluable demonstrations, stands out as the common friend of reason and quantity.

HISTORY AND GEOGRAPHY.

History affording recreation and instruction is a highly important study. Its great events make it interesting; the moral lessons derived from an analysis of these events make it in-

structive. The latter consideration is the true philosophy of history, and it should receive the greater share of attention. The history of Charles I. and the "Great Rebellion" is replete with striking events. But does it concern us as much to know the dates of its beginning and end, or what particular battle was won or lost, as to know that the high-handed measures of the monarch and the criminal ambition of the subject demoralized English manners, wasted the fairest of English lands, and hurried to untimely graves the noblest of England's sons? In this particular instance we have a fine example of the fatal results that may follow when the rights of the people or the prerogative of the monarch are pushed to extremities; and how grossly that noble sentiment, patriotism, can be abused when advocated by selfish and designing men. For, if the execution of Charles I. was not a sufficient atonement for his political sins, surely the statesmanship and military genius of Oliver Cromwell will not shield from odium the merciless, iron-handed Commoner, who hounded to death his misguided but not ill-natured king, and who, in the midst of his treacherous massacres, sang hymns and psalms to the Giver of life and death.

Geography and History are closely connected. History may be said to describe the operations of a nation's mind; Geography, its form and features. As we may be interested in

the story of a nation's adventures, as set forth in its history, so we may be equally interested in considering the attractions with which nature has endowed it, as well as be benefited by a knowledge of its material worth. Geography tells us of the noble river, weak in its origin, like the life of man, but increasing in power and magnitude as it approaches its eternity the ocean; of the lofty mountain lifting its head in majesty towards the heavens, as if indicating the true aim of human effort; of the mighty ocean, itself the emblem of infinity; of the mines of the earth, stored with wealth and comfort-giving material; of the fertile fields and forests, teeming with the requisites for human sustenance and convenience; and of the multitude of objects in general that serve to excite the grand and exalted sentiments of the mind or the more prosaic considerations of business and commerce.

The true object of knowledge, then, is the development of man's best faculties—to make him a useful, intelligent and virtuous member of society. "There is no royal road to learning" is an old and true saying; nor can it be purchased, except in so far as industry and perseverance can be considered articles of exchange. Knowledge is neither seclusive nor limited, but, like the solar orb itself, it shines for all, shedding its golden light equally for the benefit of the "hardy sons of toil" as for the more favoured offspring of wealth and title.

EXAMINATION FRAUDS IN ENGLAND.

WHAT is known as the "Goffin Case" has excited a great amount of interest in the scholastic profession in England during the last few months. "Payment by Results" flourishes there with all the luxuriance of a noxious weed, and amongst the various means adopted to carry it out are examinations held annually in May under the auspices of the Science and Art Department of South Kensington. These embrace some twenty-four subjects in Mathematics and in Physical Science. Men of eminence are selected as examiners. Professors Huxley and Michael Foster, for instance, were the examiners in Physiology and Biology at the late examination, and Norman Lockyer in Physiography. Professors Goodeve and Twisden examined in Mechanics, Professors Roscoe and Frankland in Chemistry, and Professor Guthrie in Magnetism, Electricity, Sound, Light, and Heat.

Examination papers are sent under seal from the Science and Art Department to the various bodies responsible for the management of Science Classes throughout the country. Pupils may select certain groups to be examined upon, and all answers are forwarded for examination to South Kensington. The report of the examiners decides what amount of money goes to each school as the result of the examination,—a certain sum being allowed for every scholar who satisfies the examiners. Of course this system is a direct appeal to the cupidity of school managers who have charge of science and art classes, and this induces them to place a premium upon those teachers

who are the most successful crammers. Mr. Goffin, Head Master of the United Westminster Schools, has had wonderful success in passing students at these examinations; indeed, the skill he claims for work of this kind far surpasses that of any teacher we have yet heard of, with but one exception. It has been no uncommon thing for him to pass pupils of twelve years of age and under in subjects which are difficult enough for an ordinary matriculation examination, and we find from a statement of his own that he actually sent a boy of twelve years of age to be examined in twelve out of the twenty-four subjects. In one year his scholars won a studentship, two elementary school scholarships, a gold medal, a silver medal, and a bronze medal. Is it any wonder that they presented him with a testimonial valued at forty pounds? It was worth Mr. Goffin's while to be successful, for his employers paid him six hundred pounds a year, and he earned from the Science and Art Department above four hundred pounds in addition. Five thousand dollars a year was the comfortable sum his efforts in preparing students of all ages to pass successfully the ordeal of the Science and Art examinations yielded him. At last his remarkable success aroused the suspicions of the authorities at South Kensington, and more than a year ago, owing to information conveyed in some mysterious way, three officials, with Colonel Donnelly at their head, were appointed to investigate his case. Their report led to the cancelling of the examinations of the pupils who were examined from Mr.

Goffin's school in the May of last year. This was not all,—he himself was for ever disqualified from teaching, or earning payments under the Science and Art Department. Whatever the charges were that were made against Mr. Goffin, he met them with an unqualified denial, and in his protest to Lord George Hamilton, the head of the Education Department, he says: "I declare in the most solemn manner, without the least hesitation, equivocation, or mental reservation of any kind, that I never had in my life any such information as I am charged with, and I challenge any of your officials to produce the least particle of direct evidence in support of the charge." He at the same time accuses Colonel Donnelly of serious misconduct in the investigation of his case, such as calling one boy who did not give him such an answer as he wished to be given an "incorrigible liar," another "an infernal young scamp," and the class as a whole was characterized as "a set of wretched, miserable boys, who are systematically taught to lie." The Colonel did not deny using such language, but justified it by the nature of the evidence elicited. Mr. Goffin's Board took the matter up and instituted a searching inquiry of their own, the result of which was that they held the accused altogether blameless and determined to retain him in his position.

The *Schoolmaster*, the organ of the elementary teachers in England, took the matter up next and urged a combined effort on the part of the teachers of the country to have a fair and open trial for Goffin before a select committee of the House of Commons. The case came before the teachers at their Conference held at Nottingham in Easter Week of this year, and the resolutions then agreed upon tended in the same direction as the suggestions of the *Schoolmaster*. Very strong feelings of sympathy were felt and

expressed for Mr. Goffin on account of his having been condemned without an opportunity of defending himself. The Conference, however, was very careful not to commit itself to any expression of opinion as to his guilt or innocence, though he protested the latter earnestly before them. A "Goffin Defence Fund" was started, and contributions flowed in from various local Associations throughout the country. The members of these Associations also exerted their influence with the local members to have the case properly put before the House of Commons. During all this time the general body of teachers were kept in almost total ignorance of the specific charges made against Mr. Goffin, and of the evidence the South Kensington authorities possessed to substantiate them. We have, therefore, to rely upon what he himself tells us previous to the report of the Select Committee. As early as 1865 he says he was accused of having the *same set* of questions in Chemistry as those used at the examination; this he denies, but admits that he had the *same questions*, though not the *same set*. "In 1865," he writes, "the students had ten questions to answer out of twenty-four, and of these twenty-four they found no less than ten of their old friends of former years, two or three in a very slightly modified garb, but most of them identical even in words. . . . The questions themselves are to be found in Buckmaster's 'Elements of Chemistry,' second edition, 1863. This book was read by the class, and the questions found at the end were answered, a few at a time, in my weekly examinations, and hence had not only been seen, but *answered*, by the students." An important witness against him was a Constable Ledger, a former pupil teacher, and Assistant Master under him, who testified to Colonel Donnelly that "immediately before *every* succeeding examination the class was in-

structed in questions which were afterwards found in the examination paper." "This," Mr. Goffin says, "is more or less true, certain kinds of questions, which always recur, were very probably touched upon during the last two or three lessons. What teacher does not give a lesson immediately before an examination? Do not students in training read up to the last minute? Do not University men *grind* up to the moment of entering an examination room? It may or may not be true, that another pupil showed M. N. (the Constable in question) an examination paper which I may have left in a book on the mantelpiece. It was certainly one of previous years, if at all. I usually had a number in my desk." This man Ledger had done Mr. Goffin's family the greatest injury a man could be guilty of,—he had ruined his sister, and because the injured man treated such villainy as it deserved and dismissed the scoundrel from the school, he expressed a determination in the hearing of numerous persons "to have his knife in him," and, Mr. Goffin says, adopted this effective way of doing it. His evidence is of little value, therefore, beyond showing how base human nature may become. With such facts as these before them it is not to be wondered at that the teachers of England, who seem inspired with a strong *esprit de corps* worthy of emulation amongst ourselves, were roused to the highest state of indignation at the arbitrary treatment of one of their number by what they regarded as a secret tribunal, from whose decision there seemed to be no appeal. Their united efforts were not without success. Sir Sidney Waterlow, who had been Goffin's staunch friend throughout, procured the appointment of a Select Committee of the House of Commons, with Mr. Lowe as chairman and himself and Lord George Hamilton as two of the members. Mr. Pell, one of

the Agricultural Commissioners at present travelling in Canada, was also one of the number. Its duty was to investigate the truth of the charges made against Mr. Goffin. The proceedings are reported in a blue-book of nearly 200 pages. Mr. Heller, the able and indefatigable secretary of the National Union of Elementary Teachers, who had rendered invaluable aid to Mr. Goffin during the investigation before the Committee, prepared an abstract of the evidence for the use of the Executive Committee of the Union. From this we gather that Col. Donnelly was induced to institute an investigation by a "Paper" handed to him while the examinations were in progress by a brother of one of Mr. Goffin's Assistant Masters. He had received it from another assistant, who had got it from a boy in Mr. Goffin's class whose name he had forgotten. The Colonel presented an analysis of note books taken by his officers, and contended that this proved the authenticity of the "Paper," and that Mr. Goffin had, beyond a doubt, obtained previous information of the examination papers. The inferences he drew in his analysis were characterized as "fair" in a memorandum signed by Professors Roscoe and Frankland. Several of Mr. Goffin's assistants were examined, and although they had in the previous investigation made by the South Kensington officials denied that they had any reason for suspicion of improper conduct on his part, they now seriously contradicted their previous evidence. One man admitted that while "reading up" he had received, three days before the examination eight or nine questions in each of the papers, Sound, Light and Heat, Electricity and Mathematics, bearing directly on the examination subjects. In 1878 he had three out of eight questions touched on in Chemistry. The remarkable foresight Mr. Goffin displayed in "hitting" questions,

was a subject of common talk among masters and boys. Lest any of our readers should be ignorant of this expressive term, we may explain that to "hit" questions is to anticipate those that appear on an examination paper. Another term pertaining to the art, or shall we say science, of preparing students successfully to pass an examination, is the word "tip." "Tipping" is the very essence of cramming. To "tip" questions is to give only those to your students that will bear upon what may appear on the examination paper. Had these terms been known here when Judge Patterson investigated the charges of collusion between Mr. Kirkland and Dr. McLellan, they would have saved a good deal of circumlocution on the part of those who proved themselves skilful at both "tipping" and "hitting." Another man said that on the eve of an examination in Mechanics he was asked by Mr. Goffin if he was going to present himself, but replied in the negative, as he was not prepared. "I was therefore invited into Mr. Goffin's private room, where he very kindly explained to me, with sketches, some questions which he *thought* would very likely come up. Under these circumstances I sat for the examination, and guess my surprise when the question-paper was handed to me and carefully read; I felt quite at home, and answered my questions in a very short time, for they were identical with those that Mr. Goffin had explained to me about two hours before."

There was other evidence similar to this which we need not particularize. Mr. Goffin, in his defence, gave a complete and emphatic denial to the charges and tried to weaken the evidence of Colonel Donnelly's informant by accusing him of having offered him a bribe to secure his appointment under him in the Westminster Schools. He showed that the

"Paper" that led to the suspension of his certificate had not been authenticated, and asserted that it was not supported to any appreciable extent by the note books of which Colonel Donnelly had presented an analysis. He proved that no single note book contained more than one or two points bearing on a question, and that it was only by piecing out such notes that testimony was obtained. He showed that the "Paper" had not been traced to any boy in the school, and boldly asserted that it bore internal evidence of being a concoction, containing parts not found in his lessons; these he believed had been inserted, with the examination questions in their hands, by those who had been instrumental in handing the "Paper" to Colonel Donnelly. He admitted that the most damaging evidence against him was a note book marked "No Name," but, he remarked, properly enough, until this had been traced to somebody in the school, it should not be taken as evidence against him.

Unfortunately for Mr. Goffin, through the assiduity of one of the South Kensington officials, the writers of both the "Paper" and the "No Name" note book were identified, and only one of his own witnesses had been examined when they were brought forward and proved that the documents in question were theirs, and had been written either from Mr. Goffin's dictation or copied from slips of paper he had supplied. The Committee then decided to hear no further evidence.

Another serious charge against Mr. Goffin, which was substantiated by several witnesses, was the falsification of registers, by marking those present who were not in attendance. The report of the Committee is so short that we insert it entire.

The Select Committee appointed to inquire into and report upon the circumstances relating to the suspension of the Certificate of Mr.

Goffin by the Science and Art Department, have agreed to the following report :—

Your Committee are satisfied from evidence taken on oath, and from documents laid before them :—

(a.) That Mr. Goffin, the Head Master of the United Westminster Schools, did disclose to his pupils in certain Science classes just previous to the examinations, the answers to a large number of questions in the Examination papers.

(b.) That the information which he thus gave was of such a nature that he must, before imparting it to his classes, have known the contents of the Examination papers.

(c.) That the registers containing the attendance roll of the pupils of Mr. Goffin, were in certain cases falsified by Mr. Goffin and his assistants, to obtain payment on pupils who had not made the necessary number of attendances.

(d.) That the statements in the petitions signed by pupils and teachers on Mr. Goffin's behalf, and presented to the Governors of the United Westminster Schools, were false, and were known by some of the signatories to be so.

Previous to his appointment in 1874, as Head Master of the United Westminster Schools, Mr. Goffin was master of St. John's School, Woking. Your Committee have taken evidence as to his system of teaching Science there, and from that evidence it is clear—

(a.) That a large number of pupils, including mere children, were enabled to pass examinations in a great number of Science subjects of which they knew scarcely anything, by being systematically taught by heart, on the day of, or the day previous to the examination, answers to the questions set.

(b.) That fraudulent fabrication of the attendance registers was systematically practised, in order to obtain payment upon the pupils who, by another fraud, had been enabled to pass the examination.

The investigations now held have disclosed the fact that Mr. Goffin has carried on a course of fraud, in a manner, and to an extent, which must have greatly lowered the tone of morality among a large body of scholars and teachers.

Your Committee record their emphatic opinion, that fraud, thus reduced to a system, and almost elevated to the dignity of an art, requires the immediate attention of the Education Department, with a view to the adoption of such further precautions as will prevent a repetition of these disgraceful practices.

Your Committee further express a hope that the Department will deal as leniently as their public duty will allow with the teachers who, in the course of this inquiry, have by their evidence exposed themselves to the charge of complicity with some of Mr. Goffin's proceedings.

It is speaking soberly to say that this report fell like a thunderbolt upon the whole teaching profession of the mother country.

The press without exception took the same view as the committee, and Mr. Goffin was dealt with in severe terms.

As a sample of the criticism of the case, the Edinburgh "Scotsman" remarks that the upshot of all the teachers' "eloquent speeches and indignant letters is that Goffin the champion is thrown back on their hands as Goffin the rogue."

Our readers will not fail to have noticed the strong resemblance between this case and the one we have already referred to which Judge Patterson adjudicated upon. The main difference between them is in the decision arrived at, and who knows whether this would not have been the same had Mr. Goffin had the benefit of a judicial mind accustomed to sift and weigh evidence to submit his case to as Messrs. Kirkland and McLellan had, instead of a committee of the House of Commons, even though it was presided over by a man of so brilliant an intellect as Mr. Lowe. But anyone who is inclined to this opinion must have it greatly weakened when we add that the Executive Committee of the National Union of Elementary Teachers, a body whose functions resemble those of the Board of Directors of our Provincial Association, and of which Mr. Goffin himself was a member, has after mature deliberation accepted by a formal resolution the report of Mr. Lowe's Committee as justified by the evidence.

Though disgrace has thus apparently been brought upon the whole teaching

profession by one man's misconduct, we have no doubt that the investigation will result in the teachers obtaining what they earnestly desire, a

recognized means of appeal from such Star chamber proceedings as those of the Science and Art Department of South Kensington.

THE LESSON.

A TEACHER sat in a pleasant room,
 In the waning light alone ;
 Her head was bowed in anxious thought :
 With the work and care the day had brought,
 She had faint and weary grown.
 And the task which seemed light in morning's ray,
 As she thought of it now at the close of the day,
 When weary with toil and faint with care,
 Seemed more than human strength could bear.

Since the scholars had left her, one by one,
 Full more than an hour had flown ;
 She had given them each a kind good-night,
 And while they lingered her eyes were bright,
 But they dimmed with tears when alone.
 She had borne the burden the day had brought,
 The daily task she had faithfully wrought,
 And now, to solace her weary mind,
 A lesson of life she sought to find.

The work and cares of the day she scans,
 But no lesson from them receives.
 "The day has no lesson for me," she said ;
 "A lesson, I'll read, in the Book instead,"
 And she opened her Bible leaves.
 When lo ! the lesson she had sought in vain,
 To draw from her fagged and weary brain,
 At once from the holy page she drew,
 Though always the same, yet ever new.

"Establish Thou the work of our hands ;"
 'Twas this that met her gaze,
 The words went up from her lips like prayer ;
 And as she read she treasured there
 A lesson for many days.
 Not alone for her let the lesson be,
 May it come as well to you and to me.
 Let our prayer be the words of holy writ,
 "Yea, the work of our hands establish Thou it."

ARTS DEPARTMENT.

[NOTE.—We continue this month the selection from the Annual Examination Papers of the University of Toronto, for Junior Matriculation; also the selection from the July Examination Papers of the Education Department for First, Second, and Third-Class Teachers, adding solutions to several of the Mathematical papers. ARCHIBALD MACMURCHY, M.A., Math. Ed. C. E. M.]

UNIVERSITY OF TORONTO EXAMINATIONS, 1879.

JUNIOR MATRICULATION.

ALGEBRA.—HONORS.

1. Define a *fraction*, and prove that

$$\frac{a}{b} \times \frac{c}{d} = \frac{ac}{bd}.$$

Simplify

$$\frac{\frac{\frac{1}{1-a} - \frac{1}{1-b}}{\frac{1}{1-a} - \frac{1}{1-b}} \times \frac{\frac{1}{1-b} - \frac{1}{1-c}}{\frac{1}{1-b} - \frac{1}{1-c}}}{\frac{1}{(1-a)b} - \frac{1}{(1-b)a}} \times \frac{\frac{1}{1-c} - \frac{1}{1-a}}{\frac{1}{(1-c)a} - \frac{1}{(1-a)c}}.$$

2. Describe methods of finding the G.C.M. of two algebraical quantities.

Shew that $(a-b)(b-c)(c-a)$ is the G.C.M. of $(a+b)(a-b)^2 + (b+c)(b-c)^2 + (c+a)(c-a)^2$ and $(a-b)(a+b)^2 + (b-c)(b+c)^2 + (c-a)(c+a)^2$.

Find also the least common multiple of these two quantities.

3. Find the square root and the fourth root of

$$x + x^{-1} - 4\sqrt{-1}(x^{\frac{1}{2}} - x^{-\frac{1}{2}}) - 6.$$

If $x^4 + 2ax^3 + bx^2 + 2cx + d$ is a complete square, prove that

$$a = \frac{c}{\sqrt{d}} = \frac{b - 2\sqrt{d}}{a}.$$

4. Find the roots of the equation

$$ax^2 + bx + c = 0.$$

What do the roots become when (1) $a=0$;

(2) $c=0$; (3) $a=0$ and $b=0$?

Prove that a quadratic equation can have only two roots.

5. Solve the equations

$$(1) \sqrt{2x} + \sqrt{3x} = \sqrt{5}.$$

$$(2) \{(x+l)^2 - a^2\} \{(x+l)^2 - b^2\} = \{(x+m)^2 - a^2\} \times \{(x+m)^2 - b^2\}$$

$$(3) \frac{1}{x-3} + \frac{3}{x+15} + \frac{1}{x+3} - \frac{5}{x+9} = 0.$$

$$(4) \left. \begin{aligned} \frac{1}{x} + \frac{1}{z} &= \frac{2}{y} \\ x + z &= \frac{1}{4y} \\ x^2 - 2yz &= \frac{1}{12} \end{aligned} \right\}$$

6. Find the sum of n terms of an arithmetical series, having given the first term and the common difference.

Find the sum of 32 terms of the *A. P.* whose 5th term is 20, and whose 21st term is 15.

7. Define a harmonic series, and shew how to insert m harmonic means between a and b .

If a , $2b$ and c be in *H. P.*, then will $a+c$, a , and $a-b$, be in *G. P.*, and also will $c+a$, c , and $c-b$.

8. Find the number of combinations of n things taken r at a time, and prove that it is the same as the number of combinations of n things taken $n-r$ at a time.

Prove that the number of combinations of $2n$ things taken n at a time is

$$2^n \frac{1 \cdot 3 \cdot 5 \dots (2n-1)}{1 \cdot 2 \cdot 3 \dots n}.$$

9. Assuming the truth of the Binomial Theorem when the index is a whole number, prove it when the index is a positive fraction.

Write down the fifth term of $(2^3 - 2)^{-n}$.

Prove that

$$\sqrt[3]{\frac{1}{6}} = \frac{1}{2} + \frac{1}{3 \cdot 2^3} + \frac{1 \cdot 4}{1 \cdot 2} \cdot \frac{1}{3^2 \cdot 2^3} + \frac{1 \cdot 4 \cdot 7}{1 \cdot 2 \cdot 3} \cdot \frac{1}{3^3 \cdot 2^7} + \dots$$

10. Sum the series

(1) $\frac{1}{\sqrt{2}} - \frac{1}{3} + \frac{\sqrt{2}}{9} - \frac{2}{27} + \dots$ to infinity.

(2) $3+6+11+20+27+\dots$ to n terms.

SOLUTIONS TO ALGEBRA—HONORS.

1. $a^2 b^2 c^2$.

$$2. (a+b)(a-b)^2 + (b+c)(b-c)^2 + (c+a)(c-a)^2 = 2(a+b+c)(a-b)(b-c)(c-a)$$

$$(a-b)(a+b)^2 + (b-c)(b+c)^2 + (c-a)(c+a)^2 = -(a-b)(b-c)(c-a)$$

$\therefore G.C.M. = (a-b)(b-c)(c-a)$.

L.C.M. $2(a+b+c)(a-b)(b-c)(c-a)$.

3. $x^{\frac{1}{2}} - 2\sqrt{-1-x} - x^{-\frac{1}{2}}$; $x^{\frac{1}{2}} - x^{-\frac{1}{2}}$ $\sqrt{-1}$.

Assume $x^4 + 2ax^3 + bx^2 + 2cx + d = (x^2 + mx + n)^2$

Equating co-efficients of like powers of x

$a = m, b = m^2 + 2n, c = mn, d = n^2; \therefore m = \frac{mn}{n} = \frac{m^2 + 2n - 2n}{n}$

4. Book-work.

5. (1.) $x = 25 - 10\sqrt{6}$.

(2) We have

$$\frac{(x+l)^2 - a^2}{(x+m)^2 - a^2} = \frac{(x+m)^2 - b^2}{(x+l)^2 - b^2}$$

Subtracting 1 from each side and dividing both sides by $(x+l)^2 - (x+m)^2$ we have

$(x+l)^2 - b^2 + (x+m)^2 - a^2 = 0$

$\therefore x = \pm \frac{\sqrt{a^2 + b^2 - (l-m)^2} - l - m}{2}$

$(x+l)^2 - (x+m)^2 = 0$ gives $x = \frac{l+m}{2}$

(3.) $x = -\frac{3}{4}$.

(4.) $x = \frac{1}{4}$
 $y = \frac{3}{4}$
 $z = \frac{1}{2}$

6. 525.

7. If $a, 2b, c$ be in $H.P.$, $2b = \frac{2ac}{a+c}$

$\therefore b = \frac{ac}{a+c}$

or, $ab + bc = ac$,

i.e., $a^2 = (a+c)(a-b)$

or, $c^2 = (c+a)(c-b)$.

8. $\frac{|2n|}{|n| |n|} = \frac{(1.3.5 \dots 2n-1)(2.4.6 \dots 2n)}{|n| |n|}$
 $= 2^n \cdot \frac{(1.3.5 \dots 2n-1) |n|}{|n| |n|}$
 $= \dots c.$

9. $\frac{n(n+1)(n+2)(n+3)}{4} (2^3)^{-(n+4)} \cdot 2^4$

Put $n = \frac{1}{2}$, and the second part of question follows.

10. (1) $S = \frac{a}{1-r} = \frac{\sqrt{2}}{1 + \frac{\sqrt{2}}{3}} = \frac{3}{2 + 3\sqrt{2}}$

$S = (1^2 + 2) + (2^2 + 2) + (3^2 + 2) + \dots + (n^2 + 2)$
 $= \frac{n(n+1)(2n+1)}{6} + 2n$

PROBLEMS.

1. AD, BE are drawn at right angles to the opposite sides of the triangle ABC . Shew that the triangle CED is similar to the triangle CBA .

2. Produce a line so that twice the rectangle contained by the whole line and the part produced shall equal the square on half the given line.

3. $ABCDEF$ is a hexagon inscribed in a circle such that $AB=BC, CD=DE$, and $EF=FA$. Shew that AD, BE , and CF pass through a point and are at right angles to BF, FD , and DB respectively.

IV. In any triangle inscribe a triangle similar to a given triangle.

V. Four straight lines form four triangles: the centres of the four circumscribed circles lie on a circle which also passes through the common point of the circumscribed circles.

VI. An $A.P.$, a $G.P.$, and an $H.P.$ have each the same first and last terms, and the same number of terms (n), and the r th terms are a_r, b_r, c_r ; prove that

$a_{r+1} : b_{r+1} = b_{n-r} : c_{n-r}$

VII. There are p suits of cards, each suit consisting of q cards numbered from 1 to q ; prove that the number of sets of cards numbered from 1 to q which can be made from all the suits is p^q .

VIII. If p be nearly equal to q , $\frac{(n+1)p + (n-1)q}{(n-1)p + (n+1)q}$ is a close approximation

to $\left(\frac{p}{q}\right)^{\frac{1}{n}}$; and if $\frac{p}{q}$ differ from 1 only in the $(r+1)^{th}$ decimal place, this approximation will be correct to $2r$ places.

IX. Having given

$$yz + \frac{1}{y^2} - ax - \frac{b}{x} = zx + \frac{1}{zx} - ay - \frac{b}{y} =$$

$$yx + \frac{1}{xy} - az - \frac{b}{z}$$

prove that if x, y, z be all unequal, $ab=1$, and each member of these equations = 0.

10. If $\frac{ax - by}{z} = \frac{ay - bz}{x} = \frac{az - bx}{y}$ prove that $x=y=z$.

I. Prove that

$$3^n = 1 + n \cdot 2^n + \frac{n(n-1)(n-2)}{1 \cdot 2 \cdot 3} 2^{n-2}$$

$$+ \frac{n(n-1)(n-2)(n-3)(n-4)}{1 \cdot 2 \cdot 3 \cdot 4 \cdot 5} 2^{n-4} + \text{etc.}$$

12. If A, B, C are the angles of a triangle, then $\sin(A-B) \sin C + \sin(B-C) \sin A + \sin(C-A) \sin B = 0$.

13. If $\sin l = \frac{a-b}{a+b}$, $\sin m = \frac{b-c}{b+c}$, $\sin n = \frac{c-a}{c+a}$, prove that $\sec^2 l + \sec^2 m + \sec^2 n = 2 \sec l \sec m \sec n + 1$.

14. A started from Ottawa at 9 A.M., to walk to Chelsea. After he had walked $1\frac{1}{2}$ miles, B started and overtook A half-way there. A then increased his pace one-fifth and B decreased his one-ninth, and they reached Chelsea together at 11:28 $\frac{1}{2}$ A.M. Find the distance to Chelsea.

15. O is the point in AO perpendicular to the straight line ABC , from which BC appears the longest; prove that

$$\tan COB = \frac{BC}{2AO}$$

XVI. An object is observed at three points A, B, C , lying in a horizontal straight line which passes directly underneath the object;

the angles of elevation at A, B, C are $m, 2m, 3m$, and $AB = a, BC = b$; prove that the height of the object is

$$\frac{a}{2b} \sqrt{(a+b)(3b-a)}$$

SOLUTIONS TO PROBLEMS.

VI. Let a, c , be the first and last terms respectively, then

$$a_r = a + (r-1) \frac{c-a}{n-1}, \quad b_r = a \left(\frac{c}{a}\right)^{\frac{r-1}{n-1}}$$

$$c_r = \frac{ac(n-1)}{c(n-1) + (r-1)(a-c)}$$

Required to show

$$a + r \frac{c-a}{n-1} = \frac{a \left(\frac{c}{a}\right)^{\frac{n-r-1}{n-1}}}{ac(n-1)}$$

$$a \left(\frac{c}{a}\right)^{\frac{r}{n-1}} = \frac{a \left(\frac{c}{a}\right)^{\frac{n-r-1}{n-1}}}{c(n-1) + (r-1)(a-c)}$$

$$\text{or } \frac{a(n-1) + r(c-a)}{n-1} = \frac{a \left(\frac{c}{a}\right)^{\frac{n-r-1}{n-1}}}{a(n-1) + r(c-a)}$$

$$a \left(\frac{c}{a}\right)^{\frac{r}{n-1}} = \frac{ac(n-1)}{a(n-1) + r(c-a)}$$

or $ac = ac$.

VII. First take 2 cards in each suit, and suppose the cards arranged thus, 1 2 (1), then 1 in (1) may be 1 2 (2), taken with 2 in (1), (2) 1 2 (3), ... (p), thus giving p sets. Now : : take 1 in (2) and so on for each : : of the others; thus on the whole 1 2 (p). there are p^2 sets. Then take 3 cards in each suit; now the p^3 's may be arranged with the p^2 sets in the same manner as before, giving p^3 sets, and so on. q cards and p sets taken as in question will give pq sets.

VIII. Let $\sqrt[n]{\frac{p}{q}} = 1+x$ where x is very small,

$$\therefore \frac{p}{q} = 1+nx \text{ nearly.}$$

$$\therefore x = \frac{\frac{p}{q} - 1}{n}$$

$$\text{also } \frac{p}{q} - 1 = nx + \frac{n(n-1)}{2} x^2 \text{ nearly.}$$

$$= x \left(n + \frac{n(n-1)}{2} \cdot \frac{p}{q} - 1 \right)$$

$$\therefore x = \frac{2 \left(\frac{p}{q} - 1 \right)}{n+1 + (n-1) \frac{p}{q}}$$

Hence $\sqrt{\frac{p}{q}} = 1 + x = \frac{n+1 \frac{p}{q} + n-1 \frac{p}{q}}{n+1 + (n-1) \frac{p}{q}}$

Second part follows at once, $\therefore x < \frac{1}{10}$ and 1st term neglected is $\frac{n(n-1)}{2} x^2$.

IX. From first identity

$(z - \frac{1}{xyz} - \frac{b}{xy} + a)(y-x) = 0$ $\therefore x, y, z$ are unequal.

$$z - \frac{1}{xyz} - \frac{b}{xy} + a = 0 \quad (1)$$

$$\text{similarly } x - \frac{1}{xyz} - \frac{b}{yz} + a = 0 \quad (2)$$

$$\text{" } y - \frac{1}{xyz} - \frac{b}{zx} + a = 0 \quad (3)$$

From (1) and (2) $b = xyz$,

$$\therefore a = \frac{1}{xyz}$$

Substituting which values each member of these = 0.

10. Each of given fractions

$$= \frac{a(x+y+z) - b(x+y+z)}{x+y+z}$$

$\therefore ax - by = ay - bz = az - bx = az - bz = ax - bx = ay - by$, whence $x = y = z$.

$$11. (2+1)^n - (2-1)^n = 2(n \cdot 2^{n-1} - 1$$

$$+ \frac{n(n-1)(n-2)}{3} \cdot 2^{n-3} + \dots)$$

$$\therefore 3^n = 1^n + n \cdot 2^n + \frac{n(n-1)(n-2)}{3} \cdot 2^{n-2} + \dots$$

$$12. \text{ Since } \sin C = \sin(\pi - A + B) = \sin(A + B).$$

\therefore given expression becomes

$$\sin A - B \sin A + B + \dots + \dots$$

or $\sin^2 A - \sin^2 B + \sin^2 B - \sin^2 C + \sin^2 C - \sin^2 A = 0$.

$$13. \text{ We have } \sec l = \frac{a+b}{2\sqrt{ab}}, \text{ etc. etc.}$$

Proposed identity follows immediately.

14. Let $x =$ distance from O. to C.

$y = A$'s rate per hour.

$z = B$'s rate per hour.

$$\frac{x}{y} + \frac{x}{6y} = \frac{99}{40} \quad (1)$$

$$\therefore x = \frac{27}{10} y$$

$$y + \frac{y}{5} = z - \frac{z}{9}$$

$$\therefore z = \frac{27}{20} y$$

$$\frac{27}{20} y - 1 = \frac{27}{20} y$$

$$\therefore y = \frac{20}{6}$$

$$\therefore x = 9$$

$\therefore 9$ mls. dist. from O. to C.

15. The pt. O where circle passing through B, C, touches AO is pt. where BC subtends the greatest angle, i.e. where BC appears longest.

$$\begin{aligned} \tan COB &= \tan(AOC - AOB) \\ &= \frac{\tan AOC - \tan AOB}{1 + \tan AOC \cdot \tan AOB} \\ &= \frac{AC - AB}{AO} \\ &= \frac{AO^2 + AC \cdot AB}{AO^2} \\ &= \frac{BC}{2AO} \\ \therefore AO^2 &= AC \cdot AB. \end{aligned}$$

16. Let P be the object, PD its height = x suppose.

Let CD = z.

$$\tan m = \frac{x}{a+b+z} \quad (1)$$

$$\tan 2m = \frac{x}{b+z} \quad (2)$$

$$\tan 3m = \frac{x}{z} \quad (3)$$

$$\therefore x = (a+b+z) \tan m \quad (4)$$

$$= (b+z) \frac{2 \tan m}{1 - \tan^2 m} \quad (5)$$

$$= z \frac{3 \tan m - \tan^3 m}{1 - 3 \tan^2 m} \quad (6)$$

Equating values of $\tan^2 m$ we find

$$z = \frac{a^2 - ab - 2b^2}{2b}$$

From right-angled triangle $BP'D$,

$$a^2 - (b+z)^2 = x^2,$$

$$\therefore x = \frac{a}{2b} \sqrt{\{(a+b)(3b-a)\}}.$$

ENGLISH.

(Candidates in Arts will omit questions 1, 2, 14 and 15. Candidates in Law will omit 3, 4, 5, 14 and 15. Candidates in Medicine will omit 1, 2, 3, 4 and 5.)

Write a composition, not exceeding 50 lines in length, upon any one of the following subjects:

- (a) "The Zulu War."
- (b) "All the world's a stage, and all the men and women merely actors."
- (c) "'Tis only noble to be good."
- (d) "The water system of Canada."

1. Brief sketches of the life and writings of Sir Francis Bacon, Beaumont, Fletcher, Lyly, Ben Jonson, Burton.

2. Point out clearly the distinctive traits of the literature of the Elizabethan period, shewing how it was affected by the domestic and foreign relations of England.

3. Give a short history of Milton, naming his chief prose and poetical works.

4. Brief notes on: Aescalon, Oreb, Titan, Delphian Cliff, Dodona, Aspramont, Lemnos, Taurus, Alcairo, Panim, Sovran, Cēchalia, Acheron.

5.
 "Let *such* bethink them, if the sleepy drench,
 Of that forgetful lake benumb not still,
 That in our proper motion we ascend
 Up to our native rest: descent and fall
 To us is adverse. Who but felt of late,
 When the fierce foe hung on our broken rear
 Insulting, and pursued us through the deep,
 With what compulsion and laborious flight
 We *sunk* thus low?"

- (a) Rewrite in prose.
 - (b) Parse italicized words.
 - (c) Analyse the passage.
6. Trace briefly the formation of the English language from the Anglo-Saxon, shewing the causes which brought about the change.

7. Write a brief paper upon the English possessive case; its origin, form, etc.

8. Classify pronouns in English, and name the class (or classes) to which the following belong: *mine, either, what, none*.

9. Distinguish clearly between poetry and prose; and explain the nature of the following metres: iambic hexameter, dactylic, trimeter.

10. Name two English words from each of the following languages: Greek, Dutch, Chinese, Arabic, French, Italian, Persian.

11. Write brief notes upon: hybrids, Celtic language, permutation of letters, accent, orthoepy, patronymics, augmentatives.

12. Brief notes upon the grammatical and etymological peculiarities of: *was, many a, a hunting, thither, till, to wit, myself, twelve, double, further, spinster, none*.

13. Parse italicized words in the following:
This being mine.

Al! me! I have lost *what* you *yourself* gave me.

14.
 "Vice is a monster of such frightful mien,
 That to be hated, needs but to be seen;
 But seen too oft, familiar with its face,
 We first endure, then pity, then embrace."
 Analyse fully.

15. "English Grammar is more regular and less complex than the grammar of most languages." Criticise, explain, and illustrate.

EDUCATION DEPARTMENT, ONTARIO.

July Examinations, 1879.

FIRST-CLASS TEACHERS.

ENGLISH GRAMMAR AND ETY- MOLOGY.

1. "*King Richard*—
 He is our cousin, cousin; but 'tis doubt,
 When time shall call him home from banishment,
 Whether our kinsman come to see his friends,
 Ourselves, and Bushy, Bagot here, and Green,
 Observ'd his courtship to the common people; 5
 How he did seem to dive into their hearts
 With humble and familiar courtesy;
 What reverence he did throw away on slaves;
 Wooing poor craftsmen with the craft of smiles,

And patient underbearing of his fortune, 10
 As 'twere to banish their affects with him.
 Off goes his bonnet to an oyster-wench;
 A brace of draymen bid find speed him well,
 And had the tribute of his supple knee.
 With—"Thanks, my countrymen, my loving
 friends." 15

As were our England in reversion his,
 And he our subjects' next degree in hope.

Green—

Well, he is gone; and with him go these thoughts.
 Now for the rebels which stand out in Ireland.—
 Expedient manage must be made, my liege, 20
 Ere farther leisure yield them farther means.
 For their advantage, and your highness' loss.

King Richard—

We will ourself in person to this war;
 And, for our coffers—with too great a court,
 And liberal largess,—are grown somewhat light, 25
 We are enforced to farm our royal realm;
 The revenue whereof shall furnish us
 For our affairs in hand. If that come short,
 Our substitutes at home shall have blank charters;
 Whereto, when they shall know what men are
 rich, 30
 They shall subscribe them for large sums of gold,
 And send them after to supply our wants;
 For we will make for Ireland presently."

—Shakespeare; King Richard II.

(a) Explain the meaning of "whether... friends;" "what reverence..slaves;" "patient underbearing...with him;" "as were our England...in hope;" "expedient manage;" "farm...realm."

(b) Give the derivation of "banishment," "courtship," "liege," "realm," "blank," "person," "supple."

(c) Comment briefly on the following:—"ourselves" (l. 4); "for" (l. 24); "make" (l. 33); "presently" (l. 33); and the pronouns in ll. 30 and 31.

(d) Point out and explain any figures of speech that occur in the extract.

(e) Parse "here" (l. 4), "go" (l. 15), "yield" (l. 21), "underbearing" (l. 10).

(f) Scan ll. 7, 10, 25, noticing any peculiarities of metre.

(g) What archaisms are in the extract?

2. Parse the italicized words in the following:

"The enemy were nine *hundred* strong."

"Some of the characters *were found fault with*."

"The soldier did not care a *bit* for the honour."

"None of these rogues and cowards, *but* Ajax is their fool."

"Jesters do oft prove *prophets*."

"I am a fool *to weep* at what I am glad of."

3. Analyse:

"It appeareth in nothing more, that atheism is rather in the lip than in the heart of man, than by this, that atheists will ever be talking of that their opinion, as if they fainted in it themselves, and would be glad to be strengthened by the consent of others; nay, more, you shall have atheists strive to get disciples, as it fareth with other sects; and, which is most of all, you shall have them that will suffer for atheism, and not recant: whereas, if they did truly think that there were no such thing as God, why should they trouble themselves?"

4. Explain, with examples, the various uses of the Subjunctive Mood, in English.

5. Distinguish the functions of the preposition and the conjunction. Classify conjunctions, and give an example of each class.

6. Distinguish the uses of *as* and *so* in these sentences:

Strong as he now appears, he is not really so.

"So I were out of prison and kept sheep, I should be as merry as the day is long."

He was not so successful as a statesman as he was as a soldier.

As for me, I will have nothing to do with it.

7. Correct or justify the following:

(a) A verb must agree with its nominative in number and person.

(b) "Gedaliah, who, with his brethren and son, were twelve."

(c) That is the man who we suspect is the culprit.

(d) I will give it to whomsoever needs it.

(e) Much depends on a pupil composing frequently.

(f) In no case are writers so apt to err as in the position of the word *only*.

8. Write a list of French words which have become naturalized in English, and indicate their pronunciation as nearly as you can.

9. Give the derivation of anodyne, hermit, assassin, halcyon, stoic, solecism, viscount, cardinal, sycophant, spinster.

10. Distinguish revenge and vengeance, genius and talent, safety and security, imagination and fancy, anger and indignation.

11. Write a concise account of the place of the Anglo-Saxon element in the English language.

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PHYSICS.

N.B.—One hundred and fifty marks to count a full paper.

1. Explain what is meant by "Temperature of a body," "Quantity of heat," "Quality of heat,"

2. Describe the process of graduating a mercury thermometer, and explain why a mercury and an air thermometer that agree at 0° and at 100° , will not exactly agree at either 50° or 250° . What corrections is it necessary to apply to the readings of a mercury thermometer in order to get the true temperature?

If the co-efficient of absolute expansion of mercury be .00018, and the co-efficient of linear expansion of glass be .0000089, find the co-efficient of apparent expansion of mercury in a thermometer.

3. What is meant by the co-efficient of expansion of a gas? The co-efficients of expansion of all gases are nearly the same. How may this be accounted for? Give examples of divergence from the general rule, and account for the divergence.

4. What is meant by "latent heat?" Describe a method of determining the latent heat of vaporization of alcohol. How is latent heat explained in the dynamical theory of heat?

5. How can it be shown that radiant heat passes through dry air and some other substances without sensibly raising their temperature? In the sun's rays are both heat rays and light rays. How can the latter be completely intercepted while the former are allowed to pass?

6. "Why do the rays of the sun, after passing through a hole of any shape, triangular for instance, or even a mere straight slit, if intercepted at a certain distance, always form a circle?"

7. State the laws of reflection of light. Describe the kaleidoscope and explain its action.

Two candles are placed in front of a concave spherical mirror of one foot radius, one candle being at a distance of five inches from the mirror, the other at a distance of seven inches from it. What distance apart will the images of the candles appear to an eye situated exactly in the axis of the mirror?

8. State the laws of the refraction of light. Explain why it is that a double concave air-lens, plunged into water, produces an image like that produced in air by a double convex water-lens. (Illustrate your explanation by a diagram.)

9. Looking vertically downwards into water, it seems shallower than it really is; why is this?

A short-sighted person who is not capable of seeing anything distinctly beyond five inches, is able to see distinctly a small object distant $5\frac{1}{4}$ inches, through a pane of glass whose refractive index is $\frac{3}{2}$: find the thickness of the glass.

10. What is meant by the polarization of light, and how is it explained by the undulatory theory? What is the cause of the blue colour of a clear sky, and why is the diffused light around the north pole of the heavens polarized?

11. Briefly describe a series of experiments to prove the following laws:—

(i.) There is no electrical force within a closed electrified conductor. (Mention two exceptions to this law.)

(ii.) When a separation of electricities takes place by friction or any other means, the amounts of positive and negative electricities produced are always such that, on being reunited, they exactly neutralize each other.

(iii.) The amount of opposite electricity induced on surrounding conductors by any electrified body is equal to the body's own charge.

(iv.) If two bodies be electrified and placed at a constant distance (great compared with their dimensions), from each other, they exert on each other a force proportional to the products of the amounts of electricity they contain. This force is attractive if their electrification be opposite, repulsive if similar.

(v.) If constant charges of electricity be condensed at n points, and the distance between them varied, the force of attraction or repulsion is found to vary inversely as the square of the distance.

12. Describe the Daniell's cell, and state its respective advantages and disadvantages. How is it proved that the electricity produced by a galvanic battery is the same in kind as that produced by friction? Explain the relation between them, illustrating your answer by examples of the effects they produce.

13. Twelve cells of a battery, consisting of zinc and carbon in dilute sulphuric acid are joined up in series, and the current is sent through a voltmeter containing acidulated water, and through a solution of cupric-sulphate; what are the laws of decomposition by the current both within and without the cells of the battery? If the resistance of the voltmeter and cupric-sulphate solution be equal to three cells of the battery, what arrangement of the cells of the battery will produce the greatest amount of decomposition in a given time?

14. Define electromotive force.

Find the current-strength when n cells each of resistance r and the electromotive force E are arranged (i.) in simple circuit; (ii.) in compound circuit.

Find the current-strength due to mn cells arranged in m rows of n cells, the cells in each row being in compound circuit, and the successive rows in simple circuit.

Find the current-strength and the whole resistance in any divided circuit.

NATURAL PHILOSOPHY.

N.B.—Forty marks to each question; 225 marks to count a full paper.

1. Deduce the parallelogram of forces from the principle of virtual velocities. (Virtual Work.)

At the point O of intersection of diagonals of a square $ABCD$, two forces of 8 ounces and 12 ounces respectively act along the semi-diagonals OA , OB , and two forces of 10 ounces and 2 ounces respectively act in a direction perpendicular to the sides AB and

BD , and towards those sides: required the magnitude of the resultant.

2. If two forces acting at a point O be represented in magnitude and direction by OB and $n.OA$, their resultant will be represented in magnitude and direction by $(n+1).OG$, the point G being taken on AB so that $BG = n.AG$.

If n forces acting at a point O be represented in magnitude and direction by OP_1 , OP_2 , OP_3 , ... OP_n , their resultant will be represented in magnitude and direction by $n.OG$, the point G being the centre of gravity of particles of equal mass placed at the points P_1 , P_2 , P_3 , ... P_n .

3. The sum of the moments of two forces with respect to any point in their plane, is equal to the moment of their resultant with respect to the same point.

A beam AB , 15 ft. long and weighing 25 lbs., rests against a smooth horizontal plane CA and a smooth vertical wall CB , the lower extremity A being attached to a string which passes over a smooth pulley at C and sustains a weight of 40 lbs. Find the length of the string between C and A when the beam is in equilibrium, the centre of weight of the beam being 7 ft. from the extremity A .

4. Given the centres of gravity of a body and of any part of it, show how to find the centre of gravity of the remainder.

From a rectangle six inches wide there is cut an isosceles triangle, having one of the longer sides of the rectangle for its base, the centre of gravity of the remaining piece of the rectangle is at the summit of the triangle; find the height of the triangle.

5. State the rule for the composition of velocities, and give an instance showing the truth of the rule.

Explain how a body can be made to describe the sides of a regular polygon with constant velocity by having a certain velocity impressed on it at each angular point; and calculate the magnitude of the velocity impressed on a body at each angular point of an octagon which the body describes with a constant velocity of two feet per second.

6. State Newton's laws of motion, and ex-

plain the bearing of the second law upon the definition of force.

Equal weights, *A* and *B*, are attached to the ends of a perfectly flexible, weightless string, which passes over a perfectly smooth pulley *C*. The weight *B* hangs vertically, and the weight *A* rests on a plane *AC*, inclined at 30° to the horizon, the co-efficient of friction between *A* and the plane being $\frac{1}{3}$. Find the tension of the string and the space passed over by *A* in two seconds from rest. (The part of the string between *A* and *C* is parallel to the plane.)

7. Describe the common hydrometer, and state the principles of its action.

A vessel floats in water with half of its volume below the surface-level. Two cubic inches of oil of turpentine, weighing exactly one ounce, are poured into the vessel, which now sinks until two-thirds of its volume is below the surface-level of the water. Find the volume of the vessel. (A cubic foot of water weighs 1000 oz.)

PHYSIOLOGY.

1. (a) Describe the structure of the Eye.
- (b) State the function of each part.
- (c) Give the most important rules for the preservation of the sight.
- (d) How should the light be admitted to a school-room?
- (e) How can a teacher prevent the too rapid development of *myopia* in his pupils?
2. Give rules for the guidance of your pupils in taking a daily bath.
3. What steps should be taken to prevent the spread of contagious diseases?
4. (a) Describe the process of digestion.
- (b) Show why it is wrong :
 - (i.) To work soon after eating.
 - (ii.) To study soon after eating.
 - (iii.) To eat or drink what is hot.
5. Give rules for the preservation of the proper tone of the nervous system.

SECOND-CLASS TEACHERS AND INTER-MEDIATE.

ENGLISH HISTORY.

1. Derive and explain the terms "vil-

lain," "sheriff," "confiscation," "homage," "knights templars."

2. State the chief differences between the Saxon and the Normal rule in England with respect to (i.) the government of the country; (ii.) the condition of the people.
3. Mention the chief clauses of the Magna Charta.
4. Tell the principal events of the reign of Edward I.
5. Write concise historical explanatory notes on the Restoration, the battle of Culloden, the declaration of American Independence, the Corn Laws, the Crimean War.
6. Tell briefly the part played in English history by Thomas Cromwell, John Hampden, Charles James Fox, John Wilkes.
7. "The Queen reigns, but does not govern." Discuss this statement.
8. Say what you know about Lord Sydenham's administration in Canada.
9. What led the Romans to interfere in the affairs of Macedonia, and by what steps did Macedonia become a Roman Province?
10. Give a brief account of the "Social War" in Italy.

ENGLISH LITERATURE.

1. State Milton's conception of the universe, as presented in *Paradise Lost*.
2. Give a brief synopsis of Book I., and explain the position of affairs at the time at which Book II begins.
3. Quote the descriptions of Death, Belial, Beelzebub, and Lethe, and the simile of the Gryphon.
4.

"Before their eyes in sudden view appear The secrets of the hoary Deep, a dark Illimitable ocean, without bound, Without dimensions, where length, breadth, and height, And time, and place are lost; where eldest Night And Chaos, ancestors of Nature, hold Eternal anarchy amidst the noise Of endless wars, and by confusion stand; For Hot, Cold, Moist, and Dry, four champions fierce, Strive here for mastery, and to battle bring Their embryon atoms; they around the flag	890 895 900
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Of each his faction, in their several clans,
 Light-arm'd or heavy, sharp, smooth, swift, or slow,
 Swarm populous, unnumber'd as the sands
 Of Barca or Cyrene's torrid soil,
 Levied to side with warring winds, and poise 505
 Their lighter wings. To whom these most adhere,
 He rules a moment; Chaos umpire sits,
 And by decision more embroils the fray
 By which he reigns: next him high arbiter
 Chance governs all." 910
 —Milton—Paradise Lost, Book II.

- (i.) *Their* (l. 890). Whose?
- (ii.) *Ancestors of Nature*. Explain the allusion.
- (iii.) *By confusion stand*. Explain.
- (iv.) To what ancient philosophic theory is there an allusion in ll. 898-900?
- (v.) *They* (l. 900). Who?
- (vi.) Where-were Barca and Cyrene?
- (vii.) Parse "levied" (l. 905). Explain the meaning of "poise."
- (viii.) *Their* (l. 906). Whose?
- (ix.) Explain the construction and meaning of "To whom these most adhere, He rules a moment."
- (x.) Who is called "high arbiter" in l. 909?
- (xi.) Point out any peculiarities of Milton's genius illustrated by this passage.
- (xii.) Scan ll. 892, 893, 900, 901, 905.

5. Write an account of Milton's life.

6. Briefly state anything you know with respect to the influence of the Puritan Revolution upon literature.

7. Give the propositions made by Moloch, Belial, Mammon and Beëlzebub at the council. Who utters these words:

"Who shall tempt with wand'ring feet,
 The dark, unbottom'd, infinite abyss?"
 Give the part of his speech which follows.

BOOK-KEEPING.

1. Toms has \$500 in Ontario bank, and wishes to draw it by check, to be given to-day in Toronto. Write check.
2. Smith gives Jones his note at 3 months from to-day for \$125. Write note, with amount of stamp required.
3. Brown of Toronto draws, to-day, a sight draft for \$75, on Wilson of Whitby. Write draft.
4. Journalize each of the above transactions, giving the entry for each person interested.

5. A merchant in Cobourg wishes to send through the Bank a sum of money to a merchant in Toronto; explain how this may be done, in two ways, without expense to the Toronto merchant.

6. John Wilson bought from R. Henry of Oshawa, March 14th, 1878, 12 yds. cotton @ 15c. per yd., 6½ lbs. tea @ 90c. per lb., 285 lbs. flour @ \$2.50 per cwt., and a suit of clothes \$15. Make out bill in proper form and receipt it.

7. Journalize the following, giving my entries:

(a) I buy 200 bbls. flour from Scott at \$6 per bbl., pay \$500 in cash, give my note for \$300, balance to remain on account.

(b) Scott buys from me 200 yds. broad-cloth @ \$2.50 per yd., pays \$500 in cash, gives his note for \$300, balance paid by an order on Hoskin, which Hoskin accepts.

(c) Scott and I exchange notes.

8. In making out your statements preparatory to closing your Ledger, where do the following items appear: Mdse. on hand, Cash, Money in Bank, Bills Rec., Coal for use of Store, Balance of Interest, Any Real Estate?

GEOGRAPHY.

1. Define Equinox, Steppes, Great Circle, and Isothermal lines.
2. What is the form of the earth's orbit? How do you account for the warmth of Summer in our hemisphere, although the earth is farther from the sun than it is in Winter?
3. In what country, or countries, would you be most likely to find the giraffe, the ostrich, the condor, the reindeer, the chamois?
4. Outline the west coast of North America, indicating the islands near the coast, the rivers emptying into the Pacific Ocean, and the principal cities or towns on the seaboard?
5. Name the States bordering on the lakes between Canada and the United States, and mention at least two cities in each.
6. Name six rivers in Asia running south, also the waters into which they empty.

7. Over what railroads, and through what large towns or cities would you pass on a trip from Ottawa to Barrie?

8. Where and what are Sitka, Cobequid, Lepanto, Cayenne, Socotra, Aral, Kertch, Wight, St. Louis, Canso, Tweed and Chudleigh?

THIRD-CLASS TEACHERS.

ENGLISH LITERATURE.

1. Give an account of the proposals of the doctor in the Academy of Lagado.

2. Tell what you know about the Earl of Chesterfield, and explain the cause of Dr. Johnson's quarrel with him.

3. Quote Hamlet's soliloquy on death.

4. Of what does Shakespeare say:—

"It is twice blessed;
It bleaseth him that gives and him that takes."

5.

"I passed, methought, the melancholy flood
With that grim ferryman which poets write of,
Unto the kingdom of perpetual night.
The first that there did greet my stranger soul
Was my great father-in-law, renowned Warwick,
Who cried aloud,—'What scourge for perjury
Can this dark monarchy afford false Clarence?'
And so he vanished; then came wandering by
A shadow like an angel, with bright hair,
Dabbled in blood; and he shrieked out aloud,—
'Clarence is come,—false, fleeting, perjured Clarence,—
That stabbed me in the field by Tewkesbury;—
Seize on him, Furies, take him unto torment!'"
—*Shakespeare—King Richard III.*

(i.) Name "the melancholy flood," "the grim ferryman," "the kingdom of perpetual night," "the shadow like an angel."

(ii.) *Stranger* l. 4. In what degree of comparison?

(iii.) Explain the historical allusions.

(iv.) *Which* l. 2. Account for the use of this word here.

(v.) *Furies*. Describe the Greek Furies.

(vi.) *Scan* ll. 1 and 2.

6. Explain, after Trench, the derivation of "diaper," "cherry," and "thrall;" and give an example of an exploded theory which has left traces in the language.

7. Reproduce the substance of Johnson's comparison of Dryden and Pope.

8.

"And wild and high the 'Cameron's gathering' rose,
The war-note of Lochiel, which Albyn's hills
Have heard and heard too have her Saxon foes

How in the noon of night her pibroch thrills
Savage and shrill but with the breath that fills
Their mountain pipe, so fill the mountaineers
With the fierce native daring that instils
The stirring memory of a thousand years,
And Evan's, Donald's, fame rings in each clans-
man's ears!"

(i.) Explain the meaning of "pibroch," "noon of night," "Albyn," "Lochiel."

(ii.) Should there be a full stop at the end of line 3, or does the sense run on to the middle of line 5? Give reasons for your answer. Punctuate ll. 3, 4, and 5.

(iii.) Parse "instils," l. 7.

(iv.) What is the name of the stanza, and what is the long line at the end of it called?

(v.) Quote the next stanza.

(vi.) Name the author, and tell what you know about him.

HISTORY.

1. Describe the feudal system; state the causes which produced it, and those which led to its decay.

2. Tell what you know about the history and present constitution of the English Parliament under the following heads:—

i. Its origin.

ii. The growth of the power of the House of Commons.

iii. The duration of a parliament.

iv. The election of members.

3. Sketch the history of the reign of Queen Elizabeth.

4. Give an account of the conquest of Canada by the English.

5. Give a brief account of the American Revolution, and state clearly the principle asserted by the colonists.

6. Tell what you know about the origin of the Steamboat, the Railroad, the Electric Telegraph.

7. Write brief historical notes on Lollard, Transubstantiation, Puritan, Independent, Dissenter, and explain the meaning of the terms.

GEOGRAPHY.

1. Define the Earth's Axis, and explain why we have changes in seasons.

2. Give the width of the zones in degrees, and the names of the circles bounding them.

3. What is the highest latitude possible? The highest longitude? Why is there a difference in the two cases?

4. (a) Describe the position of the Dominion of Canada. (b) Of what does it consist? (c) What is its population?

(d) How many provinces as large as Ontario might be formed in the Dominion?

(e) Name the Capital of the Dominion; the largest and the oldest city in it.

5. (a) What was the population of Ontario at the time of the last census?

(b) Name its chief productions?

(c) Name its chief minerals?

(d) Name all its cities?

(e) Name its railroads giving their termini?

6. Name the principal rivers of Europe, and one city on the bank of each.

7. Sketch Asia, showing its countries, five seas, three peninsulas, four gulfs, and the rivers running South.

8. Where and what are Aden, Father Point, Khyber Pass, Natal, Melbourne, Falkland, Sydney, Zambesi, Medina, Sedan, Gothland, Valparaiso, Ortegale, Guayaquil, Como, Havana, and Onega.

ALGEBRA.—SOLUTIONS.

SECOND CLASS.

I. Given expression

$$\begin{aligned} &= \left(\frac{a(x^2 - y^2) + 2bxy}{x^2 + y^2} \right)^2 + \left(\frac{-b(x^2 - y^2) + 2axy}{x^2 + y^2} \right)^2 \\ &= \frac{(a^2 + b^2)(x^2 - y^2)^2 + 4xy(a^2 + b^2)}{(x^2 + y^2)^2} \\ &= (a^2 + b^2). \end{aligned}$$

2. Quotient = $a^2 + ab + b^2 + ac - bc + c^2$.
Apply preceding, putting $a = 1+x+x^2$, $b = 1-x+x^2$, $c = 2x$.

$$\begin{aligned} 3. x^4 + y^4 - \frac{1}{2}x^2y^2 &= (x^2 + y^2)^2 - \frac{1}{2}x^2y^2 = \\ (x^2 + y^2 + \frac{1}{2}xy)(x^2 + y^2 - \frac{1}{2}xy). &(7x + 6y - 9) \\ (x - y + 4) &= 7x^2 - 6y^2 - xy + 19x + 33y - 36. \end{aligned}$$

$$\begin{aligned} 4. -99 \left| \begin{array}{ccc|c} 5 & 497 & 200 & 218 \\ -495 & -198 & -198 & 198 \end{array} \right| &= 2000 \\ 5 &+ 2 \quad 2 \quad -2 \quad -20 \quad | \quad -20 \\ \therefore &-20 = \text{value.} \end{aligned}$$

$$\begin{array}{r|l} -\frac{2}{3} & \left| \begin{array}{ccc|c} 6 & 5 & -17 & -6 \\ -9 & 6 & 12 & -6 \end{array} \right| + 10 - 2 \\ +\frac{1}{2} & \left| \begin{array}{ccc|c} & & + 3 & -2 \\ & & & -4 + 2 \end{array} \right| \\ \hline & \left| \begin{array}{ccc|c} 6 & -4 & -8 & 4 \\ & & & 0 \end{array} \right| \\ & \therefore 0 = \text{value.} \end{array}$$

5. Rationalizing, expression becomes

$$\frac{a + \sqrt{a^2 - x^2}}{x} = \frac{1}{b}$$

$$6. \frac{1}{a} + \frac{a}{1+a} > 1, \text{ if } 1+a+a^2 > a+a^2, \text{ if}$$

$$1 > 0. \quad \frac{a}{b} + \frac{b}{a} > 2, \text{ if } (a-b)^2 \text{ is } +ve.$$

$$7. \left. \begin{array}{l} (1) \ x=4 \text{ or } 9 \\ \quad \ y=9 \text{ or } 4 \end{array} \right\} \quad \left. \begin{array}{l} 2. \ x=1 \\ \quad \ y=2 \\ \quad \ z=3 \end{array} \right\}$$

(3) $(x^2 + 7x + 6)(x^2 + 7x + 12) = 16$, forming a quadratic in $(x^2 + 7x)$. Solving this = n , we have

$$x = \frac{-7 \pm \sqrt{33}}{2} \quad \text{or} \quad \frac{-7 \pm \sqrt{-7}}{2}$$

8. Let $x-1$, x , $x+1$ be the numbers
 $(x-1)^3 + x^3 + (x+1)^3 = 16\frac{2}{3}x(x+1)$,
whence $x=0$, 6 or $-\frac{4}{3}$: numbers are therefore -1 , 0 , 1 , etc.

9. (1) Roots, such as those given in the question, enter equations in pairs: let the equation composed of the remaining roots be represented by the symbol $f(x)=0$: the equation will be $x(x - \sqrt{-3})(x + \sqrt{-3})$

$$(x-1 + \sqrt{2})(x+1 - \sqrt{2})f(x) = 0,$$

$$\text{or } x(x^2 + 3)(x^2 - 2x - 1)f(x) = 0.$$

The coefficients of the equation are assumed to be rational and real.

(2) \sqrt{pq} is a mean proportional between p and q , and therefore, by the question, is a root; by substitution we obtain $pq + p\sqrt{pq} + q = 0$, or $q(p+1)^2 = p^3$.

10. Let x = number of miles train moving from A goes per hour; let y = number of miles train moving from B goes per hour.
Whole distance = $\frac{3}{2}(x+y)$:

$$\begin{aligned} \text{time for first train} &= \frac{\frac{3}{2}(x+y)}{x}, \\ &= \text{second train's time} + 52\frac{1}{2}' \\ &= \frac{\frac{3}{2}(x+y)}{y} + \frac{1}{2}h. \end{aligned}$$

By simplifying we have $\frac{y^2}{x^2} - 1\frac{1}{2}\frac{y}{x} = 1$, or

$$\frac{y}{x} = \frac{4}{3}.$$

ARITHMETIC.—SOLUTIONS.

SECOND CLASS.

1. (a) $6\overline{.}622$; (b) $31830 \dots$; =
2. L. C. M. of two quantities = product of two quantities divided by their G. C. M.
 \therefore other number = $34\frac{1}{2} \div \frac{2\frac{1}{2}}{1\frac{3}{8}} = 3\frac{1}{2}$.
3. \$220'31125.
4. $\frac{231 \times .000016386 \times 157}{4541'02} = 131$ nearly, =

No. of imperial gallons.

5. When 11 hrs. 35 min. are gained by the clock in advance, the same time will be indicated; this will take place in $\frac{695}{7}$ days, since 11 hrs. 35 min. = 695 min., and 7 min. are gained each day.

6. Let I be original stock,

then $\frac{83}{80} = \$16,600$, $\therefore I = \$16,000$.

7. 1st company = $\frac{548}{15}$ women.

2nd " = $\frac{178}{5}$ "

$$\left. \begin{array}{l} 6 : 8 \\ 548 : 178 \end{array} \right\} :: \frac{411}{2} : \text{amt. by 2nd company.}$$

$\therefore \$267 = \text{amount.}$

8. $\frac{1}{10}$ of 84000 = 75600 = grs. pure silver in 12 lbs. Avoir.
 = 201600 grs. alloy (in value)

\therefore if 210000 grs. alloy = \$175
 5760 " = \$4.80.

9. Let I be invoice price.

Per question $\frac{1}{4} = \frac{1}{3} + \frac{1}{3} + \frac{1}{3}$ of \$125.
 $\therefore I = \$700$.

10. (1) $\frac{(34\frac{1}{2} \times 20\frac{3}{8}) - (4 \times 4\frac{1}{2} + 12 \times 3\frac{1}{2})}{9}$

$$\frac{713 - \frac{166}{3}}{9} = 73\frac{2}{3}$$

= number of yds. painting.

(2) radius of inner circle = $\frac{1}{2}$ feet.

" outer " = $\frac{7}{8}$ "

\therefore Number of cubic feet in cylinder

$$= \pi \left\{ \left(\frac{7}{8}\right)^2 - \left(\frac{1}{2}\right)^2 \right\} 18.$$

$$= 24\frac{1}{4}.$$

ARITHMETIC.—SOLUTIONS.

FIRST CLASS.

I. $\frac{\sqrt[3]{70}}{\sqrt[3]{100000}} + \frac{\sqrt[3]{14}}{\sqrt[3]{100000}} = \frac{\sqrt[3]{84}}{\sqrt[3]{100000}}$
 $\therefore .031578 = \frac{\sqrt[3]{30}}{\sqrt[3]{100}} + \frac{\sqrt[3]{2}}{\sqrt[3]{100}} = \frac{\sqrt[3]{28}}{\sqrt[3]{100}}$
 $= \frac{3}{10} = .3$

2. A + B + C fill $\frac{1299}{12}$ gals. in $2\frac{1}{2}$ '.

A + B + C fill as much as 3 times what B would fill alone + 2 gals. in $2\frac{1}{2}$ ';

\therefore B fills $\frac{1299 - 24}{12 \times 3} \times \frac{2}{5}$ gals. in $t' = 14\frac{1}{2}$;

A, $18\frac{1}{2}$; C, $10\frac{3}{8}$.

3. Amount pure gold in

I sov. (lbs. Troy) = $\frac{11}{12} \times \frac{40}{1869}$.

I franc " = $\frac{2 \cdot 2072}{155 \times 20} \times \frac{7000}{5760} \times \frac{9}{10}$.

Number of francs in I sovereign

$$= \frac{11}{12} \times \frac{40}{1869} \times \frac{20 \times 155}{2 \cdot 2072} \times \frac{5760}{7000} \times \frac{10}{9} = 25 \cdot 192.$$

4. A gets for management

$$\frac{15}{\$200} \times \frac{10}{12} \times \frac{4000}{1} + \frac{15}{\$100} \times \frac{2}{12} \times \frac{4000}{1} = \$350.$$

A's whole capital is = to \$66000 inv. for 1 mo.

B's " " \$58000 " " ;

\therefore A's share will be

$$\$350 + \frac{66}{\$124} \times \frac{85}{100} \times \frac{4000}{1} = \$2159.67\frac{2}{3}$$

\therefore B's share will be \$4000 - \$2159.67 $\frac{2}{3}$
 = \$1840.32 $\frac{1}{3}$.

5. $\log .0000025 = \log \frac{1}{400000} = \log 1$

$$- (2 \log 2 + 5 \log 10) = (0 - .60206 - 5)$$

$$= \overline{6.39794}$$

$$1000 = 100(1.08)^n$$

$$\log 108 = 3 \log 3 + 2 \log 2 = .60206 + 1.4213639$$

$$= 2.0332439, \therefore \log 1.08 = .0334239$$

$$\log 100 = n(\log 1.08)$$

$$1 = n(.0334239)$$

$$n = 29.92 +$$

\therefore Amount will exceed \$1000 in 30 years.

6. $9(\text{cash pr.}) = 8(\text{credit pr.}) = 9 \times \frac{2}{3}(\text{cost pr.})$
 $8 \text{ " } = 12 \text{ "}$

credit price = $\frac{2}{3}$ cost price.

\therefore credit price is 50 per cent. above cost.

7. $19(\text{volume of gold}) + 2 \cdot 5(\text{do. of quartz})$
 $= 7(\text{volume of gold} + \text{volume of quartz}).$

$12(\text{volume of gold}) - \frac{1}{4}(\text{volume of quartz}).$

$\therefore \text{volume of gold} = \frac{1}{4}$ of whole volume.

$\frac{1}{4} \times \frac{1}{17} \times 19 = \text{wt. of gold in 1 oz. mixture.}$

8. At the time the goods are sold the man has really paid $\$ \frac{100}{102} \times \frac{520}{1}$ for them, which is present worth of \$520 due 3 months hence at 8%.

He sells them for $\frac{467}{400} \times \frac{100}{102} \times \frac{520}{1}$.

Now, for what term must this sum be put out at interest to equal \$677.70?

Answer.

$$\frac{\$677.70 - \frac{467}{400} \times \frac{100}{102} \times \frac{520}{1}}{\frac{467}{400} \times \frac{100}{102} \times \frac{520}{1}} = .13 + \text{years.}$$

9. $\frac{\text{percentage}}{100} \times \frac{6000}{1} = 60 \times \text{percentage} =$

1st charge. Now, for the 2nd commission he gets $\frac{1}{5}$ of 2nd price, which equals $\frac{1}{5}$ of $(6000 - 60 \times \text{percentage})$, since $\frac{1}{5} \times \frac{2}{3} = \frac{1}{3} \times 1$
 $60 \times \text{percentage} + \frac{1}{5} (6000 - 60 \times \text{percentage}) = 375$. Whence percentage

$$= \frac{375 \times 5}{25} = \frac{25}{2} = 2\frac{1}{2}\%. \quad \text{Ans. } 2\frac{1}{2}\%.$$

10. (i.) $\frac{112\frac{1}{2}}{360} \times \frac{22}{7} \times \frac{6400}{1} = 6285\frac{1}{2}$ sq. yds.;

$$\frac{112\frac{1}{2}}{360} \times \frac{22}{7} \times \frac{160}{1} = 157\frac{1}{2} \text{ yds.}$$

(ii.) A rectangle can easily be formed, by dropping a perpendicular from one of the angles of the quadrilateral to the opposite side, whose sides are 3 and 4; $\therefore \text{area} = 12$. Area of remaining \triangle (which is right-angled) = 6. Whole area = 18.

ALGEBRA.—SOLUTIONS.

FIRST CLASS.

1. Writing p, q, s for $a-b, b-c, c-a$ in the expression and transposing, we have $2(p^2 + q^2 + s^2) - 7pqs(p+q+s) = 0$. Now $p+q+s$ is a factor of the expression on the left hand side of this = n , and $p+q+s = a-b+b-c+c-a = 0$. \therefore the = n is an identity.

2. Ans. $2 + \sqrt{-1} + 2 - \sqrt{-1} = 4$.

3.

(1) Factoring, we obtain

$$(2x^2 - 5x + 2)(x^2 + 3x + 1) = 0.$$

$$(x-2)(2x-1)(x^2+3x+1) = 0.$$

Solve by equating factors to zero. $x = 2, \frac{1}{2}$,

or $\frac{-3 \pm \sqrt{5}}{2}$.

(2) $x^2 + y^2 + z^2 + 2xy + 2xz + 2yz = a^2 + 2b^2$

$$x + y + z = \pm \sqrt{a^2 + 2b^2}$$

$$x + y + z = c.$$

$$\therefore z = \frac{1}{2}(\pm \sqrt{a^2 + 2b^2} - c).$$

Write down the values of x and y from the value of z in circular order.

(3) Factoring $\sqrt{x+4}(\sqrt{x+1} + \sqrt{x-1})$

$$= (\sqrt{x+4})^2. \quad \sqrt{x+4} = 0 \quad x = -4.$$

Squaring both sides after dividing by $\sqrt{x+4}$, collecting coefficients and dividing through

by coefficients of x , $x = \frac{-4 \pm 2\sqrt{19}}{3}$.

4. See Todhunter's Larger Algebra, Art. 634.

$$5. \frac{x^2 - xy + y^2}{xy} = \frac{a^3 + b^3}{ab(a+b)} = \frac{a^2 ab + b^2 ab}{ab} = a + b.$$

$$\frac{x}{y} + \frac{y}{x} = \frac{a}{b} + \frac{b}{a}.$$

$$\frac{x}{y} - \left\{ \frac{a}{b} + \frac{b}{a} \right\} + \frac{y}{x} = 0 = \frac{x^2}{y^2} - \left\{ \frac{a}{b} + \frac{b}{a} \right\} \frac{x}{y} + 1$$

$$= \left\{ \frac{x}{y} - \frac{a}{b} \right\} \left\{ \frac{x}{y} - \frac{b}{a} \right\} = \frac{y}{a} \left\{ \frac{x}{y} - \frac{a}{b} \right\} \frac{y}{b}$$

$$\left\{ \frac{x}{y} - \frac{b}{a} \right\} = 0$$

$$= \left\{ \frac{x}{a} - \frac{y}{b} \right\} \left\{ \frac{x}{b} - \frac{y}{a} \right\} = 0.$$

$$6. n = 6 \text{ or } -8.$$

When $n = 6$, the series referred to is that, the first term of which is 6, the second 10, the third 14, etc. When, in the series 6, 10, ... 26, $n = -8$, we are to begin at 26 and count backwards 8 terms. The progression will thus be 26, 22, 18, 14, 10, 6, 2, -2.

7. Let α, β be the roots of $x^3 + 0 \cdot x^2 + px + q$,

then $\alpha + \alpha + \beta = 0$

$$\alpha^2 + \alpha\beta + \alpha\beta = p$$

$$\alpha^2\beta = -q$$

whence $2\alpha^3 = q, -3\alpha^2 = p$.

$$\therefore \left\{ \frac{q}{2} \right\}^{\frac{1}{3}} = \left\{ -\frac{p}{3} \right\}^{\frac{1}{2}}.$$

If $x^2+max+a^2$ be the other factor, we have
 $(x^2+max+a^2)(x^2+max+a^2)=x^4-ax^3+a^2x^2$
 $-a^3x$ *identically*.

$$9. (1+x)^n = 1 + nx + \frac{n(n-1)}{1 \cdot 2} x^2 + \dots$$

$$+ nx^{n-1} + x^n.$$

$$\left\{ 1 + \frac{x}{1} \right\}^n = 1 + \frac{n}{x} + \frac{n(n-1)}{1 \cdot 2} \cdot \frac{1}{x^2} + \dots$$

$$+ n \frac{1}{x^{n-1}} + \frac{1}{x^n}.$$

$$\therefore 1 + n^2 + \left\{ \frac{n(n-1)}{1 \cdot 2} \right\}^2 + \dots + n^2 + 1$$

$$= \text{coefficient of } x^0 \text{ in } (1+x)^n \cdot \left\{ 1 + \frac{1}{x} \right\}^n$$

$$= \text{coefficient of } x^n \text{ in } (1+x)^{2n}$$

$$= \frac{1 \cdot 2n}{n! \cdot n!}.$$

10. See Todhunter's Larger Algebra, Art. 473, in this question $a=1, b=2$.

$$n^{\text{th}} \text{ term} = \frac{1}{(5n-2)(5n-3)} = \frac{1}{5} \left\{ \frac{1}{5n-2} - \frac{1}{5n-3} \right\}$$

$$(n-1)^{\text{th}} = \frac{1}{(5n-7)(5n-2)} = \frac{1}{5} \left\{ \frac{1}{5n-7} - \frac{1}{5n-2} \right\}$$

etc. = etc.

$$\frac{1}{8 \cdot 13} = \frac{1}{5} \left\{ \frac{1}{8} - \frac{1}{13} \right\}$$

$$\frac{1}{3 \cdot 8} = \frac{1}{5} \left\{ \frac{1}{8} - \frac{1}{3} \right\}$$

THE most romantic of all numbers is the figure nine, because it can't be multiplied away or got rid of anyhow. Whatever you do it is sure to turn up again, as was the body of Eugene Aram's victim. One remarkable property of this figure (said to have been first discovered by Mr. Green, who died in 1794), is that all through the multiplication table the product of nine comes to nine. Multiply by what you like, and it gives the same result. Begin with twice nine, 18; add the digits together, and 1 and 8 makes 9. Three times nine are 27; and 2 and 7 are nine. So it goes on, up to 11 times nine which gives 99. Very good; add the digits; 9 and 9 are 18, and 8 and 1 are 9. Going on to any extent it is impossible to get rid of the figure nine. Take a couple of instances at random. Three hundred and thirty-nine times nine are 3,051; add up the figures and they are nine. Five thousand and seventy-one times nine are 45,639; the sum of these digits is 27; 2 and 7 are 9.

$$\therefore S_n = \frac{1}{15} - \frac{1}{5(5n+3)}$$

and sum to infinity $= \frac{1}{15}$.

11. We give the solution (1) reducing the determinant to the ordinary form; (2) retaining the determinant form.

$$1. \begin{vmatrix} bc, & -ac, & -ab \\ b^2-c^2, & a^2+2ac, & -a_2-2ab \\ c^2, & c^2, & (a+b)^2 \end{vmatrix}$$

$$= bc \{ (a_2+2ac)(a+b)^2 + c^2(a^2+2ab) \}$$

$$+ (b^2-c^2) \{ -abc^2 + ac(a+b)^2 \} + c^2 \{ ac(a^2+2ab) + ab(a_2+2ac) \}.$$

Putting $a, b, c, a+b+c$, successively = 0, in above, we find that $abc(a+b+c)$ is a factor,

2. Put $a=0$, determinant becomes

$$\begin{vmatrix} bc, 0, 0 \\ b^2-c^2, 0, 0 \\ c^2, c^2, b^2 \end{vmatrix} = \begin{vmatrix} bc, 0 \\ b^2-c^2, 0 \end{vmatrix} = 0.$$

Similarly for b , etc. $\therefore abc$ is a factor.

Put $a+b+c=0$ or $-a=b+c$, and we have

$$\begin{vmatrix} bc, c(b+c), b(b+c) \\ b_2-c_2, b_2-c^2, b^2-c^2 \\ c^2, c^2, c^2 \end{vmatrix} = \begin{vmatrix} bc, c^2, b^2 \\ b^2+c^2, 0, 0 \\ c_2, 0, 0 \end{vmatrix} = 0.$$

$\therefore a+b+c$ is a factor.

THE following bundle of maxims for teachers appears in an American contemporary:—

Educate and Train, as well as instruct and teach.

Healthy Emulation is a spur to success.

Order and Method are indispensable.

Little and Well win in the end.

The Hearts of teacher and taught must be enlisted.

Clear Enunciation and Pronunciation are necessary.

Copious Illustration always pays.

Remember the Capacity of the class.

Employ the Eyes and Ears of all.

Teach the Expression of ideas.

Encourage Invention.

Summarize what has been taught.

THE following colloquy lately took place between a wise child and his tutor: "That star you see up there is bigger than this world." "No, it is 'nt." "Yes, it is." "Then why does 'nt it keep the rain off?"

SCIENCE DEPARTMENT.

[A series of notes prepared for the Monthly, by Henry Montgomery, M.A., Coll. Inst., Toronto.]

A CONTRIBUTOR to *Chambers's Journal*, in a few sensible remarks, calls attention to the children's teeth. He very truly says, "In the nature of things it cannot be expected that children should understand the value of their own teeth; and our knowledge, or painful experience, ought to be employed to guard them from the consequences of their natural ignorance." How sad it is to see so many young mouths disfigured with gold, silver, amalgam, and decaying teeth, before their owners have arrived at the age of maturity, and often even before the age of fifteen years! Either parents or family physicians, or both, are culpable in this important matter, a matter which affects the comfort and health of the individuals themselves, as well as the comfort and enjoyment of those persons with whom they come in contact. Children are permitted to do all sorts of things with their teeth,—crack nuts, break hard sugar candies, untie knots, gnaw slate-pencils, and cut pins; but they are not naturally given to cleaning them at regular and stated times. The teeth are produced at a time of life when they begin to be needed, just as soon as the body needs solid food that must undergo the process of mastication. They are likewise developed at the commencement of the alimentary tract, in precisely the right place, evidently for the accomplishment of a particular purpose, the breaking down and separation of the food into small portions in order that the salivary and gastric fluids may the more readily perform their duties towards it. If, then, there is need for the teeth to do a certain kind and amount of labour in youth, is there not also need for them to perform that labour in adult life and in advanced years? Do the stomach and assistant digestive organs gain sufficient strength to enable them perfectly to execute the same or an increased amount of work

without the cutting and grinding aid of the dental apparatus? And why must the teeth yield and decay long before the remaining organs of the body are expected to show symptoms of decline? With few exceptions, the human family might all retain good healthy teeth until past the prime of life, say up to fifty or sixty years, if they would only give those organs "fair play." There are mentioned two principal causes of such general premature decay,—*crowding* of the teeth together, and a lack of *cleaning*. They sometimes grow more rapidly than the jaws, and consequently become irregular and hard to be kept clean. But besides this, there is another evil arising from their rapid growth and want of room. They press so closely and firmly against one another that the hard protective external covering—the enamel—cannot be evenly deposited over the entire surface of the crown. Again, many uneven teeth, displaced by crowding of the permanent set, or it may be by neglecting to extract the temporary ones to make room for the permanent, often continue quite useless throughout life. Hence crowding should be hindered by the timely removal of the superfluous ones. With respect to the second cause assigned, it may be said that they ought to be carefully cleaned every time immediately after being used. A pointed quill or a piece of soft wood may serve as a tooth-pick to remove coarse particles and prepare the teeth for a wash with a soft brush and tepid water. The brush ought mostly to be moved *vertically*, and not too often in a horizontal direction across the teeth. The cleansing process should form a part of the toilet, and needs to occupy but a minute or two after each meal. But especially should the mouth be thoroughly washed before retiring to rest at night. After partaking of acid foods or

drinks the mouth should always be rinsed with either alkaline (soda or potash) or pure water. With so many different kinds of substances passed through the mouth during a meal, and without the counteracting influences of the stomach and the digestive juices there cannot fail to be numerous chemical reactions set up in that cavity in the course of a few hours if the débris be not removed. In some cases also the teeth are attacked by parasitic fungi that appear to flourish well by penetrating the dentine tissues. In swamps, marshy regions, and stagnant pools, we are not surprised at finding innumerable plants deriving their sustenance from decaying organic matters, the refuse of other plants, and need we be astonished to learn that certain low forms of vegetable parasites find a suitable habitat in the human mouth which is plentifully supplied with minutely divided organic matters, kept at a temperature of nearly one hundred degrees, and provided with air and moisture?

SIR JOHN LUBBOCK, in speaking in the House of Commons to his Annual Motion in favour of Science-teaching in elementary schools, said he could not see why instruction was refused in science which all children liked, while they were compelled to learn grammar which they all disliked. In mechanics it might be explained to them why carts were put on wheels; the pulley, the lever, and the wedge might be explained, also the nature of the heavenly bodies, the nature of soils, and the rotation of crops, the composition of coal, clay, iron, copper, etc. The ordinary rules of health, the necessity for ventilation and cleanliness, and last, not least, the need for industry, frugality and economy.

ARRANGEMENTS are being made by the African Society in Germany for the establishment of a training school at Morocco, in which institution those persons intending to explore the wilds of the African continent may receive an education in the customs and manners of the Mohammedans and natives of Northern Africa, and at the same time be-

come more or less inured to the climate of that country. The object seems praiseworthy, inasmuch as future African travellers would be benefited by a stay in such a school, and thereby better fitted for the difficult tasks before them.

THE annual meeting of the German Natural Science Association is held this year at Baden-Baden, beginning on September 18th, and continuing for one week. Prof. Hermann, of Zurich, is to open it with a lecture upon the acquisitions of Physiology during the last forty years, and Dr. Skalweit, of Hanover, will close the meeting of the Association by a lecture on Food-adulteration.

IN a late number of the London *Geological Magazine* "A New Favourite Coral" is described by Mr. G. Jennings Hinde, F.G.S. This gentleman, the writer of valuable papers on Canadian Geology and Palæontology, viz.:—"The Geology of the Scarborough Heights," "Conodonts from the Devonian," "Annelid Jaws from the Silurian and Devonian Formations," etc., has brought to light another new fossil form, to which he has given the generic name *Syringolites*, and the specific name *Huronensis*. It is allied with the genus *Ræmeria*; but Mr. Hinde has had the opportunity, at Bonn, of carefully examining the original specimens described by Goldfuss and Edwards & Haime, and has pointed out several important differences between *Ræmeria* and his new genus. He tells us that *Syringolites Huronensis* is common in the Niagara formation of the Upper Silurian rocks in Great Manitoulin Island, Lake Huron.

A VERY great deal of the metal Platinum is required to keep Edison's electric lamp in operation; and as this substance is very expensive Mr. Edison is exceedingly anxious to discover a mine of it in the United States. With this view he has sent out over 20,000 circulars and samples, and also many mining and mineralogical experts to various parts of the American Union. Answers to the circulars have been received from several of the

old miners in Colorado showing that Platinum is widely distributed in that State. One of the mineralogical experts, Mr. W. E. Hilden, writes in an encouraging strain from North Carolina, in the auriferous gravels of which State he has found twenty-three minerals bearing a strong analogy to those constituting the platiniferous gravels of the world. Platinum occurs in company with gold, and, as its Spanish name denotes, is of a silvery-white colour. It may be recognized by appearing in very small round grains like globular specks of steel, by being very malleable, infusible (except in the oxyhydrogen flame), and insoluble in any of the acids (excepting aqua regia); it is also heavier than gold, having a specific gravity of 21.5 while that of gold is about 19.3. Owing to the properties of platinum there are additional reasons for wishing Edison success in his efforts to find considerable quantities of this metal. That it does not corrode or even tarnish in either dry or moist air, that it is able to withstand high temperatures, and is not attacked by acids, are properties that render Platinum extremely useful in the chemical laboratory.

THE singular formation described by Dr. J. W. Dawson as Eozoon Canadense, and regarded by him and most other naturalists as a chambered Rhizopod of the order Foraminifera, is once more under discussion. It occurs plentifully in the Laurentian series of rocks in Canada, having likewise been discovered in rocks of similar age in Bavaria, and in the Lower Silurian marbles in Ireland. Several have doubted that it is the remains of an animal at all, and a German scientist, Dr. Mœbins, has recently published an extensive memoir, illustrated with fine plates, upon the matter, in which he denies its organic origin. Both Dr. Dawson and Dr. Carpenter have already replied, asserting that Dr. Mœbins' conclusions are incorrect. Dana says, "whatever may be the final decision in

regard to the Eozoon, there can be but little doubt that rhizopods existed in Archean times."

A PRIZE has been awarded to the Swansea Waggon Company of Glamorgan, Wales, for a railway van that will keep fresh meat in good condition during a long journey. Meat, rabbits, and poultry, were kept fresh throughout a nine days' journey, and the interior of the van maintained a temperature of thirty-nine degrees whether in motion or at rest.

WITHIN a comparatively short period four new metals have been discovered, Gallium, Scandium, Norwegium, and Uralium, the first three being named after the countries France, Scandinavia, and Norway. Hence there are about sixty-seven elements at present known to the scientific world. Gallium, the earliest discovered of the four above named, has perhaps the most curious and interesting history of any of them. The existence of a metal possessing the properties of Gallium was definitely predicted by M. Mendelejeff, a Russian chemist, in 1871, and previously also by Mr. Newlands. This prediction was based on a study of the relations of the atomic numbers of the known elements, and their ratios of combination with one another. In the seriation which these numbers form certain terms are here and there wanting, and one was missed, having properties between Aluminium and Indium. Mendelejeff minutely described what these properties should be, giving the sp. gr. as 5.9. Several years afterwards Boisbaudran discovered the metal itself in connection with Zonic Blende from the Pyrenees, and ascertained its sp. gravity to be 5.935. Uralium is the latest discovery among the metals, and A. Guyard is the discoverer. It is nearly as white as silver, is very malleable, is almost as soft as lead, and is much more ductile than platinum, with which it is closely related in many respects. Its sp. gr. is 20.25; and its combining weight is 187.25.

TEACHERS' ASSOCIATIONS.

CHRONICLE OF THE MONTH.

TORONTO TEACHERS' ASSOCIATION.—The above Association held its half-yearly meeting in the theatre of the Normal School building on the 26th and 27th of September, under the able presidency of the Inspector. We say *able*, for Mr. Hughes has the excellent faculty in a chairman of keeping up interest in the discussion of any subject which he himself is master of. The business was begun by an address from Mr. McDonald, Head Master of Wellesley School, on "How to manage Writing Classes." He has given special attention to the subject of writing, and can therefore speak with authority upon any matter connected with it; besides he is himself an excellent scribe. It was generally agreed by the meeting that writing upon slates with *long* pencils might wisely be begun very early in the child's school life, and that both the printed letters and script should occupy his attention. When copy-book writing begins, each child in a class should write the same copy at the same time; and when the writing is a little advanced, that of each class should be done by counting the strokes by one of the scholars of the class. In advanced classes only the beginning or the ending of a line should be announced. There was perhaps a little too much tendency to formalism in Mr. McDonald's remarks. A little of this is very proper, and even necessary, in the management of school work, but if carried to excess it may become a serious evil by distracting attention unduly from proper school-room work.

The next business before the meeting was a lecture by Mr. R. F. Martin, Head Master of Parliament Street School, on the best method of teaching the Addition Table, which he exemplified by a class of his own

scholars. This was by far the most interesting and instructive of the whole proceedings. The speaker, in a modest and unpretentious manner, showed that by judicious teaching, a class of Second-Book scholars could be got to apply the Addition Table with as great facility as the Multiplication Table. It took the meeting by complete surprise to find a child of seven years of age add up columns of six and seven figures almost as fast as Mr. Martin could put them down, and much faster than most of the audience could add. We are but doing a public duty in calling the attention of the teachers of the country to Mr. Martin's system, which, if adopted and intelligently worked out, will forever banish the slow, uncertain, and too often grotesque manner of counting which prevails amongst children. It is based upon a faculty of the mind, which is an important factor in all intellectual progress,—the Association of Ideas.

Mr. Seston, one of the Music Teachers of the City Schools, took up the teaching of Music, and showed how persons without much special training might yet make the music lesson both instructive and interesting to children. He did this by taking the teachers present as a class and giving them simple exercises upon the diatonic scale. He uses numbers to represent the sounds, in preference to either syllables or letters.

The last address on Friday afternoon was on "Fourth-Book Lessons for Admission into High Schools," by Mr. S. Hughes, of the Collegiate Institute. A good deal of attractive and useful information was given upon the lessons which he took up, but the subject was not handled with that practical skill which Mr. Hughes is noted for in the school

room. Perhaps the subject was not a congenial one, or perhaps his audience expected too much.

In the evening Dr. Hodgins, Deputy-Minister of Education, delivered an earnest and practical address on the subject "A Plea for Elementary Science and Industrial Training." The lecturer supported his "plea" by forcible arguments, and by quotations from eminent writers of America, Britain, and the Continent of Europe. The teachers were glad to welcome the Deputy-Minister on the platform at their meeting, away from the chilling atmosphere of official life, which seems to freeze "the genial currents of his soul," and were gratified to find him extend that aid which, with a little more enthusiasm, would become potent for good in directing aright the educational progress of the country. The address bore fruit at the meeting by the adoption of a resolution declaring that a knowledge of some branches of Physical Science should be required from all candidates

for teachers' certificates. This was evidently aimed at the option granted at present to candidates for Intermediate Certificates, of choosing for examination either a Language or the Natural Science group, which includes Natural Philosophy, Chemistry, and Book-keeping.

The meeting concluded its proceedings on Saturday by a general discussion on Needlework and on Corporal Punishment. Plain sewing was very strongly insisted upon as being most valuable and useful for those attending our public schools; and, for the sake of effectual teaching, it was suggested that the same kind of sewing should be practised by each scholar of a class at the same time. Nothing new could hardly be expected to be said on such a threadbare subject as that of corporal punishment; the point that the meeting was most united upon was that the influence and authority of the parent should be more frequently invoked to assist the teacher in managing refractory scholars.

HIGH SCHOOL DEPARTMENT.

THE following correspondence has been handed to us for publication:—

TORONTO, 18th Sept., 1879.

SIR,—I am directed by the Honourable the Minister of Education, to state, in reply to your letter of the 27th ultimo, that he has fully considered the Resolutions of the High School Masters' Section of the Ontario Teachers' Association, forwarded him on the 27th ultimo by you as chairman of that Section.

The Minister concurs in the opinion of the Masters as to the time of holding the Intermediate Examination, and also as to distinguishing between those who pass the Intermediate Examination simply, and candidates for Class II. Certificates.

The other matters have been referred to the Central Committee for their report (a copy of which I am directed to furnish you for the information of the High School Masters.)

The Minister has instructed the Chairman of the Committee that in the Mathematical

subjects, the examination, even for Class II. certificates should be kept within the present standard, if not still lower. The report discusses very fully some of the points specially raised by the High School Masters, and the Minister submits this for their consideration.

I have the honour to be, Sir,

Your obedient servant,

ALEX. MARLING,
Secretary.

J. SEATH; Esq., M.A.,
Chairman, High School Section,
Ontario Teachers' Association,
St. Catharines.

TORONTO, 12th September, 1879.

SIR,—I have the honour to acknowledge the receipt of Mr. Seath's letter of the 27th of August, forwarding certain resolutions passed by the High School Masters' Section of the Provincial Teachers' Association, on which you desire me to express an opinion.

1. The High School Masters say, "in the former" (the several optional groups) "we would suggest that the examination: be less mathematical and more practical in their character."

By "mathematical" questions I suppose are meant those in which results have to be calculated; while "practical" questions are those in which a knowledge of principles experimentally established, with the evidence on which the principles rest, is required.

A reference to the last examination papers will show that the questions are by no means excessively mathematical. In the Chemistry paper, 80 marks out of a total 110 are allowed for questions exclusively practical. In the Natural Philosophy paper, 68 marks (indeed on a fair judgment I might say 75) out of a total of 110 are allowed for practical or non-mathematical questions. It is absolutely necessary that some questions involving calculation should be set, otherwise there could be no assurance that the pupils understand how to apply the principles in which they are instructed. I desire to add (what the High School Masters are perhaps not aware of) that the questions on which their pupils most generally fail are not the mathematical, but the practical. If the questions were made less mathematical than at the recent examination, I am afraid that the result would be utter disaster to the candidates.

2. The High School Masters say: "In view of the fact that the grading of the High Schools and the distribution of a large portion of the Legislative grant is decided according to the results of inspection, it is, in the opinion of the H. S. Section, desirable that the H. S. Inspectors should be enabled to devote a greater amount of time to the work of inspection at their semi-annual visits." The High School Inspectors instruct me to reply as follows:—They are sensible of the importance of devoting as much time to the inspection of the High Schools as is necessary, not only for the equitable distribution of that portion of the grant which is divided on the results of inspection, but for benefiting the schools in every way to the utmost possible extent. As regards the distribution of the grant they are satisfied that no school has suffered injustice from the amount of time devoted to its inspection; they will be glad, however, to meet the wishes of the High School Masters by making their visits in future as lengthened as circumstances may permit.

3. The High School Masters say: "That the English History presented should be confined to some particular period instead of extending, as at present, from Julius Cæsar to the present time." The High School Inspectors think it would be unwise to depart

from the system now observed for the following among other reasons:—

(a.) Teachers holding Provincial life certificates are expected, and with reason, to know the leading events at least of the history of England and Rome. (b.) One of the most valuable lessons to be derived from history is historical *proportion*, or the relative importance of historical events; another is the causes of the progress of nations in civilization and constitutional self-government, and the steps of national decadence; another is the literary growth and the distinguishing character of one period as related to others. None of these, the Inspectors think, can be obtained by the study of an isolated epoch. (c.) For a special period to be studied judiciously or to advantage its relations to the preceding age should be known before-hand, hence such a system of History-teaching belongs more properly to an advanced stage in the student's progress; besides, a more detailed examination of a period is necessary than is convenient in a High School. (d.) The true remedy is for the teachers to improve their methods.

4. With regard to the "system of notation" which the High School Masters say "should be more fully recognized in the assignment of subjects for examination to members of Central Committee," the Minister will readily understand that some members of the Committee are specially fitted to examine on some subjects, and others on others, and it is desirable that the schools of the country should have the benefit of the special attainments of the several members.

I have the honour, etc.,

(Signed) G. P. YOUNG.

To the Hon. the Minister of Education.

—IN this month's issue we can only briefly discuss the questions brought up by the foregoing correspondence. We invite in the meantime from the High School Masters an expression of opinion on the points submitted for their consideration. The course pursued by the Minister, as indicated in his letter, will be productive of great satisfaction to the profession, and we trust that in the interest of good sound healthy education the Intermediate itself may soon be numbered among the things of the past. It is a well-known fact that the High School Masters without, so far as the public are aware, a single exception, are unanimous in their estimate of the effect on education of the Intermediate examination. In many respects the old system of

distributing the Legislative Grant was superior to the present one, and after all the fuss that has been, and is continually being, made about "Payment by Results," the results are, in most instances, substantially the same.

But to refer briefly to Prof. Young's letter,—

(1.) We believe that the Chairman of the Central Committee has misapprehended the meaning of the term "practical," and with a not inexplicable shortsightedness has assumed that it is possible to set in the subjects of Chemistry and Natural Philosophy only such questions as the Committee has been in the habit of setting. It seems to us that what the Masters desire, and what their resolution aims at, is questions which will have the effect of giving the instruction in these subjects a character which will be of some benefit in actual life to the students in the Science course. It is by no means the only duty of our Secondary Schools to train the mind particularly in such Sciences as are under consideration; and taking it to account the peculiarly theoretical treatment of some of the other subjects on the Intermediate programme, the Department can well afford to make the instruction in Chemistry and Natural Philosophy "capable of being turned to some use or account" in ordinary life. But there is another view of the matter, and this, we are led to believe, was one of the reasons that induced the Masters to pass the Resolution. The questions proposed in Natural Philosophy are in many cases capable of solution far more easily by the aid of Trigonometry, and the student who has to pursue this subject further is forced to unlearn many of the cumbrous methods the present system has led him to adopt. The *ad captandum* appeal to the Masters, in the last clause of this paragraph of the Professor's letter, is liable to a construction which we should be sorry to put upon it. The Masters evidently desire to advance the interests of good education—not merely to pass pupils through the meshes of the Intermediate.

(2.) In reference to High School Inspection we have reason, and good reason we may add, to state that the opinion expressed by

the Inspectors is by no means that held by the Masters. It is simply absurd to suppose any man able, be his position what it may, to form a correct estimate of even an ordinary High School in the few hours the Inspectors sometimes devote to this duty. So long as the distributors of the Grant confined their operations to round numbers the tax on credulity was not so heavy; but, when it has come to odd cents and apparently minute sub-divisions, the profession may be well excused for their very mild expression of opinion. It has been distinctly charged in the public prints, and, so far as we know, not denied officially, that money has been awarded for certain subjects without even the pretence of inspection. The latest case we know of, occurred in the Dundas High School, where the sum of \$6 was awarded for Upper School work without even the performance of the usual ceremony. It is also well understood that none of the three Inspectors professes to have any knowledge of Drill, Music, or Drawing, and yet we find minute distinctions made in the schedule between the schools in which these Departments are attended to. If any established system is followed by these officials in the discharge of this branch of their duties, it would be in the interests of all concerned for the Minister to authorize an explanation. We by no means under-estimate the delicacy of the task imposed on the Inspectors, but it is only proper that the difficulties we have pointed out should be obviated in some way.

(3.) We are sorry to be able to agree with the Inspectors in their remarks on History-teaching in our High Schools. To a very large extent the fault lies with the Masters themselves. But a good deal of the trouble that exists may be attributed to the facts, that an effort is often made to prepare candidates for the Intermediate in too short a time, that owing to the recent introduction of this study into our Public Schools, entrants come with little or no knowledge of History, and that an independent knowledge of "historical proportion" or judgment in any of its higher applications cannot be expected, to more than a limited extent, from the very young candi-

dates that form the majority of those who present themselves at the Intermediate Examination. But, while we should recommend the Masters to improve their methods, an examination of the papers that have hitherto been set convinces us that the difficulties attending the present position of the bulk of our teachers of History have not always been taken into account by the examiners.

(4.) We have no space to take up the topic of "Rotation of Examiners." We may say, however, that we are glad to observe that Professor Young has shown his appreciation of the difficulty so far as he and his colleagues are concerned. But the interests of education are paramount; and while the Chairman has been so kind as to show how the examinations have been adapted to the exigencies of the Committee, he might have been ingenuous enough to admit the correctness of the position taken by the Masters. The Minister, it is almost needless to observe, is aware that the Central Committee was created presumably for the benefit of the schools, and not the schools for the benefit of the Central Committee.

THE following are new regulations anent the Intermediate Examination approved by the Lieut.-Governor in Council, 4th Oct., 1879, as issued by the Education Department:—

The first of these, we can scarcely refrain from saying, is objectionable on the score of indefiniteness, as the time for holding the Intermediate should be fixed definitely, or at least a notice of one clear year should be given before the Examination is held, so that teachers may not be kept in unnecessary suspense on the point.

1. The Intermediate Examination will be

held in each year at the time fixed by the Department.

2. The subjects will be grouped as heretofore, and candidates who obtain forty per cent. of the total in each group, and not less than twenty per cent. in each subject, shall be considered as having passed the examination.

3. Candidates who, in passing the Intermediate Examination, obtain twenty per cent. on each subject, and forty per cent. on the group, will be regarded as having passed the non-professional examination for Third-class certificates. Those who, besides fulfilling the above conditions, obtain fifty per cent. of the whole number of marks attainable, will be considered as having passed the non-professional examination for Second-class certificates, grade B; while those who obtain thirty per cent. on each subject, fifty per cent. on the group, and sixty per cent. of the aggregate marks, will be considered as having passed the non-professional examination for Second-class, grade A.

4. All the answers in each subject are to be read and the values assigned. While the passing is to be determined by these tests, the questions in each subject are to be framed by the examiners, not with reference to any high standard for competitive examinations, but solely to ascertain whether the candidate has acquired a fair knowledge of each subject, and so is qualified or not for the Upper School, or for non-professional standing as a teacher (as the case may be) having regard to his proficiency or deficiency in answering questions reasonably framed for this purpose in each subject.

The works to be read critically for the Examination of 1880—see the High School programme—are Gray's "Elegy in a Country Churchyard" and Goldsmith's "Traveller."

A SCHOOL-BOY on the other side of line 450, gave his teacher the other day, this illustrative definition of "responsibility:" "Boys has two buttons for their 'spenders, so's to keep their pants up. When one button comes off, why, there's a good deal of *responsibility* on the other button."

SEE that your pupils understand clearly what you require them to do. Most of all endeavour to understand it yourself.

THE mind of the pupil is to the teacher what the clay is to the potter—a plastic body that may be so fashioned as to become an object of admiration or of insignificance.

PUBLIC SCHOOLS DEPARTMENT.

INTERMEDIATE EDUCATION IN ENGLAND.

Mr. Forster, in a speech lately delivered on this subject in London, estimates that not more than 50,000 out of 350,000 pupils attend schools that can afford any guarantee of efficiency. The remedy he suggests is a system of registration for competent teachers who are employed in Secondary Schools, and the establishment of an Educational Council composed of members of the Universities, nominees of the Crown, and representatives of the teaching profession, whose duty it should be to supervise all matters connected with Secondary Education. His plan in fact resembles, in its main features, the one contained in Dr. Lyon Playfair's bill lately before the House of Commons. Mr. Forster believes however that no changes should be made without consulting the feeling of the teachers and sympathizing with it. That he is prepared to do both the following extract from his speech will show. "The idea of an Educational Council, fairly constituted, with a just representation of teachers upon it, taking stock every year of the state of education, making suggestions for its improvement, and superintending a scheme for the training of teachers, had taken much hold of the public mind and the professional mind, and with all that the teachers had become more and more possessed of the desire of not being content until the teaching profession was put on a level with the other great professions in society. Why ought not the profession of teaching to have as much high honour and public regard, and be as much a distinguished profession, as that of either law or medicine? If we looked at the work which its members were doing for society, at the responsibility of that work, at the difficulty of doing it well, at the obligation under which they were putting so-

ciety in general, they at least stood as high as the men whom we sent for when we were ill, or the men to whom we resorted when we wished to go to law with our neighbours."

TEACHERS' SUPERANNUATION IN IRELAND.

The condition of the Irish National School Teachers for the last few years has been far from satisfactory. There has been a gradual decrease in salaries without any prospect of relief. At length when the Government found that persons of the right stamp were beginning to shun the profession, owing to the indifferent salaries paid, it came to their relief and during the recent meeting of Parliament had a bill passed to provide pensions for those who remained in the profession.

A sum not to exceed one million three hundred thousand pounds is to be set apart from the funds remaining from the disestablishment of the Irish Church for this purpose. The interest on this amount, supplemented by contributions from the teachers themselves, will amount to £46,000. Teachers of all grades in employment at the time of the passing of the act have the option of becoming subscribers to the pension fund within five years; but those who become teachers after the passing of the act have no option. The amount of the quarterly premium is to be deducted from the salaries,—the amount varying with the class to which the teacher belongs and the age at which he enters the profession. Thus a man entering the profession at 20 years of age pays annually 11s. 4d., if he is a third-class teacher; at 30 years of age he pays 18s. 8d., and at 40 he pays £1 12s. 4d. If he is a second-class teacher and enters the profession at any of the above ages he pays respectively 15s. 2d., £1 4s. 8d., and £2 2s. 8d. If he is a first-class teacher and enters the profession at any of the

ages enumerated, he pays respectively, £1 9s., £2 7s., and £4 1s. 8d.

In return for these annual payments a male teacher, if he retires at the age of 60 years, will receive an annual pension of £22 if of the third-class; £29 if of the second-class; and £53 if of the first-class. The highest pension paid is to those who remain teaching till they are sixty-five years of age, when the amounts for each class are £35, £46, and £88 respectively. On the other hand the lowest pension paid is when a teacher retires at fifty-five years of age; the respective amounts then are £15, £19, and £34.

Female teachers have to pay a higher premium, but they may retire on a pension any time between fifty and sixty years of age—the pensions for the three classes at the former age being £12, £16, and £28 respectively, and at the latter age £25, £34, and £60.

Provision is made for granting gratuities to disabled teachers. If a teacher withdraws from the profession previous to the time when he would be entitled to a pension the amount of his subscriptions is returned to him. A teacher if he choose may be a subscriber to a class lower than his own, but then he will be entitled only to the pension of the class to which he subscribes.

BRITISH WEIGHTS AND MEASURES.

By the act passed by the Imperial Parliament which came into operation the first day of this year the perch consists of 22 yards, not $5\frac{1}{2}$ yards as heretofore, and ten perches or 220 yards make a furlong. It will thus be seen that the perch is made identical in length with the Gunter's chain. As the acre still consists of 4,840 yards, ten of the new perches squared make this up; the rood is still one-fourth of the acre or 1,210 square yards.

The following is the new Avoirdupois weight:—

16 drams make 1 ounce,
16 ounces or 7,000 grains make 1 pound,
14 pounds make 1 stone,
8 stone or 112 lbs. make 1 hundred-weight,
20 hundred-weight 1 ton.

All articles sold by weight are to be sold by this weight except—1. Gold, silver, platinum, and precious stones, which may be sold by the ounce Troy which is still to consist of 480 grains, or by any decimal part of such ounce. 2. Drugs, which may be sold in retail by Apothecaries' weight.

The gallon is to be the unit of measure, and shall contain ten pounds of pure distilled water at a temperature of 62° Fahr., and with the barometer at 30 inches. The metric system as heretofore continues legal, but its use is optional.

CONTRIBUTORS' DEPARTMENT.

ANSWERS TO CORRESPONDENTS.

Teacher.—There will be no "Intermediate" Examination in December.

Yes, there will be an Examination for entrance into the High Schools and Collegiate Institutes in December next.

We have so far been unable to find out what is to be the course of study prescribed for First-Class Teachers to be examined on next July. We hope to give full information on this point in our next issue.

We cannot answer the question, "Why Queen Victoria was made Empress of India?"

It was an act of Beaconsfieldian wizardry. The assumption of the title does not enlarge her authority.

Goderich.—The "clever couplet" on mind and matter you enquire the source of, appeared in *Punch* some ten years ago. Correctly it is as follows:

"What is mind? no matter.
What is matter? never mind."

Truro, N.S.—Deschanel's Natural Philosophy has been translated by Prof. Everett, of Queen's College, Belfast. Blackie & Son are the publishers. The translator has in-

troduced into the work the results of many of Sir Wm. Thomson's and Prof. Faraday's experiments in Electricity and Magnetism, which considerably increases its value over the French edition.

Inquirer.—We cannot answer the question whether the closing passage in Dr. McLellan's recent Presidential address is or is not intended as "a dig" at the Chairman of the Central Committee. As you say, however, the reference to "the careless admissions of a few Mathematical Metaphysicians who sacrificed the certainty of Mathematics for the aberrations of Psychology" was, under the circumstances, a delicate one. The address is so marked by intellectual "neck-craning" and mental tiptoe effort that you must excuse us in refusing to think out the meaning of the other passages you refer to in the Doctor's disquisition. We join you in the hope that the learned Doctor has got down by this time from his super-mundane heights.

Brant.—The translation into Latin verse of the stanza from the Rev. John Moultrie's poem, "Forget Thee," is to be found in Kennedy's *Sabrina Corolla*. We quote it for you, appending the original.

OBLITUS UT VIVAM TUI?

"Oblitus omnes ut tui vivam dies?

Cesset avis liquido mulcere silvas carmine:

Oblitus omnes ut tui vivam dies?

Negligat unda maris tumere sub lunæ face:

Stituculosa nulet immemor rosa

Nectareos bibere rorantis Hesperii scyphos:

Tuo paternum litus effluat sinu,

Vatasque cæruleo nota colore juga,

Vultusque amatus quisque, et a puertia

Plurima deliciis signata plurimis loca:

COURTESY of manner is one of the greatest essentials to a teacher, or any one who aims at success in guiding children on the road to knowledge. Not that they should go through all the formulæ that Chesterfield lays down as essential to intercourse between ladies and gentlemen, but they must show a studied kindness for their welfare and a regard for their feelings.

THE true value of a teacher is determined not by what he knows, nor by his ability to impart what he knows, but by his ability to stimulate in others a desire to know.

Quorum simul te ceperint oblivia,
Excideris animo tu cara, tum demum meo."

"Forget thee! bid the forest-birds forget
their sweetest tune;

Forget thee! bid the sea forget to swell be-
neath the moon;

Bid thirsty flowers forget to drink the eve's
refreshing dew;

Thyself forget thine own dear land, and its
mountains wild and blue;

Forget each old familiar face, each long-re-
membered spot:

When these things are forgot by thee, then
thou shalt be forgot."

J. H. H.—We transcribe for you Frank-
lin's Epitaph:

"The Body of
Benjamin Franklin, Printer,
(Like the cover of an old book,

Its contents torn out,
And strip of its lettering and gilding.) *
Lies here, food for worms.

Yet the work itself shall not be lost,
For it will (as he believed) appear once more
In a new

And more beautiful edition,
Corrected and amended
By the Author."

It has been suggested, however, that Frank-
lin was indebted for the idea to Francis
Quarles, from whose "Divine Fancies" we
quote you the following:

"The *World's a Printing-House*, our *Words*,
our *Thoughts*,

Our *Deeds*, are *Characters* of several sizes;
Each soul is a *Compos'tor*, of whose faults

The *Levites* are *Correctors*; *Heaven Revises*;
Death is the common *Press*, from whence being

driven,
We're *gather'd*, sheet by sheet, and bound
for *Heaven*."

A CONTEMPORARY has a wise article on
"Common School Education," in which firm
ground is taken against the cramming of
children's heads with special studies. It
says:—"They are forced into the minds of
pupils at an age when the reasoning powers are
undeveloped and the memory in its highest
state of receptivity. Obviously, that is the
age when elementary facts should be laid in
store, and when the art of using facts should
begin to be taught in that careful and guarded
way which takes care not to anticipate de-
velopment.

CONTEMPORARY LITERATURE.

THE CULTIVATION OF THE MEMORY; ON THE USE OF WORDS. Philadelphia: Eldredge & Bro. 1879.

These are the second and third of the "Manuals for Teachers," the first of which, on "The Cultivation of the Senses," we have already noticed. The work on "Memory" is apparently the production of the writer of the initial volume of the series. It shows the same admirable characteristics in closeness of thought, practical bearing, and thorough acquaintance with the subject.

The author points out that the two great aids to the cultivation of the memory are:

"(1) Attention, slow, grave, deliberate, to secure clear well-marked ideas or mental pictures acquired through each of the senses that can be employed.

"(2) Association of these ideas, through common qualities, by which you can connect them with each other, so that each idea may eventually and immediately suggest its appropriate companion idea or ideas."

He makes a meagre and unsatisfactory expansion of his first statement, but a very instructive one of the second. Indeed the chapter on Association is worthy of the most careful perusal by all young teachers who have an anxious desire to improve the memory of their scholars. In the fourth chapter some admirable suggestions are made for employing special subjects such as arithmetic, geography, etc., for the development of memory. Take the following for example:—"Success in logical reasoning is the first and most important aid to memory in arithmetic. Next to this we place neatness of work, where each figure is formed in large and legible characters, and each step of reasoning is clearly marked with detailed explanations at the side."

The illustrations of object lessons might have been more happy and some of them

more within the range of possibility. For example, what teacher in giving a lesson on Physical Geography would go to the length of making "a model in clay or sand so that the class could see the basin, water-shed, tributaries, etc." Yet our author would consider that teacher an indifferent one who would not adopt some such plan.

The chief fault of the work is its brevity, but even this is not a sufficient excuse for omitting Repetition as one of the chief factors in aiding memory. The American Publishers have added to the size of the work, but by no means to its value, by incorporating a chapter on the Cultivation of the Memory in youth from an American author. It will interest the reader to contrast this with the third chapter for the sake of seeing the difference in style, matter, and opinion, between the English and the American writers.

The Manual on "The Use of Words" has the same practical bearing, shows the same activity of mind on the part of the writer, and as much acquaintance with school room work as the two preceding Manuals, but this is certainly not done by a strict adherence to the title.

There is for example an admirable explanation of syllogistic reasoning in one chapter, some thoroughly practical remarks upon the art of school-room questioning in another, while a third is devoted to the study of words, not their use. This last, however, we must do the English author the justice to say he is not responsible for. It is taken from a work by Mr. Webb already noticed in these pages, and is more germane to the matter than the chapter appended to the Manual on Memory.

It will not be the author's fault if the reader does not always grasp his meaning, for wherever there is the slightest obscurity he dispels it by an apt illustration. His ideas are worth all the pains he has taken to make

them clear. We might give many evidences of this but we will content ourselves with two.

On page 25 he thus speaks of Definition:—"We hope we have shown that a definition instead of preceding a lesson, as it often does, should be the conclusion of a lesson or of some definite part of it. Consider what a definition is; it is not the giving of additional knowledge, it is the summing up, the gathering into a few words of all the ideas that have been obtained by a careful comparison of a number of objects by the abstraction of their common qualities which are grouped so as to represent a class; nor can the terms of a definition be of much use before these ordinary processes of thought have been performed." In our second extract he shows his independence of thought in a manner that may startle some of our readers who are accustomed to regard paraphrasing as one of the best aids to composition.

He says on page 61, "Paraphrasing or reproducing a passage of poetry in their (the scholars') own language is impossible, if the passage is involved and difficult; if the passage is easy and simple, the poet will have chosen the best words in the shortest form, and his language could only be changed for the worse."

ELEMENTARY ANATOMY, PHYSIOLOGY, AND HYGIENE; for the use of Schools and Families. By Edward Playter, M.D., etc. Toronto: Hart & Rawlinson, 1879.

At the first sight of this book of 168 pages we were struck with the suitableness of its title, for the elementary works of similar character which have heretofore appeared for use in our schools all bear the simple title of Physiology, while at the same time they necessarily treat, at some considerable length, of Anatomy and Hygiene, some acquaintance with both of which being absolutely requisite for the correct understanding and the practical uses of Physiology.

We agree with the author in the opinion that a "want has been much felt for an elementary work suited to the youthful portion of the people" on the above subjects. But, that his book is calculated to supply the want is another question, and one about which we

entertain some doubts. Dr. Michael Foster's little Primer is admirably adapted to the requirements of very young persons, being written in language easy to be understood by children. Huxley's "Lessons," on the other hand, is suited only for students of advanced years who already possess some knowledge of the subject; though it is a somewhat expensive book for the majority of boys and girls to purchase. Something intermediate is needed that will be neither too brief and simple on the one hand, nor too detailed and technical on the other. This want Dr. Playter's book in part supplies; but, not to mention several omissions, it appears to us that some corrections and alterations, and many acknowledgments ought to have been made before the work was permitted to pass through the press.

Without stopping to dispute the assertion, and others of equal importance, that all living bodies are organized, we cannot help thinking that it is a great mistake in an elementary work to reverse the usual order of subjects by introducing the brain and nervous system first to the young beginner. It can hardly be sensible to ask the pupil at the outset to enter upon the study of so complicated an organ as the eye or the ear; or to study the animal organs and functions before he has made himself in the least acquainted with the less difficult study of the organs and functions of vegetation. Nor do we think sufficient reason is given for the change by the statement that the brain and nervous system are "most closely connected with the mind." However, the book seems to contain very much of what is required in a text-book for schools, and, upon the whole, it is tolerably accurate, and is likely to prove useful in the hands of a properly qualified teacher. But, it is impossible to peruse the book without feeling that much of its accuracy is due to extensive quotations from such great authorities as Huxley and Foster. In vain have we sought however, for an acknowledgment of the sources whence those extracts have been taken. In saying this we do not mean to imply that the great established facts of the science must not be the same in all works on Physiology, no matter by whom written. The foundation, the essence of the work, so to speak, must re-

main the same ; but it is to the construction and even to the relative order of many of the sentences that we venture to object. The likeness is so apparent that we cannot refrain from calling attention to a few of them. On page 42 of Foster's Primer we find the following passage: "So thick-set are the little blood-vessels, that wherever you thrust a needle, be it as fine a needle as you please, you will be sure to pierce and tear some little blood channel, either artery or capillary or vein, and out will come the ruddy drop." On page 54 of Playter's book we find: "so thickly set are these little vessels that you cannot thrust in even the finest needle without piercing one or more of them, when out will flow the crimson drop." On p. 51 of Foster we have "the blood is the great circulating market of the body, in which all the things that are wanted by all parts, by the muscles, by the brain, by the skin, by the lungs, liver, and kidneys, are bought and sold. What the muscle wants, it, as we have seen, buys from the blood." Compare Playter, pp. 54-5, "The blood is like a great circulating market in the body. . . . From it, all that is wanted by the various parts—by the skin, the brain, the bones, the flesh, is obtained ; . . . what your muscles want they obtain from the blood ;" etc., etc.

"Huxley's Elementary Physiology," p. 134, says "all the substances which are used as food come under one of four heads. They are either what may be termed Proteids, or they are Fats, or they are Amyloids, or they are Minerals. Fats are composed of carbon, hydrogen and oxygen only. All vegetable and animal fatty matters and oils come under this division."

Playter, p. 75, thus paraphrases the above: "All foods come under either one or the other of four heads; they are either proteids, or they are fats, or they are amyloids, or they are minerals. Fats consist of carbon, hydrogen, and oxygen only. All animal and vegetable fats and oils come under this head." Numerous other passages might be pointed out did space permit; but the foregoing will suffice to show how nearly the Canadian author approaches an infringement of the

copyright laws which a dutiful acknowledgment in his preface would place in another light.

THE ENGLISH LANGUAGE: Its History and Structure. Royal School Series. London: Thomas Nelson & Sons; Toronto: James Campbell & Son, 1879.

This is a spirited outline of the history of the English language, and is intended for the higher classes in Elementary Schools. The historical development of the language is given with force and general accuracy. Then follows a succinct account of the history of English literature, and last of all some simple exercises in paraphrasing. The Etymology is touched upon sufficiently for beginners, lists being given of the most useful Greek, Latin, and Anglo-Saxon "roots." We do not however understand why a greater number of the words in the passage on page 39, beginning "But the dominion of the Norman" is not printed in italics, which are employed to indicate words of pure English origin, unless it be with the design, of which we have a hint in the "outline" at the beginning of the chapter, to limit the italicizing to words of special import. Nor is it very easy for the Canadian to understand why Canada should be supposed to have "only hundreds of thousands" of English-speaking people against the millions of the United States, especially when the author's purpose is to show the wide range of the lands in which the language is spoken. A Canadian too might be pardoned for objecting to the following line in a poem on the "Triumphs of the English Language," which we elsewhere quote, taking the liberty of substituting another adjective for the italicized one. "It spreads where winter piles deep snows on bleak Canadian plains."

But notwithstanding all this the book is one that may be heartily welcomed by the teacher, for what is wanted for elementary classes is not long, abstruse treatises, but a concise, intelligible primer such as this, written in a lively, attractive style, and sold, as the present work is, at a low price. We believe that there is not among our authorized text-

books any one work which gives a connected account of the subjects dealt with in this little volume, hence the great bulk of our school-children leave school with hardly an idea of what is meant by the history of the literature of their native tongue. With the present work in their hands this could not continue to be the case, and we therefore trust that it will come into extensive use.

LOVELL'S INTERMEDIATE GEOGRAPHY, with Maps and Illustrations; being introductory to Lovell's Advanced Geography, authorized by the Hon. the Minister of Education, Ontario. Montreal: John Lovell, 1879.

The personal history of the publisher of this Geography, and the record of his long and industrious life, is a perpetual inspiration to any one familiar with his remarkable career. Before many of the present generation were born, Mr. Lovell's public services to the country had earned for him enviable distinction, and a pension from the British Government which his ardent patriotism and generous, disinterested nature would not allow him to accept. Exchanging the military saddle in the turbulent times of '37 for work at the printer's "case," he found ready means to serve his country in a sphere of usefulness no less important than that of the military trooper. His enterprise and industry, as well as the integrity of his character, and his high sense of honour, soon secured him recognition and employment by the authorities in the practical career he had set before him. As Parliamentary printer, through the many years of the early Colonial life of the country, the Government libraries and State archives witness to his faithful and loyal labours. His many and important publishing enterprises testify also to the irrepressible public spirit which has been signally manifested in all his work. Stimulated by this patriotic ardour, some twenty years ago he threw himself into educational publishing with the motive of adapting the school-books of the country to the educational wants and national predilections of the people. The earliest outcome of this project was the "General Geography," prepared by the present Deputy Minister of Education of Ontario,

soon followed by the introductory "Easy Lessons,"—text-books which have long enjoyed the favour and patronage of the schools.

The work before us takes the place of the latter book, which we learn it would have earlier replaced but for the delay caused by the thoroughness of the revision to which the new book has been subjected. The place of the 'General Geography,' is to be immediately taken by a new and 'Advanced' text-book, of a high character, which Mr. Lovell is about to issue. The most cursory glance at the 'Intermediate,' will assure anyone that examines the book that it is the product of faithful and intelligent labour; while its attractive mechanical appearance will instantly prepossess the critic in its favour. A closer acquaintance with the work will deepen this impression, and increase the satisfaction with which the peruser of its contents will examine its pages. If we entertain an opinion that would qualify our unstinted commendation of the book, it is that that would lead us to give preference to the ordinary literary form of book construction over the catechetical, which has been adopted by the writer. The question and answer form, in our opinion, is apt to lead the instructor to impart his knowledge in splinters of fact rather than in the convertible pulp of a simple and enticing narrative. Still, for elementary classes, the form into which the book has been cast may be best suited; and the writer has admirably succeeded in the choice and statement of facts which he has embodied from the interesting fields of geographical information. As an epitome of elementary geography for Canadian schools, the work, in our opinion, is wholly satisfactory. Within its compass we have just that amount and variety of matter which must make the book thoroughly acceptable to the teacher, and easy of digestion by the pupil. The page is a clear, clean, and inviting one, and the maps and illustrations are features of excellence which call for spontaneous recognition. The book will doubtless receive a large measure of favour, and the instant and hearty commendation of every one examining it interested in education in Canada.

EDITORIAL NOTES.

TOPICS OF THE TIME.

THE question how best to impart moral instruction in schools has recently been under discussion by the members of the School Board of Birmingham, Eng. The decision came to by that body was to instruct the teachers to give two lessons a week, of a conversational character, on such subjects as the following: Obedience to parents, honesty, truthfulness, modesty, temperance, courage, kindness, perseverance, frugality, thrift, government of temper, courtesy, unselfishness, and kindred moral duties,—the lessons to be of half an hour each, and to be enforced by illustrations drawn from daily life. An amendment was proposed to the effect that teachers should be allowed to draw their illustrations from the Bible, but it was voted down—a member, the Rev. Mr. Dale, thus expressing the opinions of the majority. He (Mr. Dale) believed that the code would promote the moral health and vigour of the children, and that ultimately religious faith itself would be benefited by it. The manner in which morals were commonly taught, when morals were associated with religious instruction, had rather emasculated and enfeebled moral life by the exclusive appeal that had been made to the highest religious motives in order to enforce ordinary moral duties. He was prepared, he said, to maintain that there was a clear distinction between teaching morals and teaching religion. There were many men who recognized the obligation of honesty, and truthfulness, and of temperance, who rejected Divine revelation. He admitted, however, that an appeal to revelation added tremendous sanction to the ordinary moral duties, but he argued that neither morality nor religion was a gainer from an incessant appeal to religious motives. He desired his child to have a generous love

of goodness, not merely because God had commanded it, but for its own sake. There is much to be said in favour of Mr. Dale's robust yet thoughtful views on this subject. We are perhaps too apt to enforce our admonitions to the young in the jargon of Pharisaism or in the glib phrases of Sunday-school literature. A kindly, earnest talk in the phraseology of the play-ground would oftentimes be more impressive and effective. Still, where no objection is raised on conscientious grounds to the reading of the Bible in the school, the simple and pointed moral instruction of the teacher may well and profitably be enriched from the maxims of the Great Master.

THE question of Clerical *versus* State Lay Education in France is still wildly exercising the Gallican mind, and the agitation, we notice, is now spreading to Belgium. The intolerance and animosity of the Church is unhappily now being matched by the intolerance and animosity of the enemies of the Church, and what the outcome of the disturbance is to be no one can well forecast. So impassioned are the parties in the affray, and so hopeless seems the appeal to calm reason in France, that spokesmen on both sides of the quarrel are now appealing to England for a hearing on the merits of the burning question at issue. Those of our readers who may be interested in the matter will find the case best stated for the Clerics in the extracts given in the recent English newspapers from a pamphlet written by M. l' Abbé Martin, and for the Liberals in the article in the September number of the *Nineteenth Century*, by M. Edmund About. On the surface the Government Bill, introduced by M. Jules Ferry, Minister of Education, seems a commendable attempt on the part of

the State, to secure efficient machinery to advance the best interests of education in the country with such proposed enactments necessary to enable the Government effectively to control and direct the machinery. The article in the Bill that has roused the Clerical party to frenzy is that known as No. 7, to the following effect: "That no person belonging to an unauthorized religious community is allowed to govern a public or private educational establishment of whatsoever order, or to give instruction therein." This, it has been assumed, and no doubt rightly, is a direct slap at the Ecclesiastical schools, with the idea of repressing or abolishing them. The *raison d'être* of this is the political animus of the Jesuits towards the Republic and the well-known sympathy of the Church with the Empire. The further incitement to place the Priests' schools under the ban of the law is fear at the growing power of the religious orders and uneasiness felt at the increasing popularity of institutions conducted by the worst enemies of the Republic. It is to be feared, however, that the passage of the anti-Jesuit clause in the Bill will not help the cause of undenominational education, while this borrowing of the weapons of intolerance and repression from the Jesuits is not apt to commend itself to many liberal and fair-minded men. But its becoming law is looked upon as a prime political necessity in the interest of the State and the perpetuation of Republicanism, as well as in the interest of the large and growing class in France that desires emancipation from the mental servitude imposed by the Church.

The number of unauthorized congregations which the new law would disqualify from public teaching includes some fifty establishments conducted by about 1,500 Jesuits. These religious bodies are unauthorized in the sense that their associations have no corporate rights and hence they cannot be proceeded against as public bodies. Of course this small number of irregular teachers may seem insignificant against which to hurl the power of the State, but it must be remembered that their cause is championed by the

whole Clerical community of France and this is an array not only strong enough to give the Government trouble in regard to the immediate question at issue, but is one that is also unceasingly active in its efforts, politically, to undermine it. In view of the latter circumstance the Government's jealousy of the Clerical power is not to be wondered at, though we cannot but regret that the Republican leaders should resort to an act so impolitic and anti-Liberal as this repressive measure against the Church.

ON September 10th, a meeting of persons interested in the cause of religious education was held at the City Terminus Hotel, London, Mr. Ellery in the chair. The chairman, in his opening remarks, explained that the meeting had been convened mainly at the instigation of some gentlemen whose minds had been sorely vexed by the lamentable instances which had been brought to their knowledge of the neglect of Biblical or Scriptural education in Board Schools. After some discussion on the subject of School Board education and Biblical knowledge, it was resolved unanimously: "That this meeting is of opinion that it is of the highest importance that children of both sexes should have instilled into their minds the first principles of Christian morality by means of Bible lessons, and that such lessons should be given in all elementary schools throughout the kingdom." It was further resolved, "That an association should be at once formed, entitled the Christian Education League, for the purpose of securing the return of such candidates for School Boards as were in favour of religious education." A preliminary committee was then chosen, and Mr. W. G. Kent was appointed Secretary, and instructed to communicate with certain influential gentlemen, with the view of placing the League on a sound foundation, and enabling it to carry out the programme.—*The Schoolmaster.*

WHEN any branch of legitimate study is notoriously unpopular in an educational institution, it simply proves that it is not properly

taught there. When students stand appalled at the sight of the Greek alphabet, and during all their course never get over their fright, it proves that some teacher should be rotated out, and some other teacher rotated in. A good teacher will make whatever he teaches interesting, be it Greek, German, or Gaelic. It is not so much a question in our schools What shall we teach? as How shall we teach? Some teachers will discipline the mind more in teaching practical cookery three months, than others would in teaching Chinese or Choctaw all their lives. A pupil recently examined could repeat all the rules in the arithmetic perfectly, but utterly failed when asked how much a turkey would cost, weighing $17\frac{3}{4}$ pounds dead, at $6\frac{1}{2}$ cents per pound alive.—*Ex.*

It often occurs to us of what importance it would be if some time were devoted in the schools to the practice of short-hand writing, familiarity with which is every day becoming more valuable and necessary. In some schools the time given to the writing-lesson is absorbed by elaborate practice in ornamental penmanship, usually an unnecessary waste of time and patience which would be more serviceably expended in acquiring some practical knowledge of phonography. For literary purposes, and indeed for most of the ordinary purposes of writing, the use of short-hand is of great moment,—the economy in its use over the present system of writing out in full, being a matter instantly verifiable by any one familiar with the system. To the student in making rapid notes of lectures, and in transcribing passages from text-books for future reference and use, acquaintance with phonography would be of great assistance, while in his future career he would find it highly serviceable and profitable to him in whatever occupation he is to engage. Some years ago phonography was made the subject of reference in a Presidential address before the British Science Association, in some such words as the following:—

“It seems strange that while we actually possess a system of short-hand by which words can be recorded as rapidly as they can be spoken, we should persist in writing a slow

and laborious long-hand. It is intelligible that grown-up persons who have acquired the present conventional art of writing should be reluctant to incur the labour of mastering a better system; but there can be no reason why the rising generation should not be instructed in a method of writing more in accordance with the activity of mind which now prevails.”

The utility of short-hand, indeed, is every day becoming more and more an admitted fact, and if the system could be introduced into the schools, as a part of the writing lesson, we are certain of its great advantages to those who can acquire facility in writing it. To become a short-hand writer is not, of course, an attainment to be jumped at. Like other acquirements the “royal road” to it is through application and perseverance. “Two things,” it has been said, “are especially necessary to the complete attainment of short-hand; namely, first, to *begin*, and next, to *go on* with its acquirement and practice. The learner must, as it were, *grow* into the use of short-hand writing, pretty much in the same way that he advances to perfection in any other every-day attainment.

THE Annual Games in connection with the Toronto Collegiate Institute, came off on the Toronto Lacrosse Grounds, on Friday the 3rd instant, with great *eclat*. A lively interest was manifested in the proceedings by over 1,500 spectators. His Worship the Mayor presented the prizes. The Band of the Queen's Own Rifles was in attendance.

No student of English Literature can now complain, on the score of expense, that he is precluded from adding to the resources of his library, as he can now get the cream of England's contemporary thought in the great English serials, the *Nineteenth Century*, the *Fortnightly*, and the *Contemporary Review*, in American reprints, at twenty cents each, per month.

THE following are the Scholarship winners at the recent Examinations at the University of Toronto:—

Classics—Mr. E. J. Harris, of Woodstock Literary Institute.

Mathematics—Mr. D. Francis, of Collingwood Collegiate Institute.

General Proficiency—Mr. C. W. Mulloy, of Berlin High School.

TRIUMPHS OF THE ENGLISH LANGUAGE.

BY J. G. LYONS.

1. **N**OW gather all our English bards, let harps and hearts be strung,
To celebrate the triumphs of our own good English tongue ;
For stronger far than hosts that march with battle-flags unfurled,
It goes with FREEDOM, THOUGHT, and TRUTH, to rouse and rule the world.
2. Stout Albion learns its household lays on every surf-worn shore,
And Scotland hears its echoing far as Orkney breakers roar ;
From Jura's crags and Mona's hills it floats on every gale,
And warms with eloquence and song the homes of Innisfail,
3. On many a wide and swarming deck it scales the rough wave's crest,
Seeking its peerless heritage—the fresh and fruitful West ;
It climbs New England's rocky steeps, as victor mounts a throne ;
Niagara knows and greets the voice, still mightier than its own.
4. It spreads where winter piles deep snows on bright Canadian plains,
And where on Essequibo's banks eternal summer reigns :
It glads Acadia's misty coasts, Jamaica's glowing isle,
And bides where gay with early flowers green Texan prairies smile :
It tracks the loud, swift Oregon, through sunset valleys rolled
And soars where Californian brooks wash down their sands of gold :
5. It sounds in Borneo's camphor groves, on seas of fierce Malay,
In fields that curb old Ganges' flood, and towers of proud Bombay ;
It wakes up Aden's flashing eyes, dusk brows, and swarthy limbs ;
The dark Liberian soothes her child with English cradle hymns.
6. Tasmania's aids are wooed and won in gentle English speech ;
Australian boys read Crusoe's life by Sidney's sheltered beach ;
It dwells where Afric's southmost cape meets oceans broad and blue,
And Nieuwveld's rugged mountains gird the wide and waste Karroo :
7. It kindles realms so far apart, that, while its praise you sing,
These may be clad with Autumn's fruits, and *those* with flowers of Spring :
It quicken's lands whose meteor lights flame in an Arctic sky,
And lands for which the Southern Cross hangs orb'd fires on high,
8. It goes with all that prophets told, and righteous kings desired ;
With all that great apostles taught, and glorious Greeks admired ;
With Shakespeare's deep and wondrous verse, and Milton's loftier mind :
With Alfred's laws, and Newton's lore,—to cheer and bless mankind.
9. Mark, as it spreads, how deserts bloom, and error flies away
As vanishes the mist of night before the star of day !
But grand as are the victories whose monuments we see,
These are but as the dawn, which speaks of noontide yet to be.
10. Take heed, then, heirs of Alfred's fame, take heed, nor once disgrace
With deadly pen or spoiling sword our noble tongue and race.
Go forth, prepared in every clime to love and help each other ;
And judge that they who counsel strife would bid you smite—a brother.
11. Go forth, and jointly speed the time, by good men prayed for long,
When Christian states, grown just and wise, will scorn revenge and wrong ;
When Earth's oppressed and savage tribes shall cease to pine or roam,
All taught to prize these English words—FAITH, FREEDOM, HEAVEN, and HOME.
—Selected.