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THE AGE OF BACON.*

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FIRST PAPER.

AS we cast our eye back over the vista of the past, there are some events which loom up more conspicuously than others, events which have left a powerful impress not only on the age in which they transpired, but transmitted their influence down to succeeding generations. Like some peaks in certain mountain ranges, which overtop and surpass all others in grandeur and height, so do these events stand out more prominently than others in the same age, by reason of the powerful and widespread influence which they have exerted. The appearance of Francis Bacon may be regarded as one of the events which I have just described. His name stands associated in history with a system of philosophy which has been productive of inestimable blessing to the world. The grand, dis-

tinctive feature of that philosophy which he inaugurated was the prominence and importance which it gave to experiment and observation, as a means of advancing knowledge and discovering truth. The priceless blessings which have flowed down to us from that event, and the widespread influence which it has exerted, have had the effect of investing it with a great and lasting importance. The Reformation of the sixteenth century, which, like a surging tidal wave, swept over Europe, was an event which all regard as of great value. The glorious liberties which it secured, and the inestimable moral and spiritual blessings which it bequeathed, go to invest it with a transcendent importance and an abiding interest. Now, what the Reformation of the sixteenth century was in the spiritual sphere, the Reformation in the seventeenth was in the intellectual. The great work which Bacon did, the crown-

* Delivered before the Students of Pickering College.

ing work of his life, was, to make experiment and observation the means of attaining truth, to lead men away from the framing of theories to the study of facts, to proclaim that nature is our grand field for observation, and that the only sure pathway to knowledge and discovery was by a faithful investigation of her pages. In order fully to understand the work which Bacon did, it will be necessary to consider the age preceding that in which he arose. The ages are linked together; they are dependent upon each other. It is with the ages of history, as with the different periods in human life. The child is father to the man; the influences which are at work in childhood and youth go to give colour and shape to the character of the man. So in history. The influences and forces which are at work in one age go to determine the character of the age which succeeds. And as it is with ages, so is it with the great events in any age. The events are linked together. The one grows out of the other. The greatest events which transpire, which change sometimes the whole face of society and perpetuate their influence down to the remotest generations, are usually brought about by causes and forces which are small, insignificant, and widely separated, just as in the world of nature around us the mightiest agencies and forces derive their might from the operation of apparently small and unnoticed causes sometimes far removed from each other. It was so with respect to the event which we are now about to consider—the appearance of Bacon and the application of that system of philosophy with which his name stands associated.

In order to ascertain the causes and influences which brought the event about, and to form a correct estimate of the work which he did, we must go back a few centuries and

consider the condition in which the world then was.

The fall of the Roman Empire, in 476, A.D., marked the commencement of a period of thick darkness. In that memorable year, that empire which had so long held the supremacy among the nations of the earth and where met in a focus all the civilization and refinement of the world, passed away, as a mist of the morning, before the prowess of the barbarians of the north. Towns and cities were destroyed, and their gorgeous temples razed to the ground, fair kingdoms were ravaged, and desolation and death followed the steps of the ruthless foe. The result was that a universal darkness began to spread over Europe, learning began to decline, and everywhere were seen the unmistakable signs of mental and moral decay and decrepitude. The most gross ignorance prevailed among all classes of the people. We read, for instance, upon good authority, "that scarcely a single person was to be found in Rome itself, who knew the first elements of letters; that not one priest of a thousand in Spain could address a common letter of salutation to another; that it was rare to find a layman, of whatever rank, who knew how to sign his own name." Side by side with this wide-spread ignorance, the grossest immoralities were practised, the darkest vices prevailed, the vast mass of the people were sunk in the most pitiable moral and spiritual degradation, all liberty of thought was proscribed, every trace of mental or moral vigour seemed to have vanished away, a dreary winter set in upon the world, the streams of thought were congealed, and a spirit of moral decay and death brooded over the land. Superstition grows upon the soil of ignorance; and it is not surprising to find, in the age of which we speak, many forms of superstition thriving. The appearance of a comet,

or the occurrence of an eclipse, was regarded with feelings of terror, and as an unwelcome harbinger of coming calamity. It was a deeply cherished belief in the minds of many, that the year 1000, A.D., was to be the end of the world. The anticipation of the rapidly approaching event caused an almost universal stagnation and inactivity, and filled men's minds with anxious expectations, and dismal forebodings. Many dispossessed themselves of their property, others retired from the active duties of life, all awaited the dawn of the expected day: a universal lull brooded over the world. But the year 1000 came and went without bringing the anticipated event; men's dark fears and dismal forebodings seemed unfounded. At the close of that year the dark cloud which seemed to overhang the sky of the future rolled away; light seemed to break forth upon the darkness; signs of activity began to appear, and the world awoke from its slumbering to renewed active life. But only very slowly did the life return; the world seemed, as yet, in its childhood; the swaddling bands were yet around it; it had not yet learned to *think*. The Church of Rome still held complete sway over men's minds; all liberty of thought was forbidden; all search after truth was condemned, the teachings of the Church were considered infallible, no man dare question their truth; the study of physical science was sternly discountenanced; the teachings of Aristotle were received by the Church and stamped with the seal of infallibility. All physical truth was contained in Aristotle; all spiritual truth in the Church. We can imagine a condition of things in which the course pursued by the Church would be salutary and productive of good. When the nations of Europe were in their infancy, and unable to think for themselves, they needed some person to think and act for them. That per-

son was supplied by the Church of Rome. Whatever light or knowledge was in Europe at this time, was possessed by her. She was the educator of the infant races of Europe, when these races were rude and barbarous, and unable to educate themselves. The Church acted as the guardian of the young age. A stern guardian she sometimes was, demanding unhesitating obedience, unquestioning submission, to her authority. The circumstances of the age might have demanded this: stern measures are sometimes necessary under certain circumstances. The parent is sometimes obliged to deal sternly with the child; the teacher, with the pupil; he must demand instant obedience, unquestioning submission, so long as the child's powers are immature, his reason and moral nature undeveloped. But as the pupil advances to maturity, as reason dawns and his mental and moral nature become developed, then the teacher may relax his discipline, rely more upon moral suasion than upon force, and grant more liberty as the pupil learns how to use it. Now this was precisely what the Church did not do; and here it went wrong. The grand error of the Church lay in not taking into account the growing intelligence of the age and in not adapting itself to the new condition of things upon which it was entering. And what was the result? The result was that she paved the way for her own downfall, men refused to be treated as children, the Church began to lose her hold of the nobler spirits of the age, liberty of thought was asserted and claimed as the inalienable birthright of man, men began to drift away from their old moorings, the authority of the Church was resisted and ultimately defied, and a number of streams of influence were set in operation which, widening and deepening as they flowed, at length converged and culminated in the relig-

ious reformation of the sixteenth century, followed by the almost equally important intellectual reformation of the succeeding century under Francis Bacon. Already signs of an approaching change were beginning to appear, already faint streaks of light were beginning to brighten the world's horizon, betokening the dawn of a brighter day, already rills of influence were beginning to flow, which were, ere long, to deepen and widen into the majestic river, bearing on its bosom priceless blessings to mankind. And the same influences which went to emancipate men from the spiritual thralldom under which they were writhing, went also to emancipate them from the no less painful mental bondage which they suffered; for the Church, let us remember, not only threw its chain around the *soul*, but around the *mind* as well; it proscribed both spiritual and mental liberty, liberty to investigate the Bible and Nature. God has given us, at least, two revelations of his will—the Bible and Nature—the one, written by a human hand guided by a divine Spirit; the other, the fresh outcome of his creative power. The one is the depository of spiritual truth; the other, the depository of physical truth. Now, what the Church did, was to seal from common view both the book of nature and that of scripture. It taught that itself was the infallible depository of spiritual, that Aristotle was the infallible depository of physical, truth, and woe betide the man who dared to question her lofty pretensions. But the time had come when signs of a great and approaching change were beginning to appear, as already indicated; the cloud, as yet no bigger than a man's hand, began to darken the sky and to herald the approach of a storm which was destined to break forth with merciless fury upon the Church, shaking it to its very foundations, but fraught with

beneficent results to the world. It was to purify the atmosphere from its foul vapours, to emancipate men from the mental and spiritual tyranny under which they writhed, to restore to men the right to read an open Bible and investigate broad nature, and to inaugurate a golden age of liberty and progress.

Among the many influences which went to bring about this result, we mention (1) the *study of Natural Science*, introduced into Europe by the Arabs, during the time of their short but brilliant rule in Spain. After the death of Mahomet, the tide of Arabian conquest rolled westward, victorious over every opposing obstacle, until it became a colossal power in the world, rivalling the grandeur and magnificence of all preceding kingdoms. Crossing the strait of Gibraltar, the victorious Moslem set his foot in Spain and introduced into that country a reign of splendour. The most brilliant period in that country's history is the period of its occupation by the Arabs. A golden age of prosperity dawned; science and literature were sedulously cultivated; schools of philosophy and medicine dotted the land, to which pupils resorted from far and near; learned treatises on chemistry and medicine were written; poetry of richest imagery was composed; the winding labyrinths of metaphysics were explored; the sun was weighed and the orbits of the planets measured; and all this when the other and adjacent parts of Europe were sunk in the thick darkness of ignorance and degradation. But this reign of splendour seemed too bright to last; it came to a sad and sudden end. Urged on by the lust of power, proud in the consciousness of strength, the Moslem scaled the lofty Pyrenees and descended into the sunny plains beneath, moving onward in his victorious career, elate with the hope of seeing all Europe crouch at his feet.

But the valour of Charles Martel was now to be displayed. On the memorable field of Tours a fierce battle was fought—a glorious victory was won. Europe was rescued from the Mohammedan yoke, and Christendom was saved! The Moslem left Europe, but he left traces of his presence behind. An impetus was given to the cultivation of art and literature. Europe became the heir of some of the intellectual wealth which the Arab amassed. Some improvements and inventions due to his ingenuity passed into the hands of the European to be by him utilized and improved upon. The use of numerals was introduced; the study of algebra, botany, chemistry and medicine was begun; a spirit of investigation was rekindled, and the way was thus prepared for the dawn of a brighter morn. Thus, good arose out of evil. Mohammedanism itself might be an evil, but the encouragement which it was a means of giving to the study of art and literature was a priceless good. The fierce wars and atrocious cruelties, which stained its pathway to victory, was an evil, but the improvements and inventions, the spirit of active inquiry, which it bequeathed to Europe, was a good—a precious legacy for which Europe and we should be deeply thankful.

Another influence operating in the same direction, which tended to bring about the glorious harvest soon to be garnered in, was the study of what is known as the *Scholastic Philosophy*, introduced also by the Arabs. This philosophy consisted mainly of the logic and metaphysics of Aristotle. Its study was sedulously prosecuted by the ablest scholars of the time. The study of Nature was condemned by the Church, and all investigation of her laws sternly discontinued. Forbidden to be observers, men became speculators; forbidden to tread the inviting fields

of Nature, and gather the rich fruit she offered, men were compelled to tread the airy heights of speculation; to indulge in elaborate processes of reasoning; to frame imposing theories and build castles in the air. The most airy theories were formed; the most trifling disquisitions engaged in. What, for instance, could be more trifling than disquisitions regarding the nature of angels, their means of conversing with each other, how many could sit comfortably on the top of a needle, the morning and evening states of their understandings? Yet, such were the childish speculations indulged in, such the trifling disquisitions pursued by the ablest minds of the age. How, it may be asked, did such a course of study as this prepare the way for the bright future which awaited the world? It did so in two ways, in a positive and a negative way. First, by sharpening the mental faculties. Speculation, study of any kind, sharpens the intellectual activities and gives depth of insight and concentration of thought, and thus makes the mind more capable of investigation and research. The mind resembles an instrument; it needs sharpening ere it can do its work well. Speculation is a sharpener of the mind. As the knife and the axe need to be sharpened and the rust removed ere they can do their work well, so does the mind require to be exercised by speculation ere its faculties can do their most effective work.

But, secondly, the scholastic philosophy demonstrated, in course of time, how powerless it was in itself to discover truth and to minister directly to the material comfort and well-being of man. It proved its own ruin; it demonstrated its own powerlessness. Men were beginning to see more and more clearly that it brought forth no practical fruit, that they were only wasting their time when they spent it in indulging in idle specula-

tions, and in baseless theories. Convinced of the folly of their course, they began to turn their eyes in another direction, to yearn for more inviting fields, to seek a surer road to knowledge. They found it in the investigation of nature around them. But how dare they open that sealed book, or unlock her hidden mysteries? Had not the word gone forth from the Papal chair in tones of thunder, "the Church is the infallible depository of all spiritual truth; Aristotle, of all physical truth. The tenets of both are to be received in implicit faith. You doubt or deny at the peril of your life." A few were found brave enough to avow their convictions, to doubt the tenets of Aristotle, to open the book of Nature and read her ample page. It was at the peril of their lives, at the risk of enduring the tortures of the rack or the chains of the dungeon. But they did so, and suffered the penalty. Brave men were they. With heart inspired by love of truth, which no flame of persecution could quench, they dared to be true to themselves and to truth, and rather than prove recreant, would wear the clanking chain or die a martyr's death. Among such men may be ranked Roger Bacon (who must not be confounded with his more illustrious successor, Francis), Copernicus, and Galileo. These were men of whom the age was not worthy. They shine as brilliant stars in the intellectual firmament of an age when thick darkness brooded over the land. They were the heralds of a brighter day, the forerunners of the intellectual Reformation which was completed under Francis Bacon, and which has bequeathed to us such inestimable blessings. The hoarse thunderings of the Vatican intimidated them not; the tortures of the rack, or the chains of the dungeon, chilled not their courage or quenched their loyalty to truth. The spirit of liberty was too strong in

them to be repressed; their love of truth too deep to be extinguished. They felt the barrenness of the field they had been tilling and in which they had been toiling, and resolved to enter a new one, where their toiling would be rewarded, and where their tilling would bear fruit.

Roger Bacon in his lonely cloister was helping in the good work. His eyes were opened to the folly of the course which men had, for the past centuries, been pursuing, and he looked with a longing gaze, towards the more inviting field which nature offered. He actually began to observe, to experiment, to investigate. Success crowned his feeble efforts, and spurred him on. He made some useful discoveries in physics, invented the magnifying glass and gunpowder, and made other important discoveries in chemistry and optics. But he must go no further; the thunders of the Vatican began to rumble in his ears, and its lightnings to scorch his pathway. Alas! he must desist, and abandon his noble work. His discoveries were looked upon as the work of hellish magic, and he was cast into the dungeon, there to wear the clanking chain for ten long years! In vain did he expostulate, in vain did he vindicate the blamelessness of his conduct, the purity of his motives, the utility of his labours. What cared the Pope for the purity of his motives or the utility of his labours, when his authority was questioned, Aristotle doubted, and the book of Nature opened? At length, through the intercession of some friends, pity was bestowed upon him, and broken down by long confinement and work, and worn with care and age, the old philosopher was released, and tottered forth from his dungeon-home—to die!

Copernicus trod the same pathway, carried on the same good work, and laboured in the same field. It was in the silence of his quiet home

at Frauenburg, where he officiated as priest, that the conviction first took root in his mind that the system of astronomy endorsed by the Church as orthodox, was radically false. That system was, that our earth is the centre of the universe, and that the heavenly bodies revolve around it in circles, at a uniform rate. Copernicus first questioned it, then doubted it, and set to work, upon mathematical principles, to prove its fallacy. He maintained that the sun is the centre of our system, and that the planets revolve around it. He gave to us the germ of our present system of astronomy, and opened up a pathway along which our modern astronomers are marching to unfold yet more fully, the grandeur and glory of the universe in which we dwell. But how dare he avow his convictions, convictions so opposed to those of the church of which he was a devout follower? How brave the reproach and ridicule which the publication of his views would be sure to entail? For twelve long years he brooded over them in silence. He waited patiently and hopefully, and it was not until age was silvering his locks, and furrowing his brow, that he mustered up courage, and ventured to give them to the world, too late, however, to enjoy his well earned triumph, for it was when lying on his death-bed, life fast ebbing away, that a copy was brought to him, to assure him that his life-long labour was not all lost, but alas! he only seemed to know it.

Another intellectual hero of the same type, was Galileo. He was born at Pisa, in the year 1564, and when a mere youth displayed an absorbing passion for physical science. So far did he go in the pathway opened up by his predecessors, that he is by some regarded as the father of experimental science. He must have early thrown off the shackles by which the Schoolmen were fettered, and seen

in nature, the grand field in which discovery was to be made, and science advanced. But he does not pursue the even tenor of his way long, ere difficulties arise, and fears disquiet. It was not long ere, by his fearless investigation and bold questioning of tenets hoary with age, tenets stamped by the Church as infallible, that he provoked hostility. Alrcady might be seen the foreshadowings of that storm-cloud which, in a few years, burst upon him with merciless fury, darkening his last days, and sending him with sorrow to the grave. It had been affirmed by Aristotle, and received into the Church as infallible, that if two bodies be taken, the one twice as heavy as the other, the heavy body would reach the ground in one-half the time occupied by the lighter. Galileo, by careful observation and experiment, came to a different conclusion. He affirmed that both would descend in the same time; that the weight of a body did not determine the time occupied in falling. He openly avowed his conviction, and had the courage to challenge his opponents to a fair trial. They consented, and the day is fixed. The scene is thus described by an eloquent writer. "On the day appointed, the disputants repaired to the tower of Pisa, each party, perhaps, with equal confidence. It was a crisis in the history of human knowledge. On the one side, stood the assembled wisdom of the universities, revered for age and science, venerable, dignified, united and commanding. Around them thronged the multitude, and about them clustered the associations of centuries. On the other, there stood an obscure young man, with no retinue of followers, without reputation or influence or station. But his courage is equal to the occasion. Confident in the power of truth, his form is erect and his eye sparkles with excitement. But the hour of trial arrives.

The balls to be employed in the experiment are carefully weighed and scrutinized, to prevent deception. The parties are satisfied; the one ball is exactly twice the weight of the other. The followers of Aristotle maintain that when the balls are dropped from the tower, the heavy one will reach the ground in exactly half the time employed by the lighter ball. Galileo asserts that the weights of the balls do not affect their velocity, and that the times of descent shall be equal; and here the disputants join issue. The balls are conveyed to the summit of the lofty tower. The crowd assemble round the base. The signal is given; the balls are dropped at the same instant, and swift descending, at the same moment, strike the earth. Again and again the experiment is repeated, with uniform results. Galileo's triumph is complete; not a shadow of a doubt remained." Thus encouraged by success, and elate with hope, Galileo pursued his way; for a time friends flocked around him, the star of his fame arose, and all seemed bright at Padua, where, for eighteen years, he taught and lectured. Eager crowds flocked to hear him; pupils from all parts of Europe resorted thither to drink in his instructions, and to enjoy the charm of his intercourse. Discovery after discovery flashed across his mind, which added fresh incentive to his labours, and bright lustre to his name. He now began openly to advocate the system of astronomy adopted by Copernicus, demonstrating its truth, and boldly avowing his convictions. Here began his troubles. His heresies reached the ears of the Pontiff at Rome, and his ire was kindled into a flame. A storm cloud began to gather and blacken over the philosopher's head. He is summoned before the Inquisition to answer for his conduct. Bending beneath the weight of years, and careworn with intense study, he

appears; he is subjected to a wearisome trial, and cast into the dungeon, and there endures the tortures of the rack. He is then asked to abjure upon his knees the sublime truths which he had spent a life-time in defending. His courage, for a moment, fails. He recants, at least with his lips; but in the memorable words, which, in that hour of agony, he uttered, "It nevertheless moves," we learn how deeply rooted and unaltered were his convictions, how firm his loyalty to truth. The remaining years of his life were spent alternately in prison and in retirement, where, to the last, with unabated zeal, he pursued his favourite studies. Thus did these men fight bravely their intellectual battle against ignorance, intolerance, and superstition. They rise up before us, in the dim vista of the past, as the martyrs of science. Through toil and trial and suffering, did they follow after truth, proved faithful to their convictions and their God, and by word and deed, paved the way for the dawn of a more auspicious era.

Another influence which contributed to bring about and usher in the same period, was the *Crusades*. The ostensible object of the Crusades was to rescue Jerusalem from the cruel hands of the Mohammedans. The news was flashed abroad that Jerusalem, around which, in the mind of the Christian, so many hallowed associations clustered, was in the hands of the Mohammedans, that the holy sepulchre was being desecrated, that the streets of the holy city were crimsoned with Christian blood. All Europe shook to the centre; the heart blood of all Christendom ran cold. Peter the Hermit went forth from his cloister, and by his fiery eloquence, stirred up the hearts of the people, and called upon them to go forth to the rescue of their brethren. "He traversed Italy, crossed the Alps, from province to province, from city to city. He rode

on a mule, with a crucifix in his hand, his head and feet bare; his dress was a long robe, girt with a cord, and a hermit's cloak of coarsest stuff. He preached in the pulpits, on the roads, in the market places. His eloquence was that which stirs the heart of the people, for it came from his own—brief, figurative, full of bold apostrophes; it was mingled with his own tears, with his own groans; he beat his breast; the contagion spread throughout his audience. His preaching appealed to every passion—to valour and to shame, to indignation and to pity, to the pride of the warrior, to the compassion of the man, to the religion of the Christian, to the love of the brethren, to the hatred of the unbeliever, aggravated by his insulting tyranny, to reverence for the Redeemer, to the desire of expiating sin, to the hope of eternal life." All Europe rang with his voice. A Council was called at Rome and Clermont, where Pope Urban delivered a stirring address to assembled thousands. The enthusiasm of the multitude was kindled, their indignation stirred up, and from ten thousand hearts went forth the cry, "It is the will of God, it is the will of God!" A vast and motley army of men and women is formed, and with one heart and voice, like a surging wave, irresistible in its giant might, they move to the Holy Land. After a long and toilsome march of two years, enduring intense suffering and encountering fierce armies, the walls of Jerusalem rise before their delighted gaze. The Mohammedan hosts are scattered, and the Crusaders enter and take possession. During the two following centuries, six successive waves of Crusaders rolled over Europe, and spent their strength in defending the holy city, and then there was a lull. The wild wave of enthusiasm subsided, and a deep calm brooded over the face of Europe. In the history of nations, as in that of

individuals, periods of intense excitement are mostly followed by periods of deep calm. A reaction takes place; nature becomes exhausted, and her strength spent, and it takes some time ere wanted vigour and health returns. But the moral effects of the Crusades upon Europe were marked and abiding. They set in operation a number of streams of influence which contributed, in no small degree, to swell the tide which was to roll in the Reformation of the future. They, in the first place, had the effect of making men more liberal-minded and cosmopolitan.

There is nothing which contributes so much to make men narrow-minded and intolerant, as living for a long period of time in one place, excluded from intercourse with their fellows. Let such men go abroad and mingle with their fellows, converse and trade with them, observe their habits, and learn their opinions, and the result will be evident. They will become more liberal-minded and tolerant, their knowledge will be enlarged, their prejudices removed, and by the friction of mind upon mind, their faculties become sharpened. And such was the effect produced upon the Crusader by his journey to the Holy Land. Before, he knew little or nothing of the people of the East. This pilgrimage to Jerusalem brought him face to face with a new people. He began to know his fellow-men better, and to discern more clearly, beneath all the artificial distinctions of dress and colour and creed, the beating human heart—the pledge of our common humanity. Besides, a spirit of independence was inspired, liberty of thought was fostered and grew, and the chain which had been thrown around him by the Church became more and more keenly felt. But another benefit flowing from the Crusades, was, that a channel was opened up between the East and the West,

along which the civilizing, refining influences of the East were transmitted. The East, at this time, was wealthier, more intelligent, more refined than the West. It was when Europe was passing through a night of moral and intellectual darkness, that Asia was basking beneath the sunlight of a gorgeous civilization, which then had reached its meridian height of splendour. Since that time, its brightness has suffered an eclipse, its glory has waned away. The Turk has become degenerate, effeminate, and weak, his very name a by-word of reproach, and the progress of events seems to indicate that the day is not far distant when he must leave forever the shores of Europe, and betake himself to a more congenial society. But at the time of which we speak, a bright halo of glory encircled the Turkish rule; all that was lofty in civilization and beautiful in art was warmly encouraged, and the wealth and refinement of the Saracen was proverbial. Now, the Crusaders, by their successive journeys to the East, opened up a channel through which this wealth and refinement flowed over into Europe. Books of science were in-

roduced, a spirit of scientific inquiry awakened; discoveries, long known to the East, were brought to the West, to the surprise and delight of the people; and before the rising sun of knowledge, the mists of superstition began to melt and roll away. But still further, an impetus was given to trade and commerce by the Crusades, which blossomed into blessed results. The rich products, the luscious fruits of the East, were wafted to the West. Towns and cities, where was heard the busy hum of manufactories and workshops, and where liberty found a welcome home, sprang up as if by magic. But not only by land, but by sea, was a new life enkindled in the commerce of the world. By the discovery of the mariner's compass—a discovery, too, which came from the East—a spirit of enterprise was infused, the wonders of the deep were explored. Ships began to sail to distant lands, and to return laden with the rich products of their soil; unknown seas were traversed, and unknown lands visited. Thus was the world awakened from its slumber and prepared for the coming glory.

—A wonderful thing is a seed,
 The one thing deathless forever!
 The one thing changeless,—utterly true,—
 Forever old and forever new,
 And fickle and faithless never.

Plant blessings, and blessings will bloom;
 Plant hate, and hate will grow;
 You can sow to-day,—to-morrow shall bring
 The blossom that proves what sort of a thing
 Is the seed, the seed that you sow.

EDUCATION AND ITS MACHINERY IN ONTARIO.*

BY A. J. DONLY, SIMCOE.

THE word Education, I need not inform you, is derived from two Latin words, which mean to *unfold* or *develop*, and when used in this, its proper sense, it means a gradual development and improvement of all the powers and faculties of man from his infancy to his manhood. Education, therefore, refers to the whole man, and hence it is naturally divided into three great branches: physical, intellectual, and moral. In this sense, education is a preparation, not only for this life, but also for that which is to come—for moral education, properly so called, is based upon religion. But a great deal of false reasoning is founded upon misapplication and misapprehension of the word education. How often, for instance, do we hear the *instruction* given in our public schools designated as *education*. But this is evidently erroneous, and has led many persons to regard the education of the people as perfectly useless, if not positively injurious. It is frequently observed by persons not by any means regarded as unintelligent, but led astray from a misapprehension of the intrinsic meaning of the term "education," that a large portion of the criminals in our gaols have been "*educated* in our public schools." Of what use, they say, is education to them? Many of them even go further, by asserting that education has been positively injurious to many of them ;

adducing instances where "reading" and "writing" brought many possessed of these accomplishments to the felon's dock ; alleging that if they had not been taught how to write, they could not have committed forgery, scandalized society by writing immoral, lawless or slanderous letters, or other publications ; or if they had not been taught how to read, their minds could not have been poisoned, and therefore led to do the wrong which has brought them to their present condition, by the perusal and study of bad books and inflammatory periodicals.

But to argue against the use of a thing by bringing forward the evils arising from its abuse, is one of the commonest of fallacies. The true answer, therefore, to such statements, is, that instruction is not education, but only a branch—indeed the lowest branch of it—that persons instructed and not educated, in the true sense of the word, are as likely—perhaps more likely—to make a bad as a good use of their knowledge. It has been asserted by a great educationist that "knowledge is power;" but it is power for evil as well as for good ; and if the person who possesses it is not under the guidance and control of moral and religious principles, he will not scruple to use it for evil, if he thinks that by so doing, he can promote his own personal advantage. In close connection with this announcement, it is only necessary to mention, that the reading, writing, arithmetic, grammar,

* A Paper read before the Norfolk Teachers' Institute, on the 13th February, 1880.

geography, and even some of the higher branches of instruction taught in our schools, are merely instruments for the acquisition of knowledge, rather than the knowledge itself. The right use of these instruments, and the proper application of the knowledge acquired by them, will depend upon the nature and extent of the education which the pupils may have received.

Some teachers are of opinion that their several duties consist solely in giving instruction to their pupils; and many parents, it is feared, require nothing more from them—their only anxiety being that their children shall, as speedily as possible, become proficient in those branches of knowledge which they wish them to learn. To make good readers, good writers, and expert arithmeticians, was formerly the grand characteristic of a country teacher, and if he came up to this standard, his fitness for his office in other respects was very often overlooked. But of late years, we rejoice to say, higher and more correct views have been taken of school education, and the public teacher is now required to be an educator, and not a mere instructor. Education, therefore, is a science, inasmuch as the educator must be conversant with the physical, the intellectual, and moral capacities of his pupils; must know how to train and develop each faculty, without unduly interfering with the other. The undue development of the physical energies will lead to lassitude. The intellectual powers of the mind may be exercised and cultivated to such an extent, as to interfere with the physical and moral requirements of the subject on which the educator is operating. That subject is the embryo man or woman, whose physical, intellectual and moral natures are to be scientifically trained and cultivated, so as to fit the possessor for this world and the next.

The teacher being thus elevated from the office of a mere instructor to that of an educator, his qualifications must be correspondingly elevated. He must, accordingly, be qualified in every respect for the office which he has assumed. Moreover, he must be deeply impressed with the importance and responsibilities of his vicarious position. "Train up a child in the way he should go, and when he is old he will not depart from it" is an injunction addressed to teachers as well as to parents—for while children are in school, and this is usually a large portion of their time, the duties of the parents devolve upon the teachers—and consequently everything which wise and good parents consider it their duty to do for their children, the teacher of a public school should use his best endeavours to do for the pupils committed to his care. The teachers must, therefore, be considered moving in a sphere much above that of an ordinary hireling. To him is consigned the unhewn block from which he evolves the polished statue, using the beautiful imagery contained in a number of the *Spectator*. In order to efficiently perform the onerous duties which devolve upon him, the mind of the teacher should dwell in an atmosphere far removed from the world's carking cares. Inasmuch as it is his office to dispel every species of ignorance and prejudice, and to promote the civilization of his country, his welfare should become the special care of the State. The permanency of his position should not depend upon the breath of envy or the whisper of malevolence. Until the teacher of Ontario ceases to be a peripatetic knowledge box, systems of education, no matter how philosophical they may be, will do very little good. Although teachers may be increased by an artificial hot-bed system, as is now in existence, in a five-

fold ratio to the demand, yet the education of the masses must retrograde as it is doing at present, because the position of the teacher is not permanent, and the bulk of the schools is in the hands of inferior teachers. These statements can be sustained by statistics.

According to the Annual Report of the Minister of Education, for the year 1878, there were 4,990 public schools in Ontario, taught by 6,478 teachers, of whom there were 3,606 male teachers, and 3,418 female teachers, making nearly 400 more of the latter than the former. These 6,478 teachers had under their tuition 489,015 pupils of all ages, of whom 151,474 were in the First book, 111,360 in the Second book, and 132,144 in the Third book, making altogether 394,878, or 81 per cent. of the gross attendance of all the pupils in Ontario in the three first elementary books, and only 19 per cent. in the Fourth, Fifth and Sixth books. And again, of this gross attendance 31 per cent. were in the 1st book, 23 per cent. in the 2nd book, 27 per cent. in the 3rd book, 15 per cent. in the 4th book, a little over 3 4-5 per cent. in the 5th book, and 1-5 of 1 per cent. in the 6th book. In the same year there were 103 High Schools in full operation, taught by 298 teachers, who had under their tuition, 10,486 pupils, of whom 883 only studied Greek, 4,729 Latin, 516 German, and 3,588 French. We are not told how many in French were also studying Latin, but we may justly conclude that the 4,729 in Latin would include the Greek pupils and many of the French pupils also; leaving 50 per cent. of all the High School pupils that might still be taught in the 4th, 5th, and 6th classes of the Public Schools, even should we include those preparing for 3rd and 2nd class certificates. We have, therefore, established the fact that the state of the

education of the High and Public Schools of Ontario, so far as the great mass of the pupils are concerned, is in a low condition.

We said that there were 6,478 teachers in the Public Schools, and 298 in the High Schools, making a total of 6,776 teachers, with a grand total of pupils, under their care of 499,501. Since 1871, the grand era of the revolutionary school-law, up to the end of 1878, there were 33,250 who obtained certificates to teach. In 1879, 1,207 persons obtained certificates, giving a total of 34,457; if we add to this number the graduates of the universities, 1,445, it will bring the sum total to 36,000 persons made eligible as teachers within the period of eight years. This number does not take in the teachers now employed in the High and Public schools, and and who are not included in this vast array, making a grand total of 37,000 persons who are eligible to teach. It will be recollected that there are only 6,776 positions for them to fill; demonstrating our statement, although astounding, to be in reality even below the mark.

We have now established two facts: 1st, sufficient teachers have been created in eight years so as to be at least five times more than are requisite. 2nd, the great bulk of the school-going population is very low in point of education. Our third statement is equally provable. That is, that the great bulk of our Public Schools is in the hands of young and inexperienced teachers.

Let us again turn to the Minister's last Report. We there find that of the 6,478 teachers employed in 1878, in our Public Schools, 220 only had 1st class Provincial certificates; 1,409 2nd class; 328 County Board 1st class certificates; 142 2nd class County Board; whilst there were 3,904 who had only new County Board 3rd class; and 480 who had not even that

qualification, for they had only interim certificates. There were, therefore, 4,526 teachers in the Public Schools of Ontario, in 1878, who taught on inferior certificates—that is, over 67 per cent. of our Public School teachers had very low certificates, from which we draw the inference that they were young and inexperienced. Time will not, however, cure this defect: because from the constant changes that are taking place, and from the mill that manufactures the teachers being constantly at work, making fresh articles in thousands, the vacancies are constantly filled by teachers of the same calibre as those who last caused these vacancies. This is a deplorable picture of the condition of our High and Public Schools, and the hopelessness that the useful and ennobling profession of teaching can, in its present unsettled state, produce anything but satisfactory results.

But the results of the educational *coup d'état* of 1871 and 1874 are quite satisfactory, exclaims the Minister of Education, in his place, in the Local House, a few days ago. Well, we say, if they are not they ought to be. We have the unprecedented good fortune of having a Minister of Education in a Province of one of the colonial possessions of Great Britain, containing a population of 1,620,851, and a school-going population of 499,501. There is no country in the world, independent, or otherwise, with so small a population having a Minister of Education with a separate bureau, and unconnected with other departments of State, but the sparsely inhabited and ambitious Province of Ontario. But it is not one Minister of Education that we have; we have in reality three Ministers of Education; the *de facto* Minister of Education, Rev. George Paxton Young, Chairman of the Central Committee. It is he who really runs the "machine." Then we have the *de jure* Minister of Educa-

tion, the Hon. Adam Crooks, LL.D., and the Deputy Minister of Education, John George Hodgins, Esq., LL.D. Besides these officials there is an Educational Council styled the Central Committee who, although itself irresponsible, nevertheless, guides and governs, in the name of the Minister, the educational interests of this Province. The whole of this Central Committee, composed of the three High School Inspectors, the Professor of Metaphysics in the University, and four County Inspectors unite in their persons the duties of legislators, judges, officers, examiners, and general factotums of our Provincial system of education. Subsidiary to these are the fifty-two mills or teacher manufactories that bid fair to swamp, by their over production of an article that is now a drug on the market, the profession of teaching in this Province. These are supplied with the raw material by 103 High Schools, many of the teachers of which, to the great detriment of the others, are selfishly and shamelessly blowing might and main, tooting their horns, to obtain pupils from all parts of the Province, in place of attending and confining themselves to the education and improvement of those of their own districts. But in working on the labours of others, and in many cases, by the exercise of fraud and dishonest devices of every kind, they bring grist to their own mills, and build up a reputation to which they have, in reality, no claim. Did they confine themselves to their own districts, they would be behind in the race.

In close connection with this dishonest and dishonourable system, on the part of many of the High School Masters, to obtain an unfair precedence over other High School Masters, the late Archbishop of Dublin, Dr. Whately, tells a story quite apropos to our argument. The distinguished prelate told the story in

explanation of a statement which he made to an Irish school inspector, in whose company he visited a school, where he observed a great desire, on the part of the teacher, to coach up some astounding pupils. "I hope," said the prelate, "there are no big gooseberries here." In explanation, he added, that in a certain place in England, valuable premiums were annually given to the persons who produced specimens of the largest and best gooseberries; and that, for several years in succession, a gardener from Yorkshire had carried off all the prizes. The local competitors, at length, suspecting some management, sent a person secretly to Yorkshire, to find out how the monster gooseberries were produced. This he succeeded in doing, and the process was in this way:—As soon as the fruit was formed, all the smaller and less promising gooseberries were plucked off and thrown away, and only the largest ones were allowed to come to maturity. In this way he produced specimens of the several varieties with which no other gardener could compete. The application of the anecdote is obvious. This is precisely the system adopted by the big guns of the High Schools. They imitate the conduct of the Yorkshire gardener. They even go further and do worse than he did.

We have adverted to the eulogium recently delivered, in his place in the Local Legislature, by the Minister of Education, upon the happy results attending the operation of the laws of '71, '74 and '79, and we have just remarked that if, upon close examination, these results do not exactly tally with the roseate hues given them by the Minister of Education, it is not for want of administrative powers—we were going to say ability—for we have no less than three Ministers, and a grand Educational Council to boot, to assist them in arriving at suitable (?)

deliberations. We also stated that there was no lack of means in supplying any deficiencies that may take place in the rank and file of the teachers now employed in our High and Public schools. We have alluded to the 52 teacher manufactories, in the shape of two Normal Schools, and fifty Model Schools, whose province it is to polish and render marketable the rough diamonds presented to them by the 103 High Schools. Indeed, so rapidly—and we were going to say efficiently, but we withdraw the word—have these done their work, that in eight years a sufficient reserve has been created, that were a plague to sweep away the whole teaching body now in existence, and their successors to fall victims to the same supposed fatality, and their successors again meet a similar fate, and so on until five relays of teachers were thus imagined to answer the fell summons of death, there would still be sufficient left to fill the places of those who went before them, and perform the educational duties of the country, as if no such calamity were supposed to have taken place.

Now, teachers require superintendence, and to be generally "bossed" over. It would be a great oversight if this were neglected. But it has not been neglected. The School Law has made due provision for even this. Besides the three Ministers of Education, the Central Committee, and three High School Inspectors, there are eighty Public School Inspectors, and a force of school trustees connected with our 4,990 Public Schools, and 103 High Schools—reckoning only three trustees on an average to each Public School, and six for each High School—amounting to 15,594, say, 16,000 school trustees. This will give at the lowest figure 16,084 overseers for only 6,771 workmen. Well, one would think that, with such facilities for filling up the ranks of inefficient

teachers, and of those who are removed for trifling or no causes at all, the education of the country would be in a most prosperous condition. Well, we have shewn, from the very figures furnished to us by the Minister of Education himself, that this is far from being the case.

Of the 499,501 pupils that attended the Public Schools of the Province, the average attendance only amounted to 228,615, being only 45 per cent. of the whole; and of the 10,486 pupils who attended the 103 High Schools of the Province, there was only an average of 56 per cent., or about 5,872, or altogether 234,487. It is a sad commentary on the compulsory law that 27,415 attended no school whatever during the year 1878. These absentees were between the ages of seven and twelve years, respecting which School Boards and trustees are required by the Public Schools Act to see that all the children in their school districts attend school for four months in the year. Very nearly as bad is the fact that 42,096 attended for less than twenty days; and that 87,634 attended for periods ranging between fifty and one hundred days—that is fifty per cent. of the whole attendance might as well, for all the benefit they obtained from their attendance at school, be placed in the same category as those who attended no school at all. This is not a pleasant commentary on our schools being made free. When a rate bill was charged a much better record was shewn.

Dr. Ryerson and the Council of Public Instruction established the school system of this country on a basis which endeared it to the hearts of the people. To their wisdom, forbearance and practical good sense may be attributed the success of our system of education in times gone by. Now centralization and martinetism reign rampant, but very little good,

after all, has resulted from them. Nay, positive evil has sprung from the introduction of the foreign features that pervade the school laws of 1871 and 1874. The operation of these laws is inordinately elating those who have passed the examination ordeals with which they are characterised, and are correspondingly depressing to those who have failed to succeed. Youth is a period of enthusiasm. All are not equally bright, quick or sharp. The educationists of the world agree in condemning those systems of rewards which depress or damp the ardour of young people. It is useless, they say, for them to contend; and, therefore, becoming hopeless, they cease to exert themselves, and will not even strive to attain that which is easily within their reach.

Examinations do a great deal of good, but they do a vast amount of mischief also. Without altogether condemning them, if we had our way, we would be far from giving them the prominence they at present hold. These examinations have resulted in withdrawing from the agricultural enterprises of this country hosts of the youth of both sexes, to engage in a calling both precarious and unremunerative. The competition thus created throws many teachers, who have spent the best years of their life in teaching, out of employment. It is beginning to cause salaries to be lowered when the necessaries of life are increased in price on every hand. The cultivation of the soil, the most honourable and independent industry in connection with which men or women can be engaged, being abandoned by those best able to make it pay, impoverishes the country by the amount that could be made by them had they remained faithful to an avocation that would handsomely reward them in the end.

Payment by Results and its handmaid "Intermediate Examination"

have also done much harm. They have ruined the reputation of many an excellent teacher, who honestly endeavoured to do his duty, not by cramming, but by instilling an education that will hold for time and eternity. This being comparatively slow and opposite of flashy, has not obtained the reward given to the charlatan, who has cultivated every trick, and put in practice every device to "produce monster gooseberries." This system was first introduced into England in 1854, through the exertions of Professor Mosely. It was introduced into Canada, in 1871, through the exertions of Professor Young. It was also introduced into Victoria, South Australia, but its condemnation by the person who was instrumental in its introduction may be seen in the *Educational Journal* of last month. Hear what the senior Professor of the Dublin Normal says of it:—"This is nothing less than a revolution in popular education, and it will seriously affect the interests of thousands of highly qualified teachers, who had calculated upon the continuance of a system from which they derived so many advantages, and by which, it may be said, they were produced. It will also seriously affect a large number of Training or Normal Schools, which are chiefly supported by grants made to them by the Committee of the Council of Education,

for producing a succession of highly qualified teachers, and in many instances, as experience has shewn, too highly qualified—that is in their own opinion—for the work they were expected to do. But students and scholars and a three years' curriculum in such institutions will no longer be required, or at least paid for by the Committee of Council." The same writer calls it elsewhere "the *coup d'état* on education."

But the system introduced into Canada, through the persuasion of Professor Young is even worse than it is in Ireland, England or Victoria. It is super-imposed on the High Schools of Ontario whereas the system is used only in connection with the Public Schools of the three latter countries and in relation only to reading, writing, arithmetic and spelling.

Thanking you, Mr. President, and the officers and members of the Norfolk Teachers' Association, for the opportunity you have given me of putting my views upon the educational affairs of this Province before this Institute, I close this paper, which has been prepared somewhat hurriedly, by urging all the teachers interested as I know they are in everything appertaining to educational matters, to give them that consideration and attention which their great importance demands.

A PLEA FOR MORE SCIENCE.

BY A. P. COLEMAN, B.A., SCIENCE MASTER, COLLEGIATE INST., COBOURG.

IN its weak beginnings Physical Science received but small encouragement in the great seats of learning; man and all things moral and mental pertaining to him were thought the sole culture-giving studies, and matter was despised as being sordid and soulless. Gradually Science, in spite of early neglect and later hostility from the defenders of the old methods of education, has crept into all universities worthy of the name, not even conservative Oxford refusing it a place; and in Germany, that centre of modern intellectual life, it has taken a most commanding position beside the more ancient subjects of study. While this is the state of affairs in the universities, relatively very little has been done in the way of scientific training in schools of lower grades. There are various causes for this, including the expensiveness of the instruments and collections necessary to teach science in a practical way, and the difficulty of finding competent teachers. Both these difficulties, however, are being rapidly removed, so that how far Science is suited for popular education in Public and High Schools becomes an important question.

The object of our educational system is to give such training to the mind as shall be most serviceable in life to the majority of men. Before asking what subjects are best fitted for this, we must inquire what our minds are used for in actual life. My

reply would be, that they are chiefly used in making and storing up observations on men and things, in reasoning on their relations to one another and to ourselves, and in coming to conclusions that shall guide our own course in reference to men and things; also in following and rejecting or appropriating other men's observations and reasonings. If this be the use to which we put our minds, we should be trained to observe carefully, so as to have sure foundations to reason from; and to reason correctly, so as to reach sound conclusions. In addition, our training should afford as large and serviceable a supply of facts as possible.

Let us now inquire how well the subjects generally taught in schools answer these ends.

Perhaps the subject most anciently used in education was Mathematics. It gives an invaluable training in accurate reasoning of a certain kind; but the premises from which it starts are few in number and, being intuitive, are universally admitted; while in actual life the premises themselves need the most careful scrutiny, the false being most hopelessly mixed with the true, so that probably nine-tenths of our disputes arise from never having settled the precise meaning of the premises from which we argue. In life, also, most of our reasoning is from averages and probabilities, and by the inductive method. To this kind of reasoning Mathematics, as

taught in our schools, does not lend itself. It does not train us to balance carefully the probabilities on either side, so as to choose between the horns of a dilemma. We all know how exasperatingly often this is necessary in life. My conclusion, then, is that Mathematics, while immensely important to specialists because of its use in developing many of the sciences, is not specially suited for general education beyond the arithmetic, etc., used in business, since it supplies but few workable facts, and does not develop the intellectual muscles that we most commonly use.

Next, let us take the study of Language. This is valuable in itself as affording access to stores of knowledge in our own and other tongues, and as aiding in writing and oratory, both of great service to men of every occupation. It surpasses Mathematics as a training for life, since it demands a certain amount of observation, and exercises the reason in judging of niceties of meaning and in deciding between conflicting renderings. On the other hand, it will be admitted that in our schools students rarely get enough of any one language except their own to enable them to use it afterwards; and, as ordinarily taught, the study of language is apt to foster a quibbling habit of thought, and to give importance to words rather than ideas.

History and Geography we may say but little about, since in our schools they are commonly "crammed," and while supplying facts of great value, train chiefly the memory, which is far from being man's most lordly part. Morals or Religion, as separate branches, scarcely come within the range of popular schools.

Finally, what of the Physical Sciences as a mental discipline?

In general, these follow the methods of actual life, only with more exactitude, gathering facts by obser-

vation, arranging them, and generalizing and theorizing from them. Some, like Geology, give splendid exercise in tracing the relations of cause and effect, and in judging of probabilities; others incline more to the exactness of Mathematics; all, when not taught from books alone, demand close observation and conscientious truth in setting down the results of observation. This last point is one of great importance. How many blunders are the result of hasty and careless observation? How many so-called facts are twisted out of all semblance of the reality by prejudice! What but unsound conclusions can be drawn from these ill-observed and twisted facts? The more logical the reasoning the more certain is the conclusion to be false, if it sets out from false premises. Science trains us to observe with unprejudiced eyes before forming a judgment. The chemist, making an important analysis, if he spills a drop or two from his beaker, patiently goes back and begins anew, even though he has spent days on his work, and is on the point of finishing. In this age of shams and defalcations and fraudulent bankruptcies, let us not neglect anything that trains the mind to scrupulous honesty.

Again, most of the Physical Sciences, unlike Mathematics and Philology, treat of subjects of practical importance in the sphere of everyday life. We are fond of boasting of the advance the world has made in our age. If we look carefully we shall see that but few important advances have been made except in the domain of physical science. The process often goes on somewhat in this way: certain phenomena in nature, perhaps very trifling in appearance to an untrained eye, are observed; their relationship to previously known phenomena are studied, and the knowledge thus gained is by some inventive brain turned to practical use.

Next day, the world, as it sips its coffee, reads in the morning papers of Edison's last wonderful invention. With the occult powers of electricity at his back, the man of our day can laugh to scorn Ariel and the whole troupe of old-time fairies.

The majority of mankind deal mainly with matter rather than mind. Those who till the soil as farmers, and handle tools as mechanics, must always form the majority. Ought not their training to give them the most thorough knowledge possible of the things they are to work with, so that they may work intelligently? Knowledge is power only in so far as it can be used. Perhaps some strong supporter of the mental gymnastics theory would recommend us to train boys for blacksmiths by a course of dumb-bell and Indian clubs to harden their muscles. Other people would apprentice them to a blacksmith. As most men have chiefly to do with material things, is it not reasonable that their education should have some reference to matter and the forces that work upon it, *i.e.*, to the physical sciences?

It may be objected that not only is a preparation for life work to be looked to, but also some higher culture to give access to the pure and elevated pleasures of the intellect. Very true, but will it be thought that a familiarity with the intricacies of a Greek or Latin construction, and an acquaintance with the silly and often obscene fables of the old mythologies, which is about all most High School students get from their classics, is more elevating than a glimpse of the everlasting truths of God's work in Nature!

There are numberless other points which might here be treated of; such as the keen pleasure all boys feel in practical work in science. The introduction in a practical way of science into our schools would, to many, make

school life as attractive as it is now repulsive. Any one who has taught chemistry and allowed the students to make the experiments for themselves will testify to this. But to go into all the lines of thought naturally belonging to the subject would make this paper interminable.

We are justly proud of our system of education in Ontario, but the world is moving and if we would keep our rank, we must move too. Art must have more than a nominal place in our curriculum if we are not content to remain hopelessly behind our neighbours in New England. Science must take the position it deserves in our schools, or Germany, with her natural science and technical schools so lately introduced, will leave us far in the rear.

In regard to the physical things around us, most of us are going through the world with our eyes shut. If the school boys of the Dominion were trained, not merely to see, but to ponder intelligently on what they see, and to turn their natural curiosity to good account, how much more easily and profitably their work would go on, from taking advantage of the laws of nature rather than ignorantly flying in their face? What a list of discoveries and inventions, profitable and honourable to us as a nation would result from this attention to science during the next half century! And not only would material blessings flow from it, but a deep and innocent pleasure would be found in the wonders and beauties around us.

Science has done much in the past, who can say what she will do in the future? Let us be ready to do our part in raising man to his true position, that of an intelligent lord and master of the blind energies and elements with which the wisdom of his Maker has surrounded him.

MANY LAW SCHOOLS.

BY R. V. R.

THE Toronto *Mail* lately remarked that the want of proper instruction to the students-at-law is the crying disgrace of our system of legal education; and Mr. Gorham pointed out, in the February number of the CANADIAN MONTHLY, the difficulties to be encountered by law students as they try to find their way—unguided save by their own erring minds—through the dark and tangled mazes to be threaded by all who would attain the degrees of barrister and attorney-at-law. Every one who knows anything of the subject is aware that the active practitioner, engrossed with the cares of business, cannot, or at least does not, furnish the students, who place themselves in his charge, and bind themselves to do so much for him, the attention and assistance essential to give a correct direction to their reading and to teach them how to apply it usefully and aptly in their subsequent professional life. The reading of a student in a law office is, practically, the study of an intricate science by himself, and he seldom even acquires that familiarity with books, and that facility of reference, which are of the greatest advantage to the practitioner. In fact, nine out of ten students-at-law are but hewers of wood and drawers of water to the gentlemen to whom they are articulated, and oft-times are they blamed for not making bricks for their task-masters, although unsupplied with the straw of knowledge or experience. The con-

sequence of this mode of training our future lawyers is obvious.

The *Albany Law Journal* (the leading legal periodical of the neighbouring Republic) lately said, while referring to the necessity of Law Schools: "we feel that there is no class of professional men who are, on their entry upon professional life, so poorly taught as our own. It is a wonder to us, after a considerable experience, how any young man ever learns the law except at the expense of his clients."

A would-be divine does not become qualified for ordination by merely sitting in a parson's study, clearing up the litter, and copying sermons out of books for his spiritual master, and then passing an examination or two. Nor is a medico launched upon the world after a few years spent in washing bottles in a surgery, and having passed his Intermediate and Final. The one is trained in his profession by attending lectures and walking hospitals and practising upon poor people who cannot pay: the other attends college, and imitates, at a distance, the licensed preacher, by teaching in Sunday school, and acting as catechist or lay reader. The law student should be taught in a similar manner by lectures, recitations, exercises in drafting pleadings, frequenting moot courts, and discussing legal questions. For who will not admit that the law, in its way, is as important as either physic or divinity? Lord

Selborne once said : " Law is a calling upon which depend, in no small degree, the rights and liberties, both of individuals and of nations."

A student should be taught, not the mere technicalities of the profession, but also the great principles underlying all our law, and should be well versed in professional ethics. Then, too, (as the Hon. Charles Sumner, for many years a teacher in the Harvard Law School, remarked): " a lawyer must be a man of polish, with an *omnium gatherum* of knowledge; he must know everything. He must know law, history, philosophy, human nature, and if he covets the fame of an advocate, he must drink of all the springs of literature." Logic, rhetoric, and elocution are *sine qua non*s. And how to obtain this knowledge the student will not learn in an attorney's office.

In properly equipped Law Schools, alone, can the needed instruction be given. Such a school the Law Society of Ontario could not establish in Toronto, except at great cost, and an expenditure of the funds of which the Benchers are the custodians that would be unfair to country practitioners and students, (and these together contribute the major part of the golden stream that flows into the coffers at Osgoode Hall.) The universities of the Province are institutions already in operation, and could furnish the instruction required by the students-at-law in the humanities and philosophy, history, logic and elocution, without cost to the Law Society, and at but slight expense to students. All our universities are situated in towns or cities where many legal practitioners reside, and from among these gentlemen lecturers on professional subjects could readily be obtained for the Law Schools. There-

fore let each university establish a Law School in connection with its other faculties, not one that merely examines aspirants for the degree of B. C. L. or LL. B., but one that will teach and work; and let the students, while learning the art of the attorney and solicitor, and acquiring a knowledge of the mechanics of the profession, in the office of the practitioner, study the science of law in academic halls, and obtain there that polish and breadth of view, without which "lawyers" tend towards being what old Burton (not his lordship of the Court of Appeal, but the melancholy man), roundly calls them, "common, hungry pettefoggers, irreligious harpies, scraping, griping catchpoles."

But if our universities do this work still the Law Society will not be relieved from responsibility and liability, and it should out of its overflowing purse afford aid to these Law Schools, and this it could do, for the Benchers have, by statute, power to make rules for the improvement of legal education, to appoint readers and lecturers with salaries, to prescribe rules for the attendance of students and clerks at such readings or lectures, and to establish scholarships. The pecuniary assistance might be granted according to some such plan as that adopted by the Government in affording assistance to Collegiate Institutes, High Schools, &c., that is according to the average attendance of pupils, and their proficiency in the prescribed studies; or according to the number of those who take the degree of B. C. L. or LL. B. A scheme like this whereby "Many Law Schools" would flourish could, we verily believe, be easily carried out, and the coming generation would reap the benefit.

THE UNITARY METHOD IN ARITHMETIC.*

BY PROFESSOR M'GREGOR, M.A., M'GILL NORMAL SCHOOL, MONTREAL.

WE have heard a good deal lately about this so-called *new* method. We read of it in Educational journals; learned Doctors refer to it in their Annual Addresses, and we see it occupy a prominent position in carefully prepared Examination Papers. All this, too, among our friends in the sister province of Ontario, so justly celebrated both by themselves and others for the excellence of their schools and schoolmasters. Being so well received there, ought not we to adopt it here without further question? I think not. Not at all influenced by the morbid dread of seeming to be submissive to *authority*, which haunts many of the would-be leaders of educational thought and practice, we would still like to inquire for ourselves into the credentials of this new-comer. It would not be the first time that a specious adventurer had, in Toronto as well as elsewhere, by dint of brass and the enthusiasm of his patrons, obtained a position far above what his true merits entitled him to. Wherever the Unitary Method is mentioned, it is generally in connection with the name of Hamblin Smith as its author or promulgator. Let us examine his work and see whether, in other directions, he proves himself such a careful, correct, intelligent director that we can, in regard to this new matter, heartily accept him as a safe guide; and, without further demur, follow his lead. If he does not prove himself such a trustworthy guide, then we must examine the subject itself on its merits, and decide accordingly.

I have here A TREATISE ON ARITHMETIC, by J. Hamblin Smith—fourth edition—London, 1877. A *Treatise*, observe; not a mere

collection of rules and exercises for the convenience of schools, but a discussion of Arithmetic as a *science* as well as an art.

Nothing could be better than the first sentence of the preface—"In writing this book, the object I had in view was not so much to teach *rules* as to explain *principles*." Farther on he says; "I have carefully avoided the unsatisfactory and misleading process called the *Rule of Three*, which merely teaches how to arrive at certain results without a thorough knowledge of the method." In the preface to the second edition, he says: "I have added a few remarks on ratio and proportion." Observe the concession, the graceful condescension of a great mind to popular prejudice. On looking over the table of contents, which is well divided into the two parts, Pure Arithmetic and Commercial Arithmetic, I find his *remarks* on ratio and proportion thrust into the middle of the commercial part. This augurs ill either for his understanding or for his honesty in dealing with the despised subject.

Passing on to the work itself, he begins with Notation, without any hint of the system of Numeration which preceded it, and on which it is based. His Numeration is only written, not spoken, and he nowhere shews that, e.g., 936 represents nine hundred and thirty-six *ones*. In Addition and Subtraction he does not use the technical names, *addend*, *minuend*, etc., though he uses corresponding words afterwards. To subtract 3 from 5 he says that *strictly* it is $5-1=4, 4-1=3, 3-1=2 \therefore 5-3=2$. He defines \times to mean *times*, and then elsewhere uses it in the ordinary sense of *multiplied by*. Division is thus defined: "The process by which when a *product* is given, and we know *one* of the factors, the *other* factor is determined." To me this

* Delivered before the Provincial Association of Protestant Teachers, Province of Quebec, held at Quebec, October, 1879.

seems a piece of pure assumption, and the illustration of the subject, which is given, is based on an entirely *different* notion of division.

As a proof, in multiplication, he gives a long rule for casting out the nines, and refers the student for an explanation to Hamblin Smith's Algebra. So in finding the H. C. F. and L. C. M. of a set of numbers, he makes the same reference to algebra, giving no hint at all by way of explanation. Now it is quite possible that there may be in this Canada of ours, honest, intelligent young men and women who are not in the way of studying algebra, and who may yet desire to be fairly thorough arithmeticians. Is it fair to these to leave them thus in the dark? In Article 52 he defines numbers as "the measures of quantities." Elsewhere he speaks of a *Fraction* as expressing the measure of a quantity, and yet he says $\frac{3}{4} \times \frac{3}{4}$ has no meaning until we extend the meaning of the sign \times and make it mean *of*. This is not very logical.

In Article 82, in reference to decimals, he says: "To save trouble, a method of notation is used," etc., as if a new method were here introduced, while, in Article 84, he proceeds to shew that it is merely the common method. As to finding the square root of a number, a page—or in fact six pages—are taken up in describing the process; not one word is given by way of explanation, unless, indeed, it be this: "And we conclude that 35 is the square root of 1225," "conclude" having no meaning that I can see other than *finish*.

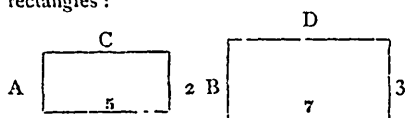
For finding the cube root, in the same way he gives a long rule, interspersed with figures, and no explanation, not even a reference to his Algebra for one.

These are some specimens of our author's carefulness and precision; of the way in which he fulfils the excellent promise in his preface. Shall we follow him unquestioningly in his condemnation of Proportion, and in the adoption of his Unitary Method? I think not. But perhaps he is a safer guide when treating of these. We shall see.

He defines the ratio of A to B as the relative greatness of A with respect to B, not

stating whether it has reference to *difference* or *quosity*. He says the ratio of 2 to 3 is represented in arithmetic by the fraction $\frac{2}{3}$, which is a measure and \therefore a *number*; not observing that a *relation* cannot be expressed by a *number*, and that the true explanation is that 2 is to 3 as $\frac{2}{3}$ is to 1. Just as $12 : 3 = 4$ is not correct, but $12 : 3 = 4 : 1$ is in every way correct.

Again he says, "Ratios are compounded by multiplying together the fractions which represent them," as $2 : 3$ and $5 : 7$, $\frac{2}{3} \times \frac{5}{7} = \frac{10}{21}$ = the compounded ratio. Looking at these rectangles:



If $A = 2$ and $B = 3$ then $A : B = 2 : 3$ and $C : D = 5 : 7$. These are the ratios of *lines* to each other. But the rectangles depend for their magnitude on neither of these alone, but on both at once (that is, on these compounded). And the ratio $A C : B D$: or $10 : 21$ is the ratio of the two *surfaces*: and it has been found without references to *fractions*, for there is no fractional notion in the case. In Proportion "The ratio $6 : 12$ is equal to the ratio $4 : 8$, because the fraction $\frac{6}{12} =$ the fraction $\frac{4}{8}$. Nonsense! the ratio $6 : 12 =$ the ratio $4 : 8$, because each of them is equal to the ratio $1 : 2$. To this double subject the author gives scarcely three pages, including twelve illustrative examples. Then, of the twelve examples for exercise, only one is in concrete numbers, although in the Commercial part of the book. Not quite fair play, as it seems to me.

We are now about to enter the sacred territory, J. H. Smith *duce*.

"*Procul, O procul este, etc.*"

"The *Unitary Method*, which is rapidly displacing the Rule of Three, will be gradually explained in this and the succeeding sections."

Ex. 1. If 23 bullocks cost £483, what is the cost of one bullock?

Since 23 bullocks cost £483,
1 bullock will cost £ $\frac{483}{23}$ or £21.

It seems hardly worth while so far to judge here of the respective claims of the Rule of Three, and of the Unitary Method, to proprietorship in this and all in the next set of examples.

Ex. 8. If 9 horses can plough 46 acres in a certain time, how many acres can 12 horses plough in the same time?

Since 9 horses can in the given time plough 46 acres.
 1 horse can in the given time plough $\frac{46}{9}$ acres.
 \therefore 12 horses can in the given time plough $\frac{46 \times 12}{9}$ acres
 or $61\frac{2}{3}$ acres.

Is that much better (simpler or more concise) than the old-fashioned answer to the question, "How many?" viz.: more than 46, just in proportion as 12 is greater than 9;
 $\therefore 9 : 12 :: 46 : \frac{46 \times 12}{9} = 61\frac{2}{3}$ acres?

The rule for stating in the Rule of Three: "If the answer is to be greater than the given single term, place the less term of the given ratio first: but if less, then the greater first," compares favourably with this "Note" II.:—"In simple questions of this kind we have a *supposition* and a *demand*. Each contains two kinds of things; in the *supposition* the magnitudes of both kinds are given; in the *demand* a magnitude of one kind is given, and the appropriate corresponding magnitude of the other kind has to be found. The first line of the solution contains the magnitudes of the supposition, so arranged that at the end of the line we have that kind of thing, of which the magnitude is required in the demand."

Then, just once more, compare this (expressed even in its clumsiest form) for the Rule of Three:—"The terms of a ratio must be reduced to the same denomination," with this Note III., "To one of the magnitudes in a supposition there is a corresponding magnitude of the same kind in the demand, and these magnitudes must be expressed in units of the same denomination."

As to problems involving fractions we have

Ex. If $\frac{2}{3}$ of an estate be worth £1,500, what is the value of $\frac{1}{3}$ of the estate.

Since $\frac{2}{3}$ of the estate is worth £1,500

$\frac{1}{3}$ of the estate is worth £ $\frac{1500}{2}$

\therefore the estate is worth £ $\frac{7 \times 1500}{3}$

Hence $\frac{1}{3}$ of the estate is worth £ $\frac{4 \times 7 \times 1500}{5 \times 3}$ or £2,800.

Assuming, as we must do, that this is not the first example given to the student, but that he knows something of arithmetic by this time, and that his duty is now not to solve this problem by reference to first principles, but to make all or any of his present knowledge of the subject subservient to the solution; is it not better to say—this is an example in direct proportion, for the answer will be in the same ratio to £1,500 that $\frac{1}{3}$ is to $\frac{2}{3}$: the student remembers, too, that to divide by a fraction is to multiply by its reciprocal. All this stated *arithmetically* is:—

$\frac{1}{3} : \frac{2}{3} :: 1500 : \text{Ans.}$

$\therefore \frac{1}{3} \times \frac{3}{2} \times 1500 = £2800$ is the Ans.

Again in complex Problems (compound proportion).

Ex. 1. If 12 horses can plough 96 acres in 6 days, how many horses will plough 64 acres in 8 days?

In 6 days 96 acres can be ploughed by 12 horses.

In 1 day 96 acres can be ploughed by 6×12 horses.

In 1 day 1 acre can be ploughed by $\frac{6 \times 12}{96}$ horses.

In 8 days 1 acre can be ploughed by $\frac{6 \times 12}{8 \times 96}$ horses.

In 8 days 64 acres can be ploughed by $\frac{64 \times 6 \times 12}{8 \times 96}$ horses.

\therefore The number of horses required is 6.

Apparently simple enough to be sure, though there might be some difficulty in deciding as to the arrangement of the first line in the solution. But how, or how much, is it better (or worse) than the old way?

The answer depends on the number of acres (directly), and on the number of days (inversely), and will be obtained by compounding these ratios. \therefore *Arithmetically*:

$96 : 64 \} :: 12 : ? \therefore \frac{6 \times 64 \times 12}{8 \times 96} = 6$ is answer.

The *practical* convenience of cancelling is

more easily applied to the latter than to the former method.

In Problems relating to work done in a certain time, the method seems to be better applicable, as, for example, in Ex. 1: A can do a piece of work in 5 days, and B can do it in 12 days. How long will A and B, working together, take to do the work?

Here $\frac{1}{5}$ represents the part A does daily,

And $\frac{1}{12}$ represents the part B does daily;

$\therefore \frac{1}{5} + \frac{1}{12}$ represents the part A and B do daily:

\therefore they do $\frac{17}{60}$ in one day:

\therefore they do $\frac{1}{60}$ in $\frac{1}{17}$ day.

\therefore they do the whole work in $\frac{60}{17}$ days, or $3\frac{6}{17}$ days.

But the question might fairly be given under Fractions, as involving only a reasonable application of their principles: thus—A's day's work is $\frac{1}{5}$ of the whole, and B's $\frac{1}{12}$.

$\therefore \frac{1}{5} + \frac{1}{12} = \frac{17}{60}$ is (A + B's) day's work.

\therefore they do the whole in $\frac{60}{17}$ or $3\frac{6}{17}$ days.

Or, if we must compare it with our Rule of Three,

A and B can do $\frac{1}{5}$ and $\frac{1}{12}$ in 1 day; how long will it take them to do the whole?

$(\frac{1}{5} + \frac{1}{12}) : 1 : : 1$ day: Ans.

$\therefore 1 \div \frac{17}{60} = \frac{60}{17} = 3\frac{6}{17}$ days is the answer.

I cannot see that *this* suffers in comparison with *that*.

Lastly (in this section), Problems relating to clocks:

Ex. 1. Find the time between 3 and 4 o'clock when the hands of a watch are together.

Now no matter what method is adopted or the solution of this problem, the Unitary, the Rule of Three, or the Algebraic, the *conditions* of the problem, *e. g.*, that the minute hand moves 12 times as fast as the hour hand, must be *known*, and their bearing on the *data* must be considered. The problem will therefore resolve itself into this: How long will it take the minute hand to gain 15 spaces on the hour hand? In the book it is thus solved:

The minute hand gains—

11 minute-divisions in 12 minutes.

1 minute-division in $\frac{12}{11}$ minutes.

15 minute divisions in $\frac{15 \times 12}{11}$ minutes.

\therefore the time required is $\frac{15 \times 12}{11}$ min., or $16\frac{4}{11}$ minutes past 3.

For the Rule of Three it is: if the minute hand gain 11 spaces in 12 minutes, how long will it take to gain 15?

$11 : 15 : : 12 : \frac{12 \times 15}{11} = 16\frac{4}{11}$ minutes (past 3).

In the following sections Interest and kindred subjects are taken up and dealt with "on precisely the same principles" as the preceding; and yet in Simple Interest, after a lengthy (Unitary) explanation, we find this:

"Hence we derive the following Rule: Multiply the principal by the rate per cent. and by the number of years, and divide the product by 100."

The process stands thus, $2,675 \times 4 = 10,700 \times 3 = \pounds 32,100$. \therefore the interest is $\pounds 321$, a rule which clumsily misses a very neat application of the Unitary method, for if we take, instead of the rate per cent., the rate per 1, the process will be this, $\pounds 2,675 \times .04 \times 3 = \pounds 321$, or, expressed *generally*, $\text{Prt} = I$, from which, by the very simplest reasoning, we *deduce* expressions for the value of each of these parts; something which our author does not attempt to do.

His method of dealing with Compound Interest is simple, no doubt of that, *very* simple, but eminently tiresome. In the seven pages he gives to the subject, there is no trace of, nor any hint that elsewhere may be found a *general* method.

In Profit and Loss, still the same principles of "section XX."

Ex. 1. I sell for 6s. that for which I gave 5s., what is my gain per cent.

On an outlay of 5s. my gain is 1s.; on an outlay of 1s. my gain is $\frac{1}{5}$ s.; on an outlay of 100s. my gain is $\frac{100}{5}$ s. or 20s.; \therefore I gain 20 per cent.

Compare—On 5 I gain 6—5; What do I gain on 100?

5 : 100 : : 6—5 : Ans. = 20. \therefore 20 per cent.

I cannot see that this is not just as clear, and to any *rational* scholar, much more satis-

factory than the "fiddling" involved in the other.

Here I close the book, without referring more particularly to the excellence of the sections on measurement of area and of solidity; or to his examination papers of 1,000 examples, which may be, for aught I know to the contrary, as excellent as they are said to be, for that does not concern our present purpose.

Shall we, as teachers, assist in this attempted displacement of the Rule of Three, and, observe, as a natural consequence, of the notions of Ratio and Proportion, from our arithmetic? Not I, for one. I find Proportion or Analogy existing as an Arithmetical *fact*. I have a great respect for facts, and am not easily to be whistled over to join a crusade against any member of the fraternity. I fear, fear! no—hope, perhaps—believe, yes, certainly, that the *fact* will prove harder than even those mathematical heads that are butting against it. Besides, I find that after addition, multiplication, etc., etc., the doctrine of Ratio comes in as a new, beautiful, and powerful instrument to be used in the elucidation of the science of Arithmetic, and consequently in its application to practice. Why then should I refuse its aid? If its beauty and power are denied (as they can be only by those who are blind to the one, and unable to estimate the other), it is still an essential part of Arithmetic, and thus has claims that cannot be set aside.

What shall we say as to this Unitary Method, which, by the way, is not new at all, but only a new name for an old method, viz., *Analysis*, which figures largely in some of the American arithmetics, also in Smith & MacMurchy's Arithmetics? In the best of these it is kept in its proper place, appointed its proper function, namely, to serve as a sort of arithmetical substitute for Algebra. Used in this way, it may be both interesting and useful in the solution of problems that do not range themselves easily under the ordinary heads of arithmetical processes. But used *generally* for such questions as we have been considering, it seems to me to be not only useless but mischievous. Useless, because it is a wearisome, round-about way of

arriving at results that can be obtained by speedier and more direct ways. Is it not very much the same as if a scholar were obliged to prove Euclid's I. 47th, by tracing every assertion back to the Axioms and Postulates? We know that this, or something like it, is a good prescription occasionally, but no one advises it as a regular article of diet. It is mischievous, for, if it has any mental effect on the scholar, it must be in the direction of making him careless of the value of generalization. The two principles of the method (when applied in ordinary cases), appear to be, first, when a difficulty is met with, to go back to the beginning of the course, and retrace every step; second, to make as little use as possible of previously gained arithmetical knowledge.

We older fashioned people have thought it one of the best things we could do for our scholars in arithmetic, to shew them how each new fact was to serve as a stepping-stone to the next; that each new arithmetical truth gained was gained for good and all, and to be considered as now in our possession, to be used at once, and directly, in the search for, and investigation of, other such truths. In this connection, I must open the book again, and read another sentence from the preface. It is, "I cannot too earnestly set before my readers the fact that examiners do not assign so much credit to *results* as to the *processes* by which they are reached." Yes, he can too earnestly hold up the examiners to the view of the student. This preparing for examinations is a wretched sham. The reader of his book has nothing to do with examiners—his duty, and his whole duty, is learn arithmetic *thoroughly*. If he does this, he is prepared for any examiners, or there is something wrong with *them*. The author of the book has nothing to do with examiners—his duty is to lay the whole subject before his readers carefully and clearly; he ought to know nothing but his subject and his reader. The appearance of the examiner on the scene is an *impertinence*, if not worse. We will therefore not adopt the Unitary Method as here pronounced.

ARTS DEPARTMENT.

ARCHIBALD MACMURCHY, M.A., MATHEMATICAL EDITOR, C. E. M.

Our correspondents will please bear in mind, that the arranging of the matter for the printer is greatly facilitated when they kindly write out their contributions, intended for insertion, on one side of the paper ONLY, or so that each distinct answer or subject may admit of an easy separation from other matter without the necessity of having it re-written.

Solutions have been received from Messrs. Frisby, Cox, McMinn, Ellis, Boulthbee, and MacMurphy, which will be made use of in subsequent numbers of the MONTHLY.

SOLUTION

BY PROPOSER, J. L. COX., B.A., MATH.
MASTER, COLLINGWOOD C. I.

45. In a given triangle to inscribe a triangle similar to a given triangle.

Let ABC be the given triangle in which the triangle is to be inscribed. In AB take any point D and draw any line DF to the adjacent side; and at the points D and F make the angles FDE , DFE , equal to two of the angles of the given triangle to which the inscribed one is to be similar; therefore, the angle E will be equal to the third angle. Join AE , and produce it to G ; and from G draw GH , GI , respectively, parallel to ED , EF ; join HI . HIG is the triangle required.

Since DE and EF are respectively parallel to HG , GI , the angle DEF is equal to HGI .

Also $DE : HG :: AE : AG :: EF : GI$, whence (Euc. VI. 6) the triangles HGI , DEF , are similar, and therefore HGI is similar to the given triangle.

60. Prove (by the method of Indeterminate Coefficients) that the sum of the products of the first n natural numbers, taken two and two together, is

$$\frac{(n-1)n(n+1)(3n+2)}{24}$$

Let Σ_n be the required sum

Assume $\Sigma_n = A_0 + A_1 n + A_2 n^2 \dots$

$$\therefore \Sigma_{n+1} = A_0 + A_1(n+1) + A_2(n+1)^2 \dots$$

$$\therefore (n+1)(1+2+3+\dots+n) = \Sigma_{n+1} - \Sigma_n = A_1 + A_2(2n+1) + A_3(3n^2+3n+1) + \dots$$

$$\text{or, } \frac{n^3 + 2n^2 + n}{2} = A_1 + A_2(2n+1) + A_3$$

$$(3n^2 + 3n + 1) + A_4(4n^3 + 6n^2 + 4n + 1) +$$

Equating co-efficients of n in these identical equations.

$$\left. \begin{aligned} A_1 + A_2 + A_3 + A_4 &= 0 \\ 2A_2 + 3A_3 + 4A_4 &= \frac{1}{2} \\ 3A_3 + 6A_4 &= 1 \\ 4A_4 &= \frac{1}{2} \end{aligned} \right\} \begin{aligned} A_1 &= -\frac{1}{2} \\ A_2 &= \frac{1}{8} \\ A_3 &= \frac{1}{4} \\ A_4 &= \frac{1}{8} \end{aligned}$$

$$\therefore \Sigma_n = A_0 - \frac{2 + 3n - 2n^2 - 3n^3}{24} n.$$

Put $n=2$, and therefore $A_0=0$, and

$$\Sigma_n = \frac{(n-1)n(n+1)(3n+2)}{24}$$

$$104. (x^2 + xy + y^2)^2 - (x^2 + xy + y^2)(x^2 + y^2) + x^2 y^2$$

$$= (x^2 + xy + y^2)(x^2 + xy + y^2 - x^2 - y^2) + x^2 y^2$$

$$= (x^2 + xy + y^2)(xy) + x^2 y^2$$

$$= xy(x+y)^2 \quad \text{---FRANK BOULTBEE, Univ. Coll.}$$

Solution by Prof. Edgar Frisby, M.A.,
Naval Observatory, Washington:—

105. If $ax^n = by^n = cz^n$, and if

$$x^{-1} + y^{-1} + z^{-1} = k^{-1}, \text{ then}$$

$$(ax^{n-1} + by^{n-1} + cz^{n-1})^n = (a^n + b^n + c^n) k^{-n}.$$

$$\frac{a}{x^{-n}} = \frac{b}{y^{-n}} = \frac{c}{z^{-n}} = \left(\frac{a^n + b^n + c^n}{x^{-n} + y^{-n} + z^{-n}} \right)^n =$$

$$\left\{ \left(\frac{a^n + b^n + c^n}{x^{-n} + y^{-n} + z^{-n}} \right) k \right\}^n = \frac{ax^{n-1}}{x^{-1}} = \frac{by^{n-1}}{y^{-1}} =$$

$$\frac{cz^{n-1}}{z^{-1}} = \frac{ax + by + cz}{x + y + z} = \left(\frac{ax + by + cz}{x + y + z} \right) k$$

$$\therefore ax + by + cz = \left(\frac{a^n + b^n + c^n}{x + y + z} \right)^{n-1} k^{n-1} \text{ whence}$$

extracting the n^{th} root we obtain the given result.

Solution by proposer, Angus MacMurchy,
University College:—

Let ABC be a triangle; D, E, F , the points wherein its sides are touched by the inscribed circle; H, K, L , the feet of the perpendiculars from the vertices of the triangle DEF on the opposite sides; Δ, R, r , the area of triangle ABC , and the radii of its circumscribed and inscribed circles, and Δ_1 the area of triangle HKL , prove—

$$\Delta^{\frac{1}{2}} : \Delta_1^{\frac{1}{2}} = 2R : r.$$

The angles of triangle DEF and its pedal triangle HKL are—

$$\angle D = \frac{1}{2}(\pi - A), \text{ etc., etc.}$$

$$\angle H = \pi - 2D = A, \text{ etc., etc.}$$

The radius of circle round HKL , which is nine-point circle of triangle DEF , is $\frac{1}{2}r$. Now, triangles ABC, HKL , are similar, and have their linear dimensions proportional to the radii of their circumscribing circles.

$$\text{Therefore, } \Delta^{\frac{1}{2}} : \Delta_1^{\frac{1}{2}} = R : \frac{1}{2}r = 2R : r.$$

PROBLEMS.

132. Prove $\log \sqrt[n]{x} = (x^{\frac{1}{n}} - 1)$

$$\frac{2}{x^{\frac{1}{2}} + 1} + \frac{2}{x^{\frac{1}{3}} + 1} + \frac{2}{x^{\frac{1}{4}} + 1} + \dots \text{ad infin.}$$

133. Prove $2 \frac{r-1}{r} = \frac{1}{r-1} + \frac{1}{r} + \dots$

$$\frac{1}{r-2} + \frac{1}{r-3} + \dots \text{ad infin.} + \frac{1}{2} \left\{ \frac{r}{2} \right\}^2; \text{ or, } \frac{1}{\frac{r+1}{2}} + \frac{1}{\frac{r-1}{2}}$$

according as r is even or odd.

134. Prove $2 \frac{2^n - 1}{2n+1} = \frac{1}{2n-1} + \frac{1}{2} + \dots$

$$\frac{1}{2n-3} + \frac{1}{2n}$$

135. In a plane triangle ABC , if $\sum \sin^2 A = 2\sigma$, and $\sigma - \sin^2 A = \sigma_1$, etc., prove—

$$\sigma_2 \sigma_3 + \sigma_3 \sigma_1 + \sigma_1 \sigma_2 = \sin^2 A \sin^2 B \sin^2 C.$$

By W. J. ELLIS, B.A., Mathematical Master, Collegiate Inst., Cobourg,—

136. Given that the centre of gravity of a hemisphere is $\frac{3}{8}$ of radius from base, find the centre of gravity of a hemispherical bowl whose internal radius is " m ," and uniform thickness " p ;" result to be given as distance from base in terms of m and p .

From this result find the distance of centre of gravity of a hemispherical surface from the centre of the base.

UNIVERSITY OF LONDON.

Matriculation Examination—January,
1880.

ARITHMETIC AND ALGEBRA.

Examiners—Dr. John Hopkinson, M.A.,
F.R.S., and Rev. Prof. Townsend, M.A.,
F.R.S.

1. From $1\frac{1}{4}$ of $\frac{1}{8}$ of $\frac{3}{4}$ of a mile subtract $\frac{3}{4}$ of $\frac{1}{8}$ of a foot, and express the result in metres. [One metre may be taken as $39\frac{1}{8}$ inches.]

2. Multiply 0.0316228 by itself, giving the result correctly to six significant figures.

3. Obtain the square root of 0.03456789 correctly to seven places of decimals.

4. Find the product of $0.53846\dot{1}$ and $0.328571\dot{4}$, reducing the result to a vulgar fraction expressed in its simplest form.

5. Given that a gallon of water weighs 10 lbs., that a cubic foot of water weighs 1,000 ounces, and that a litre is a cubic decimetre; find how many litres there are in a gallon.

6. Find r and s in terms of a and b , p and q , so that $x^4 + px^3 + qx^2 + rx + s$ may be divisible by $x^2 + ax + b$, whatever x be.

7. Solve the simultaneous equations

$$\begin{aligned} \frac{1}{2}x + y + 7z &= 41; & x + \frac{2}{3}y + 7z &= 42; \\ x + y + z &= 15. \end{aligned}$$

8. Reduce

$$\frac{x^4 + a^2x^2 + a^4}{x^2 - a^2} \times \frac{x+a}{x^2 + ax + a^2} \div \frac{x^2 - ax + a^2}{x-a}$$

$$- \frac{x^3 - a^3}{x^3 + a^3} \times \frac{x^2 - ax + a^2}{x-a} \times \frac{x+a}{x^2 + ax + a^2}$$

to its simplest form.

9. A milkman has three cans of 10, 7 and 4 quarts capacity, respectively: the first is

full, the other two are empty: he is required to divide the ten quarts into five quarts in the ten-quart can and five quarts in the seven-quart can. How will he do it?

10. Three numbers are in geometrical progression: the sum of the first and third exceeds the double of the second by unity; and if from the difference of the first and third one be taken, the result is one-third of the second. What are the numbers?

11. A agrees to pay B a total sum of £300, in three instalments of £100, at the ends of one, two and three years, respectively. He fails to make any payments; and at the end of four years B demands payment. Reckoning compound interest at 4 per cent., how much should B receive?

12. Assuming, for the purpose of this question, that a full-rigged ship has 40 hands, a schooner 15, and a steamer 10; on a certain day 36 vessels, all either ships, schooners or steamers, arrived in port: they had, in all, 750 hands; the hands on board the ships would be just numerous enough to man all the schooners and twice as many steamers as arrived that day. How many of the vessels were ships, schooners and steamers, respectively?

GEOMETRY.

Examiners—Dr. J. Hopkinson, M.A.,
F.R.S., and Rev. Professor Townsend,
M.A., F.R.S.

[Candidates are at liberty to use all intelligible abbreviations in writing out their answers.]

1. Two finite right lines, of any lengths, being supposed to radiate, in any directions, from a common terminal point; shew that the angle they determine is equal to that determined by their two productions through the point.

2. Two rectilinear segments, of any lengths, being supposed to have a common middle point, but not a common direction; shew, assuming the preceding property, that they are the two diagonals of a parallelogram.

3. Two triangles, having a common base, being supposed to have their two vertices on a common parallel to the base; shew that the four parallelograms, on the same base, having their four sides for diagonals, are equal in area.

4. By aid of the preceding, or otherwise, construct, on a given base, a triangle of given area, having its vertex on a given indefinite right line not parallel to the base; and determine the number of solutions.

5. Two chords of a circle, intersecting at a point within the circumference, being supposed to make equal angles with the line connecting the point with the centre; shew that the two segments of either are equal to the two segments of the other.

6. By aid of the preceding, or otherwise, construct an isosceles triangle of given vertical angle, having its vertex at a given point within a given circle, and both extremities of its base on the circumference of the circle: determine also the number of solutions.

7. A quadrilateral, of the ordinary form, being supposed inscribed in a circle; shew that the sum of either pair of its opposite angles is equal to the sum of the other pair.

8. The quadrilateral, in the preceding property, being supposed to be a parallelogram; shew, as a consequence from the property, or otherwise, that its two diagonals pass through the centre of the circle.

9. A quadrilateral, of the ordinary form, being supposed circumscribed about a circle; shew that the sum of either pair of its opposite sides is equal to the sum of the other pair.

10. The quadrilateral, in the preceding proposition, being supposed to be a parallelogram; shew, as a consequence, from the proposition, or otherwise, that its two diagonals pass through the centre of the circle.

11. Divide a given finite right line into two unequal segments, so that the rectangle contained by the whole line and the lesser segment shall be equal to the square of the greater segment.

12. By aid of the preceding, or otherwise, construct, on a given base, an isosceles triangle, each of whose base angles shall be double of its vertical angle; and complete, by aid of it, the construction of a regular pentagon on the base.

NATURAL PHILOSOPHY.

Examiners—Prof. W. G. Adams, M.A., F.R.S., and Wm. Garnett, Esq., M.A.

[N.B.—Not more than *eight* questions are to be answered.]

1. Define force. What is meant by the resultant of a number of forces? Give a geometrical construction for finding the resultant of any number of forces acting at a point.

2. Define the moment of a force about a point. Shew how to find the resultant of two parallel forces which act in opposite directions but not in the same straight line.

3. What is the centre of gravity of a body? A line is drawn across an equilateral triangle, of 12 inches side, parallel to its base, and so as to cut off one-fourth of its area. Find the distance of the base from the centre of gravity of the remainder.

4. Equal forces act for the same time upon bodies of different mass. What is the relation between the effects which they produce? Describe fully the unit of force implied in the equation $P=mf$.

5. A body is allowed to fall freely from rest. Find an expression for its velocity at any point in terms of the distance through which it has fallen and the acceleration of gravity. If $g=981$ centimetre-second units, from what height must a body fall in order that it may have a velocity of 50 metres per second on striking the ground?

6. A cubic foot of water may be assumed to contain 1,000 ounces, while a gallon contains 10lbs. Two gallons of water are placed in a cylindrical can, 10 inches in diameter. Find the whole pressure upon the curved surface of the can.

7. How would you determine the specific gravity of a solid lighter than water? A

piece of metal weighs 850 grains in vacuum, 760 grains in water, and 772 grains in a mixture of alcohol and water. Find the specific gravity of the mixture.

8. A barometer tube of uniform bore is 34 inches in length. A small quantity of air is left by inadvertence above the mercury, so that the barometer registers 30 inches when the true atmospheric pressure is 30.05. What will be the true barometric reading when this barometer registers 28 inches?

9. Light proceeds from a point at the bottom of a lake. Make a careful drawing of the pencil of rays after emergence from the water, and find the geometrical focus of the pencil.

10. What is the critical angle of a transparent medium? Describe what a fish would see on looking towards the surface of the water in directions differently inclined to the horizon, and illustrate your description by a diagram.

11. A small object is placed in front of a concave spherical mirror of 6 inches radius at a distance of 4 inches from the surface of the mirror. Where will its image be situated? will it be erect or inverted? and what will its dimensions be compared with those of the object? Where must the object be that the image may be of the same size?

12. What is the focal length of a lens, and how would you determine it experimentally? In the case of a convex lens, if the object be as near as possible to the image, where must the lens be?

13. Shew how to convert temperatures expressed in the centigrade scale into degrees Fahrenheit, and *vice versa*. The number expressing the temperature of a body in degrees Fahrenheit is double that expressing it in degrees centigrade: find the temperature.

14. What is meant by the latent heat of steam? Describe some method by which it may be determined, mentioning the chief precautions which must be taken in carrying it out.

15. Distinguish between evaporation and ebullition, and define the boiling-point. How is the pressure of aqueous vapour in a saturated space affected by the presence of air or other gases?

16. Define the absolute conductivity of a substance. A metal plate $\frac{1}{2}$ in. in thickness and two feet square has the whole of one face in contact with water which is kept boiling, while the other face is in contact with melting ice; and it is found that 300 pounds of ice are melted in one hour. Find the absolute conductivity of the metal, stating clearly the units you employ.

ENGLISH LANGUAGE.

Examiners—Prof. Henry Morley and C. Knight Watson, Esq., M.A.

[N.B.—Not more than *ten* questions are to be answered, inclusive of the exercise in dictation.]

1. Write out and punctuate the passage read by the examiner.

(Candidates will bear in mind that it is not allowable to make a fair copy of this exercise in dictation.)

2. Distinguish between the classical and the Teutonic elements in English. Point out the several ways in which words of Latin origin have been introduced into the language.

3. Define the terms vowel, diphthong, consonant. What letters are called mutes, and how are they subdivided? Tell the substance of Grimm's law.

4. Describe the several ways of indicating gender in English nouns, including explanation of the words *woman*, *lady*, *vixen*, *scamstress*, *mistress*, *bridegroom*, *widower*, *drake*.

5. What arguments might be used for and against the recognition of the article as a distinct part of speech? Tell what you know of the history of *an* and *the*.

6. Trace as fully as you can the history of the inflections of *thou*, and of *he*, *she*, *it*, in singular and plural.

7. Account for the separate forms *two* and *twain*, and for the words *ten*, *eleven*, *twelve*,

hundred, thousand, first, second, dozen, score, fortnight.

8. What is meant by the terms "strong" and "weak" applied to the conjugation of verbs? Explain the difference between the two forms of conjugation by telling what you know about their history.

9. Discuss the inflexions of the verbs *may, can, shall, have, will, do.*

10. Account for the use of *to* in the infinitive present, and for its occasional omission in an infinitive after a verb, as, "I *darsay.*"

11. Make two classifications of adverbs; one logical, according to their meaning; the other etymological, according to their form and origin.

12. Analyze the following sentence:—

"This day, to-morrow, yesterday, alike
I am, I shall be, have been, in my mind
Towards thee; towards thy silence as thy speech."

13. Illustrate by examples the points most worth attention in the syntax of pronouns.

14. Distinguish between syntax and prosody. Define a perfect rhyme.

ENGLISH HISTORY AND MODERN GEOGRAPHY.

Examiners—Professor Henry Morley and
C. Knight Watson, Esq., M.A.

HISTORY.

[N.B.—Of these fourteen questions, only *eight* are to be answered.]

1. What do we gather from Cæsar (1) respecting the races he found in Britain, (2) respecting their connection with Gaul and Germany?

2. Discuss as fully as you can the traces left by Roman occupation in this country.

3. What features and elements of the feudal system were to be found in England before the Norman conquest?

4. Explain the words *duke, thane, count, earl, mayor, alderman, sheriff, guild, exchequer*; and say to which of the peoples who have established themselves in Britain they may respectively be traced.

5. Give an account of the leading disputes between the sovereigns of England and the clergy, from the time of Dunstan to the reign of Henry III.

6. What were the several rights by virtue of which the throne was claimed by the House of Lancaster?

7. Describe the conquest of Ireland by Strongbow, and give an account of the chief risings against English rule in that island down to the year 1650.

8. Write a life of Edward the Black Prince.

9. Give some account of the steps which led to the suppression of the monasteries; of the statesman who first conceived and of the statesman who executed the work.

10. Give the date of the accession of Henry VIII. Mention the names of his wives, children, and chief ministers; adding the fate of each.

11. What important events happened in English History in the following years?—*937, 1166, 1304, 1360, 1461, 1513, 1628, 1645.*

12. Of what parties in the nation were Essex, Fairfax, and Cromwell the respective leaders, and on what grounds did these parties oppose the King?

13. What were the most important legislative measures passed in the reign of William III.? Give your estimate of the personal character of that monarch.

14. What colonies did England possess at the end of the seventeenth century? When and how were they acquired?

GEOGRAPHY.

[N.B.—Of these five questions *two*, and not more than two, are to be answered.]

1. Define geography. Into what branches has it been divided? Specify fully the subjects held to be included in each branch.

2. Name some districts that are nearly or altogether rainless, and others that have an excess of rain. Explain the cause of these conditions.

3. Describe the voyage of a ship from Calcutta to Japan.

4. If lines were drawn through the greatest breadth and length of England, respectively, from what points would they start, what distance would they reach, what counties would they traverse, and where would they intersect?

5. Where are the following places, to whom do they belong, and for what are any of them remarkable?—Mocha, Merv, Sevres, Cairo, Washington, Durban, Basle, Yokohama, Havana, Maritzburg, Tiflis, Assaye, Gravelotte, Dordrecht, Certe, Surinam, Quito, Andaman Islands, Kirkwall.

CHEMISTRY.

Examiners—Prof. Debus, Ph.D., F.R.S., and Prof. Dewar, M.A., F.R.S.

1. Describe the preparation of chlorine, and explain your process. What happens when dry litmus-paper, an aqueous solution of litmus, a burning candle, and powder of copper, respectively, are introduced into chlorine gas?

2. Give a brief description of the allotropic

modifications of sulphur, and of the preparation of each modification.

3. How would you prove, by means of experiments, that water is a compound of hydrogen and oxygen?

4. If you place a burning candle into a closed bottle the flame will soon be extinguished. Why does the candle not continue to burn? How is the composition of the air affected by the flame?

5. Explain the action of hydric chloride (H Cl) on calcic carbonate. If you pass carbonic acid over a layer of red hot charcoal, it becomes converted into a combustible gas. Explain the reaction which takes place between carbonic acid and hot charcoal.

6. Silica has no taste and does not act on blue litmus. Why do we call this substance silicic acid?

7. If you heat common salt with hydric sulphate (H_2SO_4), hydric chloride (H Cl) is given off. How many cubic centimetres of hydric chloride at $0^\circ C.$ and 760 mm. pressure could you liberate from 1,000 grammes of sodic chloride.

A REMEMBERED TEACHER.

BY WILLIAM C. WILKINSON.

I see him now, importunate, eager, bold
 To push for truth, as most to push for gold;
 Young then, with youth's fine scorn of consequence
 He weighed no whither, so he knew his whence—
 Asked only, but asked hard, Is it a fact?
 That point well sure, deemed then he nothing lacked.
 Truth was from God, she could not lead astray.
 Fearlessly glad, he walked in Truth's highway;
 Who joined him there, had fellow stout to cheer;
 Who crossed, met foe behooved his weal to fear;
 His quick, keen, urgent, sinewy, certain thrust
 Well knew those knights who felt it in the joust.

Ideal Christian teacher, master, man,
 Severely sweet, a gracious Puritan,
 Beyond my praise to-day, beyond their blame,
 He spurs me yet with his remembered name!

—*Scribner for February.*

CONTEMPORARY OPINION ON EDUCATIONAL TOPICS.

TEACHERS' TENURE OF OFFICE.

President Eliot, of Harvard University, in an address before the Massachusetts Teachers' Association, on the Teachers' Tenure of Office, said: "If no intelligent method of selecting efficient teachers is used, the shorter their tenure of office the better, as inefficient ones could thus be quickly got rid of. The means of careful selection are two: First, examinations upon the subjects taught in schools, and such other examinations as may best exhibit the capacities of candidates. These examinations should include a fair range of optional subjects; for it is rather the candidates' power of acquiring, than their actual acquisitions, that are to be tested. Secondly, probationary service under the eyes of competent judges of teachers' work. There is no dispensing with actual service on probation, if teachers are to be chosen with reasonable care; for examination can only test knowledge and readiness, whereas the good teacher must also have conscientiousness, force of character, devotion, enthusiasm, and these can only be successfully displayed in actual teaching, under the watchful eyes of professional persons of high character, good judgment, and long experience.

There is no need of argument to prove that a system of long tenure for teachers can be successfully carried out only by competent inspectors, who themselves are reasonably secure in their positions, and who actually serve for long terms. Long probations imply long continued observation of the candidates.

FULL APPOINTMENT.

Supposing now that a teacher has given all the securities for future usefulness which thorough preliminary examination and long probation can supply, we ask what should be

the nature of the ultimate appointment? In the interest both of the profession and of the community, it should be an appointment without limitation of time. There should be no recurring election. Nevertheless, the teacher should be subject to removal for inadequate performance of duty, or for misconduct, and there should be a regular provision for the retirement of superannuated teachers upon pensions or annuities. I touch here the subsequent question, from which I am not able to disengage the question of tenure. Long tenures logically involve pensions or annuities. Further, there should be absolute security against reduction of salary for each individual once admitted to the permanent service. If the financial necessities of cities and towns really compel the reduction of teachers' salaries,—a well-nigh impossible supposition,—these reductions should take effect upon new appointments only, never upon the old. I know that this principle of good public administration is violated at pleasure by our national, state, and municipal governments; but I take leave to say that the practices of our governments in this respect are to the last degree barbarous, shiftless, and uneconomical. It is to be observed that this remark applies only to public administration; the servants of industrial or other private companies of uncertain income cannot be completely protected against the adverse chances of business; but government, whether national, state, or municipal, ought to be able to give its servants two rewards, which, to an appreciable extent, replace immediate money payment,—namely, security of income and public consideration.

The dignity, independence, and freedom from solicitude of the teacher's life would be greatly enhanced by deliverance from the necessity of securing an annual re-election

and from apprehension of reduction of pay. How great a boon is freedom from anxiety for the future! An uncertain tenure is no great hardship in early life, or so long as a man may readily turn from one pursuit to another; but when the prime of life is past, and the stiffened mind no longer bends easily to new tasks, though still apt for familiar labours, an uncertain tenure gives terrible anxiety to one of prudent temperament who has given hostages to fortune.

Again, how precious would be the independence which an assured position would give!—precious to the teacher, and of great value also to the public; for I am persuaded that the public now loses much good advice through the natural caution and reserve of annually-elected teachers. Thirdly, security of tenure would increase the public consideration which attaches to the teacher's office.

ANNUITIES.

Let us then imagine our representative teacher of proved capacity, appointed during good behaviour, upon an assured salary sufficient for the modest support of a family. He will lead a tranquil, independent, and honourable life, such as promotes longevity, and favours the prolongation of mental and bodily activity within familiar limits to an advanced age. Do we not here encounter a very serious objection to a system of long tenure? Are the schools to be filled with aged teachers? someone will naturally ask. Certainly not, under a complete and wise system. A regular provision for retiring old teachers on suitable annuities is a necessary supplement to a long-tenure system. It would

be very rash for any city or town to appoint even proved teachers without limitation of time, in the absence of any proper means of removing them from the school when they get tired out, inefficient, or obtrusive. Retiring annuities are desirable for three reasons: First, they enable an old teacher who is disposed to rest from strenuous daily labour, to retire with honour, and enjoy a repose which all the world agrees he has fairly earned. Secondly, they enable the city or town to retire faithful teachers whose services are no longer desirable, and to do this in a considerate, just, and not unacceptable way. Thirdly, the habitual use of retiring annuities, in part voluntarily claimed, and in part involuntarily accepted, makes promotion through all the grades of a large service more rapid than it would otherwise be. This is a great object, because the prospect of slow promotion deters ambitious young persons from entering a service which otherwise would attract them.

The administration of any retiring system must be entrusted to some reasonably permanent authority which commands the confidence both of the teachers and of the public.

These, then, are the three main features of a well organized public school service: Careful selection of teachers by examination and probation; ultimate appointment, without limitation of time; and a system of retiring annuities. These principles, taken together, either openly avowed or tacitly recognized, are the foundation of every just, economical, and efficient public administration in the world."

TEACHERS' ASSOCIATIONS.

CHRONICLE OF THE MONTH.

TEACHERS' ASSOCIATION—COUNTY OF NORFOLK.—The Teachers of Norfolk held an Institute on the 13th and 14th of February, at Simcoe, 110 teachers being present. Dr. Wadsworth, the Inspector, took the chair in the absence of the President. After devotional services, conducted by the Rev. George Grant, B.A., the minutes were read and approved. Mr. Bennett asked what had been done toward procuring a teachers' library. The library committee reported that they had procured catalogues of the libraries of adjacent counties, but as yet no purchases had been made, and Messrs. Bennett and Pegg were then appointed to audit the accounts for 1879.

Mr. W. F. Cron took up the subject of Map-drawing. Apart from its use in teaching geography, he held it to be exceedingly valuable as a training for both hand and eye. He drew a map of South America on the blackboard, and shewed that it was an exercise in which the members of the class might profitably and easily take part every day without loss of time. Mr. W. W. Pegg then delivered a lecture on the "Teaching of Reading to Junior Classes." He preferred to teach first by the word-forms, and afterwards the letters. His plan differed in one important respect from that of most of those who had attempted the method, in that he used the black-board extensively, inventing lessons of an original and interesting character, and printing them on the board while talking to the class; thus the pupil supplied the ideas and he the signs. This work was introductory to the ordinary book lessons. Transcription followed; he found this plan was productive of intelligent and natural reading. Many teachers took exception to

this "look and say" method, contending that the spelling suffered. The effect of the debate appeared to be that many teachers would in future try the word-system, with a very liberal use of the black-board and slate and original lessons.

Afternoon Session.—Mr. Courtlandt, the President, took the chair. Mr. W. H. Weston dealt with the subject of Algebraic Factoring. His style was remarkably clear and convincing, and was a model of algebraic illustration. Dr. Wadsworth then addressed the institute on "Home-work for Teachers and Pupils," and maintained that the necessity for home-work was the out-come of time wasted in school. He said that the pupils in the first, second and third books should prepare their lessons under the guidance of the teacher, and in the school rooms, and that the true remedy for the evils connected with home-work was in skillful preliminary teaching at the time the lessons were assigned. He thought that much of the time now taken up in recitations, might, with advantage, be spent in rousing the interest of the pupil in the coming lesson, and in stimulating him to correct modes of thought. He claimed that this could not be done without special home preparation on the part of the teacher himself. Mr. D. W. Parsons, while admitting the value of preliminary teaching, urged the want of time in rural schools. An animated discussion followed. Mr. Donly then read a paper on the School System of Ontario, for which he received a vote of thanks, coupled with a request for the publication of the article. The paper appears elsewhere in our columns.

Evening Session.—At 8 p.m., the Association met at the Mechanics' Hall, where an

eloquent lecture was delivered by Mr. A. F. Butler, School Inspector of Elgin, on the Kindergarten. The Rev. D. L. Brethour, of Simcoe, followed with a very pleasing address on Education, shewing the necessity for cultivation of morals as well as intellect.

Saturday, 14th.—Mr. Butler took up the subject of arithmetic, dealing principally with weights and measures, analysis and proportion. While not undervaluing analysis, he claimed a high place for proportion. After a discussion, the audience appeared to be of opinion that analysis was probably the more effective means of developing thought in young pupils, while proportion was to be retained rather on account of its intrinsic beauty and practical utility. An essay by Mrs. Dorothea Smith, entitled "Hints to Teachers," was then read. The writer enumerated the qualities of a successful teacher, and gave many valuable hints on discipline. The following officers were elected for the ensuing year:—Pres., W. W. Pegg; Vice-Pres., James Lumsden, M.A.; Sec.-treas., Rev. Geo. Grant, B.A.; Recording Sec., W. F. Cron; Executive Committee, Messrs. Bennett, Weston, Payne, Knowles, Fisher, and the School Inspector; Auditors, Messrs. Fulton and Parsons. The auditors for 1879 then read a statement shewing a balance to the credit of the Association of \$70.75. After a lengthened discussion on the action of the Government, in shortening the summer vacation, a resolution was passed condemning the change. Mr. Robert Grant, Model School Master of Welland, spoke on Object Lessons in a very pleasing and instructive manner, illustrating the subject by giving an object lesson on leather. Mr. E. Payne, of Simcoe, seconded Mr. Grant's views and shewed how the teaching of object lessons enlarged the child's vocabulary. Mr. R. T. Livingstone, Barrister, then gave several very enjoyable readings in his usual happy style, and received a hearty vote of thanks from the Association, which then adjourned.

NORTH PERTH TEACHERS' ASSOCIATION.—The regular half-yearly meeting of the above Association commenced in the

Listowel Central School on the 20th ult. Mr. B. Rothwell, president, occupied the chair. The first business was the reading of William Cullen Bryant's poem, "The Prairies," by the members of the Convention. Each individual who was called upon read a part, while the others criticised. This was an admirable and most instructive exercise to begin the work with. Those who have read John Stuart Mill's Autobiography will remember the benefit he derived, when a youth, from critical reading of certain works in the company of a few kindred spirits. We can well believe "the forenoon was spent profitably in this way, and would commend the example of the North Perth Teachers' Association to sister Associations.

Mr. J. Crozier then took up the subject of Natural Philosophy, discussing Moments, Hydrostatics, and other divisions of this subject. Problems were solved which gave a practical character to the address.

Mr. D. D. Ellis introduced the subject of "History." He gave a number of valuable hints as to how this subject should be taught to an ordinary public school class. He was followed by R. A. Coleman, B.A., who read a carefully-prepared, and thought-provoking essay on "Physical Science as an Educator."

The mode of conducting promotions was introduced by Mr. R. Munro, who stated that though the county had made great advances in the method of conducting these examinations, still there were a few points that might be improved upon. The suggestions made by Mr. Munro were incorporated in the following resolution which on motion of Mr. Draper, seconded by Mr. Ellis, was carried. That a committee be appointed to examine papers for each township, that no scholar over eighteen receive a prize, and that numbers be used instead of names of candidates. J. S. Draper gave his method of teaching algebra to beginners.

In the evening a public entertainment was given in the town hall. The attendance was large, the hall being crowded to the doors. The mayor of Listowel, Mr. J. W. Scott, occupied the chair, and addresses were given

by Messrs. D. D. Campbell, S. Ranton, R. A. Goleman, S. J. Kilpatrick and Rev. A. F. McGregor. Excellent music was discoursed by R. H. Collins, J. W. Laird and the Misses Wilson and Patmore.

On Saturday the first item of business was an address by S. Ranton on pupils' reports. Valuable hints were given in the address.

The analysis of "Gray's Elegy" was next in order, introduced by J. Wilson, B.A. An hour was profitably spent in unravelling the difficulties of this composition, the discussion at times being quite spirited.

Mr. Dickenson introduced a resolution to the effect that the next meeting of the Association be a joint one with the South Riding Association, if the latter consent, to be held in Stratford, which was unanimously carried. Messrs. Dickenson and Rothwell were elected as delegates to the Provincial Association, after which the convention terminated. Judging from the attendance and interest manifested, the North Riding Association may be said to be in a prosperous condition.

EAST MIDDLESEX TEACHERS' ASSOCIATION.—The annual meeting of the above named Association was opened on Friday morning, 27th February, at the County Buildings, London; the President, Mr. J. Dearness, in the chair.

A discussion took place on the proposed amendment to shorten the summer holidays. The general expression of opinion was, that the worst feature of the proposition is its indefinite character. The holidays ought to be either four weeks or six, not left indefinite as proposed by the amendment. A committee, consisting of Messrs. J. Hodgins, Donaldson and Hunt, was appointed to draft a report on the subject. Mr. Eckert gave notice that he would move that this Association petition the County Council to establish a High School in the East Riding of Middlesex.

The President gave a very interesting address on the subject of "Our Flag." He pointed out the various kinds of activities that make up human life, and shewed how far Spencer's definition of an ideal education

harmonized with them. It is obligatory on the State to prepare its youth for citizenship, and the public schools mainly are entrusted with this high duty. The influence of the Prussian and Canadian School systems in fostering patriotism were compared, much to the detriment of the latter. The principle of proceeding from the concrete to the abstract in teaching history as well as other subjects was insisted on. He gave an interesting and vivid illustration of this by a model lesson on the British Flag. While he gave its description and history, Miss Wilkinson, a lady teacher, dexterously drew it in colours on the black-board.

Mr. Dearness' original and practical address was followed by a spirited discussion on "National Character and Loyalty," by Messrs. Eckert, Jarvis, Fawcett, and McQueen, all of whom agreed on the importance of cultivating a love of country in the mind of the young. Mr. McQueen then explained how to use the Lithogram, and recommended it for examination papers, book-keeping, monthly reports, etc. His statement of its benefits was corroborated by the experience of a number of teachers present. A treat was reserved for the Middlesex teachers on Friday evening in the shape of an address by Dr. Bucke, Superintendent of the London Asylum for the Insane, on "Walt Whitman." Now, though we are far from agreeing with the doctor in his extravagant estimate of this writer, and of his work, "Leaves of Grass," we think the members of the East Middlesex Association were most fortunate in being able to listen to the eloquent utterances of a man of such a cultivated mind, upon a subject on which he is so enthusiastic.

On Saturday Mr. Dearness favoured the Association with his views on Spelling Reform. Mr. Jarvis spoke of the use of newspapers in schools, and shewed their utility as an aid in teaching composition, arithmetic, grammar, geography, history, and literature. He was followed by Mr. Wilson on "How to Teach Composition." Mr. Amos, who evidently keeps pace with the age, described his plan of promoting gen-

eral knowledge among his scholars by means of newspapers, and read a set of questions on the topics of the day, which he had given to his pupils at their last examination. The following were amongst them:—

State the objections to Mob or Lynch law. Name any important subjects engaging the attention of the Dominion or Ontario parliaments. What are the causes of the Irish distress, and what is being done to alleviate it?

The following officers were elected unanimously:—President, John Dearness, I.P.S.; First Vice-President, Mr. Jarvis; Second Vice-President, Miss Boone; Secretary, Mr. McQueen; Treasurer, Mr. Eckert.

The committee on the holiday question submitted a report expressing disapprobation of the recent changes of the school law relative to vacations. A discussion followed in which Messrs. Jarvis, Hodgins, Donaldson, Colton, and Stock condemned the shortening of vacations on the ground that confinement of children in the school-room during the dog-days is detrimental to their health and progress. Messrs. Fawcett, Eckert, and Stuart, while agreeing with this idea, thought it better to defer action until it was seen whether trustees would unwisely exercise the power given them by the recent changes.

Mr. McQueen read a report from the Examination Committee recommending that uniform promotion examinations be held in every school in the inspectorate, twice yearly, in January and August. The details of the scheme were left to the Management Committee. The report was unanimously adopted.

On motion it was resolved to purchase Parkman's Works on the History of Canada for the library.

Mr. Woodburn, head master of Bond street school, and Mr. H. B. Sutherland, gave short addresses, which were well received.

NORTHUMBERLAND TEACHERS' COUNTY CONVENTION.—The semi-annual meeting of this Association was held in the Cobourg Collegiate Institute buildings, on the 26th and 27th ult. Mr. W. E. Bartlett, of Wark-

worth, presided. The first session was devoted to general business, the most important item of which was the appropriation by the Association of about \$50, whereby the members, on payment of a nominal sum, may obtain a copy of the CANADA EDUCATIONAL MONTHLY, and also a copy of the *School Journal*. It is expected that from eighty to one hundred copies of the MONTHLY will find their way into the hands of our teachers by this means; a number of *Journals* will also be taken.

Mr. David I. Johnston, ex-President of the Association, and who has recently retired from the active work of teaching, was elected an honorary member and invited to participate in the discussions.

The first part of the second session was devoted to "Factoring in Algebra," the discussion being opened by Mr. W. S. Ellis, B.A., Mathematical Master of the Institute. His exceedingly clear and comprehensive treatment of the subject elicited the admiration of the Association, and a hearty vote of thanks was presented. A discussion followed on "School Discipline," during which valuable suggestions were given by Messrs. Inspector Scarlett, Johnston, Dowler, McHenry, Sprague, McEvers, and others. While theoretically in favour of moral suasion, the Association were unanimously of the opinion that a judicious use of the rod is both necessary and beneficial.

The evening session was given to a very able lecture by Dr. Burwash, on "Schools and Schoolmasters."

The first session of Friday was devoted to the subject of "Reading," the discussion being opened by Mr. W. E. Sprague, whose practical remarks were followed by valuable suggestions from Mr. Ash and others. Mr. Orr, Head Master of Brighton High School, followed in an able critical analysis of the principal parts of Gray's "Elegy." A discussion on the subject of Third Class Literature was brought to a close by a resolution condemning the present course, and recommending that the Literature for Third Class teachers be more in harmony with that required of Second Class teachers. "Penman-

-hip" was dealt with in a very satisfactory manner by Mr. Sawyer, a student of the Institute. A very profitable discussion followed on "Waste of Labour in School Work," introduced by an address from Mr. D. C. McHenry, M.A. Mr. W. Scarlett next took up "History," and gave some valuable hints as to the best methods of teaching the subjects. A question drawer exercise followed, which gave rise to the discussion of many important practical points.

On Friday evening the large audience-room of the Institute was filled with an intelligent and appreciative assembly—this last session being devoted to Chemical Experiments by Messrs. Odum and Ellis, masters of the school. Mr. A. P. Coleman, B.A., Science Master, unable to take charge of the experiments himself, remarked that they were those usually performed by the members of his class. The audience were highly pleased, and tendered a vote of thanks to the gentlemen for their services. The thanks of the Association were given also to

the excellent glee club of the Institute, whose choice music did much to enliven the proceedings.

ONTARIO TEACHERS' ASSOCIATION. A Deputation of members of the Board of Directors of the Ontario Teachers' Association, consisting of Mr. Hughes, Secretary, and Messrs. MacMurchy, Doan and McAllister, waited upon the Minister of Education by appointment on Saturday, 21st February, to lay their views before him against the proposed shortening of the summer vacation, and some other matters. Though the time was of his own choosing, the deputation, after dancing attendance in the halls of the Education Department for an hour or more, and trying to see good in everything from the cobwebs on the ceiling to the pictures that adorned the walls, were compelled to give up the hope of an interview and reluctantly withdrew. The views of the deputation were subsequently submitted by the Secretary in writing.

THE GRAVEL-BANK.

BY JOSHUA KENDALL.

Upon that bare and stony field, with gravel strewn,
 All day the July sun beat fiercely down, and yet
 It blossomed not, nor scarce a trace of verdure shewed,
 Though, breast high, grass and grain in all the meadows stood.
 And so, what time in Spring the fresh new sap ran fast,
 It felt no vital tide through throbbing pulses rush,
 Nor work with joy, once more its lease of life to try.
 "Oh, God!" I cried, "some hearts how thankless and how cold!
 How can thy mercy spare, thy wrath leave them unscathed!"
 Thus, in my zeal. But later, one September day,
 By chance, I passed that way; and in the golden rays
 Of sunset, all the bank was bright with asters blue,
 Whose petals toward the sun-god joyfully were turned;
 In brilliant colour all the field was deeply dyed;
 No more was seen the shingle bare, by harvest hid.
 Surpassing ripened corn and mellow, dropping fruit.
 And I thy wisdom questioned? Rashly, others blamed?
 Some in the early Spring may blossom forth, and some
 May bloom much later. Grace of God, whenever it comes,
 Will make its presence known, the heart to sing for joy.

—*New England Journal of Education.*

SCIENCE DEPARTMENT.

[A series of notes for THE MONTHLY, by Henry Montgomery, M.A., Coll. Inst., Toronto.]

MR. HANNAY, a skilled chemist of Glasgow, claims to have succeeded in producing a form of crystalline carbon closely related to diamond, especially in the quality of hardness; rubies, sapphires, and natural diamonds having been deeply scratched by the "artificial diamond." We await the publication of the process by which the long-sought-for result has been obtained. In all likelihood diamonds will soon become plentiful and their price within easy reach.

ABOUT four years ago the British Government decided that the sum of four thousand pounds be annually devoted to the encouragement of original scientific work. Labourers in Science in Great Britain and Ireland have received due allotments of this grant; but as the limit of five years was attached to it, the question is now under consideration whether "it is desirable in the interests of Science, that the fund should be maintained," and, if so, in what form?

THERE is an ingenious contrivance known as the "Locomotive Indicator," made use of with great profit in the United States. At regular intervals it is sent out to indicate the condition of the track. This is done by means of a machinery of wheels and a ribbon of paper. The wheels are put in motion by the movement of the locomotive, and at every jolt, caused by a defect in the track, the paper band receives a mark from the wheels. Every mile is also marked, so that the locality of any fault in the line may be easily determined.

IT has been proposed by Professor Hagen, of Harvard, to substitute diluted yeast for "Paris Green," Hellebore, and other poisonous substances heretofore employed for the

destruction of insects injurious to vegetation. He advises the use of yeast diluted with water and applied by a sprinkler or a syringe, particularly for checking the ravages of the potato-beetle, the cotton-worm, vine-pest, and Colorado grasshopper. On the surface of yeast there grows a parasitic fungus, that when the yeast is sprinkled on the potato-beetle, rapidly penetrates and traverses the internal organs such as the "tracheæ," and in a few days causes the death of the insect. This fungus acts very well as a ferment in the process of baking.

ANOTHER formidable animal is reported as discovered by the diamond diggers of South-western Africa. The natives, however, appear to have been well aware of its existence for a long time past. It is known among them as the "Bear-lion," which, according to the description given, seems quite an appropriate name. It is a combination of bear and lion, its colour being a tawny yellow with dark spots. The general outline of its body is lion-shaped, its legs comparatively short, thick and powerful, and its head and neck extraordinarily large. Its mode of progression is that of walking or running, and not by springing or bounding, as in the case of the lion.

"A NEW Point of Resemblance in the Respiration of Plants and Animals," is the subject of a paper read a few months ago by Dr. Jamieson, of Australia. The now well-known fact that plants as well as animals inhale oxygen and emit carbon-dioxide gas is there referred to by Dr. Jamieson, who asserts that oxygen in plants, as in animals, is but *loosely* combined, and is therefore readily parted with when other substances having a

strong affinity for oxygen come into its neighbourhood. The same writer expresses his belief that plants contain a substance very similar to the hæmoglobin of the animal kingdom.

MEAT that has been allowed to remain in brine for any considerable period loses much of its creatine or nutriment, only the non-nutritious and indigestible portions being left. Of course the most, if not all, of the nourishment has become mingled with the brine. Accordingly, the process of dialysis has been called into service for the purpose of separating and rescuing the best part of the meat from the salt liquor. The salt being a crystalloid will pass through the membrane and leave the albuminous colloid behind. The wonder is that this method had not been thought of and published long ago. It may undoubtedly be turned to good account in the navy and in marine exploring expeditions.

THOSE who had the good fortune to be students of Dr. Nicholson, while he so successfully discharged the duties of the Chair of Natural History in University College, Toronto, will no doubt be gratified by the perusal of the following extract taken from the London *Geological Magazine*, and referring to a new book "On the Structure and Affinities of the Tabulate Corals of the Palæozoic Period, by H. Alleyne Nicholson, M.D., D.Sc., etc., Professor of Natural History in the University of St. Andrews:"

"It might have been thought that the various memoirs on Fossil Corals which have been written by Edwards and Haime, Lindström and other palæontologists, including Dr. Nicholson himself, would have pretty well exhausted all that could be said on the subject, and rendered a fresh work almost

unnecessary; but a glance at the contents of this elaborate book at once shews that it is no mere recapitulation of what has already appeared in previous publications, but that it contains a great amount of additional knowledge respecting this division of fossil corals. This is not owing so much to the description of new forms, but rather to the results obtained by the examination of microscopic sections of forms already known. Whilst it is true that this method of investigation involves, in the preparation of thin transparent sections, a vast amount of preliminary work which only those who have undertaken a similar task are capable of estimating, there can be no doubt that it is only by this means that reliable evidence can be obtained and satisfactory conclusions drawn as to the true characters and affinities of these fossil organisms. Dr. Nicholson may be said to be the first to apply, to any extent, the microscopic method of investigation to elucidate the structure of fossil corals; and the results which he has obtained serve to shew in a striking manner the importance and necessity of microscopic examination in determining the intimate structure of corals. The great amount of material which the author has been collecting for many years past from those localities in Britain, the continents of Europe and America, which have yielded most of the known fossil tabulate corals, has enabled him to carry out the task of a critical description of these forms with the great advantage of being able, at will, to compare and collate the specimens in his own cabinet. Though this book treats of the Palæozoic *Tabulate* Corals, the author fully recognizes the necessity of abandoning this division as a natural group, and distributing the various families and genera included therein by Edwards and Haime amongst the other divisions of the Actinozoa."

PUBLIC SCHOOL DEPARTMENT.

[Contributed to, and under the management of, Mr. S. McAllister, Headmaster of Ryerson School, Toronto.]

IN another department occasion was taken last month to speak of the interesting reports of the Model School Masters of Ontario upon the deficiencies of their Pupil-Teachers. It was shewn how alarmingly the lack of energy prevailed among these young people, and the writer indicated in a few words how this might be accounted for; but the subject is so important, and is so far from being exhausted, that it may be recurred to at a future time.

In the meantime we wish to direct our readers' notice to another defect that appears painfully frequent in these reports :

INABILITY TO SECURE AND TO SUSTAIN
ATTENTION.

Attention has been defined as "the direction of consciousness." In its absence the mind cannot employ its receptive power in absorbing knowledge, nor its productive power in using it. A person, for instance, may sit in a room for hours and not notice the ticking of a clock at his elbow, nor be able to tell whether it strikes or not. A scholar may have the attitude of a careful listener, but it is only the skilful teacher who can tell whether his consciousness is directed to the lesson that is going on, or to the games of the playground. With young children attention is not the result of an exercise of the will; it is an involuntary effort induced by the pleasurable sensations that accompany or follow its exercise. A child will give attention to a story only so long as the incidents create a pleasant mental excitement. He will look through a book while the variety of the pictures interests him; he will attend to a lesson if it is made attractive

to his senses by pleasant sights or sounds, to his imagination by illustrative stories or anecdotes, or to his thinking powers by giving his mind something to accomplish, which may impart to him a sense of power. Froebel wisely recognized these varied resources for training children, and his system is largely based upon their use. By means of pleasant games and play, children can be led to give attention to subjects that develop their observing as well as their thinking powers, and thus they acquire a knowledge of colours, form, number, etc., without having one formal lesson given on any of these subjects. The great lesson that Froebel's method teaches us is that before we can secure the attention of children we must

AROUSE THEIR INTEREST.

The weak and unwise teacher will try to do this by whipping, but this is like driving unwilling soldiers to fight at the point of the bayonet, or trying to straighten a crooked sapling by an occasional push. The judicious teacher will have means of doing this without violating that harmony which is one of the charms of the school-room. An anecdote or short story, a few discursive remarks, leading up to the subject to be taught, will generally get children's minds into the attitude of attention. We say *generally*, for there will still be some sluggish ones with whom these resources will prove ineffectual. Another resource remains, their self-love. Try to elicit some observations from them, either as information or as criticism, and you will thus create an awakening that may have the same effect on the mind as a stone thrown into still water. In all efforts to secure

attention we should make what is already known a stepping-stone to what we want our scholars to know. In fact we should follow the fundamental rule of all correct training—proceed from the concrete to the abstract. In teaching reading, for example, you can only secure general attention by having a running commentary upon every sentence that is at all difficult either to understand, or to read. This commentary should come as much as possible from the scholars, even at the risk of its being a little irrelevant. When attention is once secured, do not weary your scholars by making the lesson too long, nor perplex them by too much repetition, nor overtask them with too many points to be remembered.

The attention of those disposed to be idle should often be tested by asking them what the last question or answer was, what you are explaining, or what has been explained; and that of the whole class should be put to the proof by seeing how many can reproduce what you or some scholar may have said immediately before, particularly if that has been important. It is by such expedients as these that we should aim at making attention what it should be, a habit.

As pupils advance in age, their growing intelligence comes to the aid of the teacher in securing attention; their varied knowledge creates a desire for further acquisition. Any subject that forms part of the stock of digested knowledge can be added to with ease, and perhaps with pleasure; hence attention becomes anything but irksome, and can be given with the full co-operation of the will. Every teacher, to make attention a habit, should try to make each scholar a *good listener*; the task of securing it then ceases to be one of the heaviest duties.

As another aid to sustained attention the teacher should, in every subject he teaches,

KEEP AHEAD OF HIS CLASS.

He may then be able to contribute a spice of freshness from his own mental storehouse to what might otherwise be a stale and dry subject. The scholar will then feel that a lesson is not taught merely because it is pie-

scribed in the time-table, but because his teacher has something valuable to impart in connection with it.

One important result that follows from the habit of attention is the

IMPROVEMENT OF THE MEMORY.

Memory is as much dependent upon attention as attention is upon the interest we take in any subject. It cannot be exercised unless a distinct impression is made on the mind, and this can only be done while attention is active. The more fixed this is, the stronger is the memory. The teacher should be ever on the watch to foster this state of mind. Everything should be avoided that would distract attention. There should be no unnecessary noise on the part of either teacher or scholars, no interruptions by trifling questions, no waste of time by the teacher's having to watch disorderly pupils. There should be no undue wandering from the subject, unless the bye path leads to a richer pasture; and there should be no distraction to attend to the heating and ventilation of the room. These should be arranged before the lesson begins. Attention cannot be sustained with young scholars unless there are spells of physical exercise every half-hour at least. Even the oldest scholars will have their power of concentration invigorated by calisthenic movements at least every hour.

We cannot finish these remarks better than by giving the rules a United States writer lays down for securing and maintaining attention.

Rule 1.—Interest the Pupil. This is the fundamental means of securing, as well as of cultivating, the power of attention. The teacher must have something good to present, and must present it in a suitable manner. Study the secret springs of interest. Keep curiosity and the thirst for knowledge always active. Repulsive lessons, and forced work, are educational mistakes. They repel and repress, rather than develop the power of attention. It is glad activity that gives culture. When study is made more interesting than play, pupils unmasked, give the utmost attention. By interest and management, not by force, the soul is reached.

Rule II.—Win Attention by Endless Variety. Avoid all routine, all monotony, all prosy explanations. Make everything *real*. Flash upon the class your information and your explanations. Inspire the class with the new and the fresh. Never repeat yourself. Create activity and gain attention by constant surprises.

Rule III.—Foster Attention by a good Elocution. Don't talk much. Don't talk loud; never scold; and seldom repeat. Talk to the point, be in earnest, and keep in mind that "words fitly spoken are like apples of gold in pictures of silver." As the magnet attracts the needle, so does good elocution attract attention. Where the elocution is good it is seldom necessary to ask attention. It is hard for any one to give attention to droning, inarticulate, monotonous, lifeless utterances.

Rule IV.—Compel Attention by Right Class Management. Each member of the class is held responsible for the entire lesson. Each one may be called on at any moment. Inattention is made a serious disgrace. Questions are asked but once. Topic and question, individual and concert answers, written and oral work, are duly intermingled. The pupils are learning, not merely reciting. Most minds are somewhat sluggish, and work well only under pressure. The skilful teacher incites without exciting; presses without forcing; instructs without repressing self-helpfulness; inspires without confusing.

Rule V.—Maintain Attention by Frequent Change of Position. If kept in one position long, it is a constitutional necessity that pupils should become restless and inattentive. Now have them stand, now sit; now have them work on the board, now explain; now have them answer individually, now in concert; now give a moment's exercise, or vary the position in some way, and thus make attention possible and pleasant.

Rule VI.—Promote Attention by Using your Ears and Eyes. The entire class and the entire school must be seen and heard. All symptoms of inattention must be noted at once, and the remedies applied. Stupid teachers who see but a part of the class, and of the school, foster inattention. Sensible teachers will not continue the lesson for a moment without attention. The alert teacher promotes attention by always being wide awake.

Rule VII.—Cultivate Attention by frequency of Repetition. During each recitation, the leading features of previous lessons are required. Because they are required to use continually their knowledge, pupils learn to give close attention. Studying merely to

recite is a fatal error. The lesson of to-day is forgotten to-morrow. Now, nothing can be said to be well learned until it has been often before the mind. Then, children delight to do that which they can do well.

Rule VIII.—Stimulate Attention by Rewarding it. Always have something interesting and valuable to present. The teacher supplements both the book and child's experience. He is a great student. He constantly interrogates nature. His knowledge is always fresh and sparkling; it is at once wider and more specific than that derived from text-books. He opens up to the child's mind new beauties and new wonders. Curiosity is kept active. Every energy is aroused. The pupil grows strong as well as wise, and the power of ready and penetrating attention becomes a life habit.

Rule IX.—Shew that Attention is essential to Success. Your own observation will furnish many examples. Each successful life is an example. Each pupil's experience will illustrate the rule

HOW TO OBTAIN A FIRST-CLASS CERTIFICATE, GRADE C: NON-PROFESSIONAL.

1. The non-professional examination for First-class, grade C, shall be separate from that for First B or First A.
2. All candidates must take that for grade C before being eligible to be examined for grade B or A.
3. The examination for grade B or A shall take place in each year after that for grade C. Subjects and authors to be read:

English Language and Literature.

GRAMMAR.—A thorough acquaintance with the subject will be required.

COMPOSITION.—Candidates will be required to shew by passing an examination in this subject, and by the character of their answers in other subjects, that they are in the habit of writing the English language correctly.

ETYMOLOGY.—Candidates will be required to know the prefixes, the affixes, and the principal Latin and Greek roots, and to be able to analyze etymologically the easier words in the Reading Books.

LITERATURE. — Candidates will be required to have a general acquaintance with English Literature and its history, and a fuller knowledge of special eras and authors to be prescribed from time to time by the Department.

The subjects prescribed for the examination in 1880 are—

Julius Cæsar—*Shakespeare*.

An Elegy in a Country Churchyard—*Gray*.

The Traveller—*Goldsmith*.

The Spectator—Papers 106, 108, 112, 115, 117, 121, 122, 123, 125, 126, 131, 269, 329, 335, 517—*Addison*.

Johnson's Life of Addison.

Macaulay's Life of Johnson.

No particular editions of these texts are prescribed, but the following good ones are mentioned in order to aid candidates :

The edition of Julius Cæsar in the Clarendon Press series.

Morley's Spectator.

Mathew Arnold's Johnson's Chief Lives of the Poets. This contains both Johnson's Life of Addison and Macaulay's Life of Johnson.

History and Geography.

HISTORY.—A special knowledge of the History of England between 1688 and 1820, as presented in Green's Short History of the English People, and in Hallam's Constitutional History, chapters 15 and 16.

GEOGRAPHY.—North America, Europe and the British Empire.

Mathematics.

ALGEBRA.—Fundamental operations ; Involvement and Evolution ; Resolution into Factors ; Principle of Symmetry ; Theory of Divisors ; Fractions ; Ratio, Proportion and Variation ; Theory of Indices ; Surds ; Arithmetical, Geometrical, and Harmonical Progression ; Scales of Notation ; Permutations and Combinations ; Introduction to Binomial Theorem ; Simple and Quadratic Equations, with relations between Roots and Coefficients ; Problems.

ARITHMETIC AND MENSURATION.—To know the subject in theory and practice. To be able to solve problems with accuracy,

neatness, and despatch. To be familiar with rules for Mensuration of Surfaces and Solids.

GEOMETRY.—Euclid, Books I. to IV. (inclusive), Book VI., and definitions of Book V. Exercises.

Elementary Mechanics.

STATICS.—Equilibrium of Forces acting in one Plane ; Parallelogram of Forces, Parallel Forces, Moments, Couples, Centre of Gravity, Virtual Work, Machines, Friction, Experimental Verifications.

DYNAMICS.—Measurement of Velocities and of Accelerations ; Laws of Motion, Energy, Momentum, Uniform and Uniformly Accelerated Motion, Falling Bodies, Experimental Verifications.

HYDROSTATICS.—Pressure of Fluids, Specific Gravities, Floating Bodies, Density of Gases as depending on Pressure and Temperature, Construction and use of the more simple Instruments and Machines.

Physical Science.

CHEMISTRY.—Definition of Chemistry and of chemical action. Indestructibility of matter. Simple and compound substances. Laws of chemical combination by weight and by volume. Principles of chemical nomenclature. Symbolic and graphic notations. Classification of elements into metals and non-metals, into positive and negative elements.

Theory of atoms and molecules. Empirical, molecular, and constitutional formulæ. Absolute, latent and active atomicity. Classification according to atomicity. Atomic and molecular combination. Graphic formulæ. Definition of simple and compound radicals. Chemical equations.

French and English systems of weights and measures. Their convertibility. Expansion of gases by heat. Reduction of gaseous volume to standard pressure and temperature. Calculation of the weight and volumes of gases. Calculation of chemical quantities by weight. The crith and its uses. Calculation of empirical formulæ from percentage composition.

The preparation and properties of hydrogen, oxygen, nitrogen, carbon, chlorine,

bromine, iodine, fluorine, sulphur, silicon, boron, phosphorus, and arsenic.

The allotropic modifications of oxygen, carbon, sulphur, boron, and phosphorus.

The preparation, properties, and composition of water, hydrogen peroxide, the compounds of nitrogen with oxygen and with hydroxyl, ammonia and the ammoniac salts, carbon monoxide, carbon dioxide, carbonic acid, the carbonates, light carburetted hydrogen, acetylene, heavy carburetted hydrogen, hydrochloric acid, the oxides and oxyacids of chlorine, bromine, and iodine, hydrobromic, hydriodic, and hydrofluoric acids, the oxides and oxyacids of sulphur, hydrogen sulphide, hydrogen disulphide, carbon disulphide, silica, silicic acid, silicic hydride, boron trioxide, boric acid, phosphuretted hydrogen, the oxides and oxyacids of phosphorus, arseniuretted hydrogen, arsenious and arsenic acids, and the arsenic sulphides.

Manufacture of hydrochloric, nitric and sulphuric acids. Composition and manufacture of bleaching powder. Theory of bleaching. Structure of flame. Suitability of water for domestic purposes. Causes of temporary and of permanent hardness of water. The atmosphere, its constitution; effects of animal and vegetable life upon its constitution. Names and formulæ of some of the more important silicious minerals.

The chief properties of the following named metals; their reduction from their ores; and the preparation, properties, and composition of their more important compounds; the monad metals, especially potassium, sodium, and silver; the dyad metals, barium, strontium, calcium, magnesium, zinc, cadmium, mercury, and copper; and gold, aluminium, lead, platinum, nickel, cobalt, iron, manganese, and chromium.

Manufacture of soda-ash, glass, porcelain, and earthen-ware.

HEAT.—General effect of heat upon the volumes of bodies. Experiments illustrative of the expansion of solids by heat. Coefficients of expansion, linear, superficial, and cubical. Illustrations of precautions which changes of volume by heat and cold render necessary in the arts. The gridiron pendu-

lum. Construction and use of the mercurial thermometer. Centigrade and Fahrenheit scales and the conversion of the readings of either into those of the other. Dependence of the boiling point of water upon external pressure and illustrations of this dependence. The temperature at which the maximum density of water occurs, and the effects of this in nature. Change of volume when water passes from the liquid to the solid state and the effects of this in nature. Bursting of water-pipes in frosty weather. Other substances which expand on solidification. Experiments illustrating the expansion of gases. Principle and action of the fire-balloon. Principles of ventilation. The Sun's action in the generation of winds. Explanation of the Trade Winds. Constancy of the coefficient of expansion of gases. The small deviations from the general rule exhibited by carbonic and sulphurous acid gases, and the chemical and physical character of these gases. The chemical and physical constitution of aqueous vapour and its diffusion through the atmosphere. Meaning of the term *saturated* as applied to air charged with vapour. The effect of expansion in chilling air, and the consequent condensation of the aqueous vapour diffused through the air. Application of this knowledge to the explanation of clouds and rain. Meaning of specific heat or capacity for heat. Description and use of the calorimeters of Lavoisier, Laplace, and Bunsen. The facts covered by the term *latent heat*. The latent heat of water and of aqueous vapour expressed in the centigrade and Fahrenheit scales. Conduction and convection, and the distinction between them. The low power of conduction of organic substances. Effect of mechanical texture on the transmission of heat, and the function of the clothes in preserving the body from cold. Character and phenomena of combustion. Chemical actions which occur in the combustion of coal and of ordinary gas. Explanation of the manner in which a candle flame receives its supply of combustible matter. The cause of animal heat. Structure of an ordinary gas flame, and the cause of the difference between this flame

and that of a Bunsen's burner. General phenomena of radiant heat. Reflection and refraction. Different powers possessed by different substances to radiate heat. Explanation of how it is that under certain circumstances

the cooling of a vessel may be hastened by surrounding it with flannel. Reciprocity of radiation and absorption. Meaning of the term *diathermancy*. Manifestation of this property by different bodies.

HIGH SCHOOL DEPARTMENT.

LEGISLATIVE APPORTIONMENTS TO HIGH SCHOOLS.

WE have to record another phase in the history of Payment by Results—another instance of the short-sightedness of Mr. Crooks' official advisers—another proof of the correctness of the views held by those who opposed the system as it has been administered.

The distribution of the High School grant for 1880, will, according to the Departmental notice, be as follows :—

1. 105 High Schools at \$450 each	\$47,250 00
2. Average attendance	13,500 00
3. Results of the Intermediate	10,000 00
	\$70,750 00

The total allowance to each High School will be the sum of the amounts distributed to each under the foregoing heads. The balance of the Legislative Grant is expended in the payment of the special grant of \$750 each, to thirteen Collegiate Institutes.

As compared with the scheme which has hitherto been carried out, the new one presents the following points of difference :—

1. The apportionment per unit of average attendance has been increased.
2. The fixed grant to each school is now \$50 more than formerly.
3. The amount hitherto distributed on the Inspectors' special reports struck out.

All that is now left of the 1875 scheme is the annual Intermediate. The most imaginative of the Departmental officials can no longer persist in misnaming the system.

The increase of the fixed grant will, no doubt, give general satisfaction. Like all

favours, it is acceptable so far as it goes; but unfortunately it doesn't go very far. Considering the increased expenditure now incurred in connection with nearly every High School, it will be but a drop in the bucket—a help probably to the lowest grade of schools, but almost inappreciable in the case of those—and they are now many—whose annual expenditure is from \$4,000 to \$8,000.

There is one feature, however, in this amended scheme, which will recommend itself to High School Masters; the Inspectors will no longer manipulate any of the money. This is only what we anticipated would happen, as soon as the matter had been brought fairly before the Minister of Education. When we look back on the past few years of the history of our High Schools, it seems incredible that this part of the original plan, burdened as it was, could have been tolerated so long. It has done few schools any good, while it has injured very materially the prospects and state of others. Even had all the men entrusted with the appraisal of the ability of the Masters, the character of the work done, and the other *et cetera* on which the elaborate scheme was professedly based, been distinguished for broad as well as high scholarship, and for unblemished reputations, fault would have been found with their decisions. Is it any wonder, under the circumstances, that there have been murmurs, not loud but deep? We do not say that there has been good foundation for the charges, but the public prints have not been silent on the question. This portion of the scheme, which by independent masters has all along been

strenuously opposed, has been from beginning to end a delusion and a snare. Intended to be an accurate and trustworthy estimate of the condition of our schools, and of the capabilities of the teachers, it attempted what in the very nature of things is impossible. The worst feature in the whole business has been the production of a spirit of toadyism that has occasionally shewn itself, when a more manly course might have been expected. The best interests of the profession require the existence of a proper *esprit de corps*, and, in our opinion, nothing has done more to suppress this than the system we are discussing.

This part of the scheme was emphatically the Inspectors'; but like most of their original notions, it has turned out to be an abject failure. The misfortune will not, however, be without its advantages, if Mr. Crooks has discovered that there is intelligence outside of the official circle. In the report of 1875, the Inspectors make the following remarks in reference to the distribution of a part of the grant, on the results of inspection: "Thorough inspection is admitted to be absolutely essential; but it does not accomplish its important purposes unless it bestows on efficiency a pecuniary reward, and visits inefficiency with a pecuniary penalty. Teachers and school authorities should understand that substantial advantages depend on the results of the personal examination of the schools by the Inspectors." Taking the statement made by themselves of the essential part of their duties, we submit that it is now a question for consideration whether, in view of the condition of the Province, and the existence of other reliable tests, the Government is justified in spending on the inspection of 105 schools almost as much money as it awards on the results of the Intermediate. We have always thought that two energetic and competent men might, by devoting themselves exclusively to their own business, do all the work required. It is true, they might have little time for Teachers' Conventions; but the propriety of engraving on the duties of a High School Inspector those of the itinerant lecturer is not obvious to the ordi-

nary observer. What we need is less buncombe and more genuine work. This subject, we make bold to say, is one which will force itself on the attention of the Ministry.

While we are glad to see that the per caput allowance on the total average has been increased, we regret that the grant to be distributed on the Upper School average has fallen off. This we regard as a mistake. There are few schools now that have not an Upper School of some description, and in the progress of improvement even the present state of matters will improve. Just as under the old plan the middle grade of schools will suffer. The weak ones will receive comparatively liberal support: the Collegiate Institute grant will, in the case of a few schools, do something towards supplying adequate Legislative aid; but the High Schools on the border line of the latter will still suffer. An increase in the amount to be apportioned on Upper School attendance would, in some measure, obviate the difficulty without interfering with the claims of those of the lower grades. We should much prefer to see the grant on the total average remain unchanged, if increasing it is to have the effect of diminishing that based on the Upper School attendance. But we shall return to this subject in another number. We cannot refrain, however, from impressing on Mr. Crooks the great necessity there exists for promptness in the matter of the payment of the Legislative grant. It is now generally two months after the close of each half-year before the High School Treasurer receives the amount, and in many places the delay is productive of serious inconvenience. We trust that the Minister will give this matter his serious consideration. He has done much to improve the condition of our schools. He is admittedly anxious to do his utmost to make them more prosperous. We need hardly assure him that promptness is a necessary adjunct of liberality—*Bis dat qui cito dat.*

OFFICIAL INTERFERENCE IN THE APPOINTMENT OF TEACHERS.

SOME time ago an Education Office official took upon himself to recommend

for a vacant position a teacher with whom he had some acquaintance. An appeal to the Minister against the course adopted provoked the following reply, which has been handed to us for publication, and which deserves a wide publicity :—

EDUCATION DEPARTMENT, ONTARIO.

SIR,—I am directed by the Honourable the Minister of Education, to state, in reply to your letter of the 1st instant, that he has personally considered the question raised in your letter of the 1st instant, and is prepared to recommend to the Principals and Masters of the Normal Schools, and High School Inspectors, the propriety of abstaining from assenting to go so far as to recommend any one for any position as Teacher in the High or Public Schools.

It is not part of their official duty to give any recommendation whatever. The results of the training of the candidates are best expressed by the certificates which each one obtains after being subjected to the required tests.

The Minister has directed this to be made generally known, so that any such practice may be discontinued.

I have the honour to be, Sir,

Your obedient servant,

ALEX. MARLING,
Secretary.

In recording our satisfaction with this statement of the Minister's opinion, we must express the hope that it will not be ignored as some others of the Regulations have been. As a case in point we may instance what we believe to be a fact that, although the Normal School Masters are directed to accompany their students to the schools they visit, the Regulation is quietly ignored in Toronto at any rate.

In the foregoing letter the Minister himself gives some excellent reasons why what had actually become a custom in official circles should not be permitted. We may add that the permission to recommend to situations would confer a dangerous power on those whose position gives weight to their words. "It is human to err," and amongst the Departmental officers there seems to be a remarkable amount of "humanity." The unscrupulous Inspector might, of course, use this as one of the most effective means of building up his influence in the country, and

of keeping at his back a body of men whose better judgment would be warped by their feelings of gratitude. It is hardly likely either that the Inspector would like to report adversely on the work done by one who owed his appointment to his influence. The effect of such permission on the morale of teachers is also bad. It interferes with their freedom of action, and dwarfs that feeling of manly self-reliance that should characterize the teacher above all men. It is no secret that "hundreds of deserving men" have met their reward owing to a liberal exercise of this recommending faculty, but we hope that now that the Minister is asserting himself, this Regulation will be strictly enforced.

ENGLISH COMPOSITION AT THE INTERMEDIATE.—We would suggest to the Minister a change in the mode of conducting this part of the Intermediate Examination. It would be well for the Examiner to indicate the length of composition expected from the candidate, and to vary the mode of examination: theme-writing should not be the only test of a student's capabilities at this stage of his progress. It is also worth while to remark that there are others besides teachers examined, and that the subjects should be such as are familiar to all. At the last Intermediate, of four theses proposed, only one was general in its character. This is unfair to the ordinary High School pupil for whom this is often the most difficult of the tests.

THE Senate of Toronto University has just made its appointments of the Examiners in Arts for the present year. They comprise the following :—Classics: D. H. Fletcher, M.A.; F. W. Kerr, B.A.; and Rev. F. H. Wallace, M.A. Mathematics :—Chas. Carpmacel, M.A.; A. K. Blackadder, B.A.; and F. E. Hayter, B.A. Mental and Moral Science :—Prof. G. P. Young, M.A., and Rev. Prof. John Campbell, M.A. English and History :—F. E. Seymour, M.A., and J. H. Long, B.A. Modern Languages :—Rev. Jas. Roy, M.A., and Rev. Reinhold Von Pirch. Oriental Languages :—Rev. John M. King, M.A. Mineralogy and Geology :—Geo. M. Dawson, F.G.S.

CONTEMPORARY LITERATURE.

ORIGIN OF THE HOMERIC POEMS. A lecture by Dr. Hermann Bonitz. Translated from the Fourth German Edition by Lewis R. Packard. New York: Harper & Brothers; Toronto: James Campbell & Son.

THIS lecture of Dr. Bonitz adds another contribution to the now somewhat voluminous literature on the Homeric question. It contains an excellent digest, in the shape of appended notes, of the main features of the controversy viewed from a German standpoint. Since the days of Wolf's celebrated *Prologomena* the question has assumed, varied forms, and while the lecture in question by no means settles the points in dispute, we recommend its careful perusal to all students of classical literature as an earnest endeavour to narrow the difficulties of arriving at a satisfactory conclusion. We shall endeavour to give a brief resumé.

The influence of the Homeric poems on subsequent literature is manifold. The tragedians were eminently indebted to him—the historians accepted his legends—the philosophers considered him an oracle of the national faith—while even the most eminent of Greek sculptors borrowed the idea of his celebrated statue of Olympian Zeus from the description found in Homer. This influence was further extended by Solon ordering the recital of these poems at the Panathenæo, and from this time no doubt every Athenian youth was taught the poems of the divine bard. The argument, which in many respects is similar to that of Wolf, may be briefly stated thus: "The *Iliad* and *Odyssey* are not the works of a single poet, but each of them—certainly the older of the two, the *Iliad*—is made up of separate songs of different poets. Trojan legends were in circulation among the Greeks, each giving an account of a single action, designed to be

accompanied by the lyre and to be sung on festive occasions. In course of time the songs were arranged." The author then assumes as proved the question that the *Iliad* and *Odyssey* were not originally committed to writing, and considers that the question of the plurality of authorship can only satisfactorily be settled by examining the self-consistency of the poems themselves. Lachmann first gave an impulse to this part of the dispute and regarded this as the only solution of the difficulty. Dr. Bonitz then enumerates the various poems included by the ancients as Homeric, such as went under the general name of "Troica," and concludes that the Alexandrian grammarians were the first to limit the authorship of Homer to the *Iliad* and *Odyssey*.

"But not only did the ancients differ as to what poems were Homeric and what were not, but we also find that the dates of the age of Homer vary from the eleventh century to the eighth, or a period of about 400 years. The *Synmæan* traditions place him in the eleventh century, the Chian in the tenth, the Samian and Herodotus in the ninth. These facts lead us to conclude that the name Homer signified nothing more than the rise of epic poetry at a particular point, and the sequence of dates marks the gradual development of this class of composition over the shores of Western Asia." Such are the main arguments affecting the traditional statements of the Homeric question. His arguments as to the self-consistency of the *Iliad* may be stated as follows: The events recorded in the main part of the *Iliad* occupy three days. The adventures of the first day are recorded in *Il. ii.-vii.*; those of the second day in *Il. xi.-xviii.*; while those of the third day comprise *Il. xx.-xxii.* In describing the second day's conflict, after some eighty lines we are

told that when the sun was ascending the battle stood undecided, and after five books of shifting narrative requiring considerable time for incidents such as the battle at the Greek camp—the storming of the gate—the help of Poseidon to the Greeks—Hera's trick in beguiling Zeus to sleep—Zeus aiding the Trojans—the retreat of the Trojans—their renewal of the attack—and numerous other incidents, we are still told that the sun is high in the heavens (Il. xi. 86, cf. Il. xvi. 777). We also find the description in battle in Il. xi. 824 inconsistent with that recorded in xii. 35-39; Poseidon enters the conflict in two ways irreconcilable (Il. xiii. 10-39, cf. Il. xiii. 345-360); the two prayers of Zeus are incompatible with the immediate future (Il. xi. 193). We have two different accounts of the death of Patroclus (Il. xvi. 793-815, cf. Il. xvii. 13, 16, 125, 189, 204). Many other examples might be adduced of contradictions. When we turn to the accounts of the first day's conflict we find this occupied with the details of the prowess of individual heroes. The conflict of Paris and Menelaus—the exploits of Diomedes and Glaucus—the interview of Hector and Andromache are all evidently separate lays. While Diomedes wounds Ares, he himself is wounded by an obscure enemy. All these facts go to prove that the composer of the Iliad had separate songs of early origin—that he blended them into his own poem without any material alteration, that these seeming contradictions arose from this combination of earlier lays. However the very fact of a great poem being formed from such lays shews a high development of the Greek Epic.

The Odyssey may have originated in a single poetic conception, although made up of separate materials. The argument of original authorship is mainly derived from the fact that all the incidents are grouped around one central figure. An examination however reveals the fact that there are two or three threads of the story ingeniously interwoven. The journey of Telemachus—the wanderings of Ulysses—the occurrences in Ithaca, form the whole poem. In regard to

the first part we have two minor *voστολ* namely those of Nestor and Menelaus related in Odyssey iii.-iv. We also find the character of the hero completely changed, and in the later books Ulysses plays rather the part of a buffoon than a hero. The style is altogether different in the later books as compared with the first. Many minor points of difference might be mentioned did space permit. These are the chief arguments of Dr. Bonitz. Some of these points have been anticipated, and while as we have already said, this lecture by no means puts at rest the vexed question of the authorship of the Homeric poems, we still recommend its careful perusal to our readers assured that such perusal will well repay them for their time spent.

SHAKESPEARE'S KING JOHN. Edited by W. J. Rolfe. New York: Harper & Brothers; Toronto: Willing & Williamson.

WE have had occasion in previous issues of this magazine to notice the other plays of this series. While recommending the book as excellent for the general reader, it seems to us that there is too much in vogue a custom of interlarding our English classics with useless notes. We have laid before us a great deal of this man's and that man's opinion about Shakspeare, and we are apt to make this the chief point of study while we leave the real Shakspeare in the background. However valuable the notes and commentaries of different editors may be, English literature ceases to be valuable as a factor in education if it is confined to these. The tendency of examinations fosters this abnormal method of studying literature, and we were sorry to find in the last Matriculation Examination at Toronto University, papers set which practically ignored the authors prescribed. As examinations are now conducted by our examiners we know of no better books than those of Rolfe. They are excellent for getting up *points that will be asked*. For the real purposes of education however we must recommend the Clarendon Press Series.

EDITORIAL NOTES.

ENGLISH SCHOOLS AND HER
MAJESTY'S INSPECTORS.

FROM our recent English professional Exchanges there would seem to be a great outcry at present in the Government Schools against that distinguished class of educational workmen known as Her Majesty's Inspectors. The greater number of that body, it is admitted, are men of culture, and estimable gentlemen. Not a few, it would seem, however, are neither the one nor the other—their "University culture," it is asserted, being "the veriest veneer, not even able to sustain the weight of good manners." This charge, in brief, covers the whole ground of complaint, though the specific offences are many and heinous. In the main, ignorance and want of experience as practical schoolmasters, are said to have led the offending inspectors into trouble, though the loudest complaints come from teachers who have been the victims of their arbitrary conduct and boorish manners. So outrageously have some of these gentlemen acted, in their personal contact with the profession, that they can scarcely be said to have taken their manners from the Court, though they plume themselves upon their official "H. M." rank, and give themselves airs as representing "My Lords" of the Educational Council. It will be understood, of course, that the officials who have been conducting themselves so offensively are not many in number, though they are sufficiently numerous to have incited to rebellion not a few masters and school-boards in various parts of the Kingdom. To enumerate the charges in detail would be to take up too much of our space, though did we do so, it would doubtless be considered "spicy,"

if hardly profitable, reading. A few, however, may be given, which include "favouritism of the worst and most pernicious character," "flagrant breaches of gentlemanly courtesy," together with vagaries of all sorts, and a variety of other indictments, such as criminally underrating certain schools, and spitefully procuring the dismissal of teachers, or the suspending of their certificates, without just or reasonable cause. In one instance, a complainant speaks of a certain Inspector as resorting to "bullying and catchy tricks." Another says, "in ten years' experience as a teacher I have never met with such an Inspector, and with such an Inspector I never hope to meet again on this side of heaven!" Still another remarks, "the unknown dread of this annual farce (inspection) had quite as much, if not more, to do with the lamentable results in my school at the last inspection. I have verified this incontestably, because when another inspected the extra subjects, some days subsequently, the children were overheard to say that they would not be afraid to answer him (Inspector); and, I must admit, they satisfied me immensely by their bright and eager answering." From such accounts the statement is not to be wondered at that large numbers of the profession are disheartened in their work, and that they despair of the future. Some of the "hotspurs" are, however, shewing fight, and with the school-boards at their back, are, in a lively way, "going for" the patronage system which has foisted these obnoxious gentlemen into the inspectorate. The result will be looked for with a keen interest by more than the educationists of the mother country.

ONTARIO SCHOOLS AND THE DEPARTMENTAL INSPECTORATE.

IN following the foregoing account of the serious breach in England between Head Masters and some of the Inspectors with a few words on the relationship which exists here between the same classes, we trust that we shall not be considered as desiring in the slightest degree to disturb the harmony which, in the main, happily prevails in educational circles in Ontario. Recent events, however, indicate, as yet perhaps feebly, that the course of true love between High School Masters and the official Inspectors of the Province is not likely to continue to be free from the infelicities which usually mark so intimate a relationship. For the present we shall keep out of view the relations that exist between Public School teachers and those numerous, and in most cases, excellent functionaries, the County Inspectors; though, at another time, we may have something to say of matters that mark and affect that relationship. The office of a High School Inspector is admittedly one which exacts arduous labour, and imposes a serious burden of responsibility. As one of the prizes of the profession, in view of the onerous duties of the office, it is difficult to know wherein lies its attraction. It is true, the salary is a good one, and the Public Accounts shew that it can be considerably supplemented. But the work, unquestionably, must often be disagreeable and exacting. It involves frequent and often lengthy absence from home, with but few of the pleasures, and little of the comforts, of travelling. In the remoter districts of High School location, the experiences of the visiting officials must often be greatly and disagreeably aggravated. Added to all this, there are the delicate duties to be performed which connect themselves with the objectionable system of "Payment by results"—a system which must place a great strain on the mental, moral, and physical powers of the conscientious Inspector. Verily, his duties, if undertaken in the right spirit, and ruled by principle, are not to be coveted. In the spirit in which we de-

sire to write of so useful a class of men, we must frankly and fully say this much for the High School Inspectors.

On the other hand, there attaches to their position coveted official rank, Departmental consideration, and the pleasing accompaniments of professional and social distinction. In contrast with these, the High School Master occupies not only a less exalted professional position, but one oftentimes made irksome by its dependence upon the good faith and friendliness of the Inspector. His work, moreover, is greater, and its pecuniary rewards less, than are those of his more favoured brother. In preferment, too, he is at a disadvantage, as the step from the Inspector to the Minister is a more possible one than is that of even the Head of a Collegiate Institute. This, at least, we judge from the one-time aspirations of a certain politician-Inspector. In view of these contrasts in position, what, it might reasonably be asked, should be the relations existing between the two classes of men? Certainly not those that breed suspicion of, and harassingly molest, the High School Master. Still less should they be those that manifest arrogance and breathe hostility, on the part of the Inspector. So far from there being displays of such a spirit, there should be the most cordial understanding, and a hearty interchange of the kindest feelings. There are few relations in which men stand to each other that more urgently call for the reciprocal expression of sympathy and regard than those subsisting between the men to whom we refer. Not only are enjoyable intercourse and social pleasure dependent upon the existence of mutual confidence and good will, but the interests of education can only be served by their presence and be promoted by their exercise. How carefully, then, should harmonious relations be cultivated, and no interests be allowed to disturb them, other than those which may unhappily have to be considered in the just performance of duty. The Inspector, of all men, should hold the balance evenly. He should attach himself to no clique; and have no interests save those with which he is professionally en-

trusted. Equally expedient is it that he should ride no hobbies, and have no axe to grind in his intercourse with the profession. Commercial alliances, we need hardly say, should be scrupulously shunned, and his hands, above all things, kept clean from publishing house subsidies. In the matter of examinations, here also should he be just. Many interests are dependent on his faithfulness, and large trusts are committed to his judgment and discretion. To be swayed by prejudice, or to be partizan from dislike, would be to degrade his judicial office. In all his intercourse, the Inspector should most shew himself a man of probity and of honour. Every act should be "above board," and there should be no tergiversation, no double-dealing. Confidence should be encouraged, and frankness responded to and respected. The contagion of good manners, moreover, should never be lost sight of. It is the best solvent of difficulties, and works "like a charm" upon irritation. In the class-room repellent looks and frigidity of manner should be alien to the place. "Bullying and catchy tricks," of course, are never the resorts of a gentleman. To no influence do the pupils more readily respond than to kindness of speech and a sympathetic mood. These should, therefore, be in large and constant exercise. Working in this spirit, the best results will wait upon the Inspector's labours. The profession, also, will be more closely brought together. In closing let us add, that the higher the Inspector's conception is of the principles that should govern his conduct, the more beneficently will he influence that of others.

SPECIMEN numbers of two new College Serials, representing undergraduate interests,

at Toronto and Trinity Universities, respectively, have recently come to our hand. "The White and Blue" appears under the auspices of University College Literary and Scientific Society, and is announced to appear every Saturday morning of the Academic year. "Rouge et Noir," is the *Quarterly* of the students of Trinity College, and the Post-Captains of that institution. A prosperous wind to the dual Argosy!

WE have received Inspector Somerset's "REPORT FOR THE COUNTY OF LINCOLN" for 1879. We are glad to notice that two of the most important subjects in the public school course—writing and spelling, show marked improvement. He urges greater attention, on the part of teachers, to neatness and system in working questions in arithmetic, and in teaching geography. The attention of trustees is directed to the necessity of keeping their school-houses clean and in proper repair; and parents are urged to secure greater regularity of attendance at school on the part of their children. One of the most serious faults Mr. Somerset notices is the frequent change of teachers, quite as serious a fault is the preponderance of teachers with a low certificate. There are only two teachers holding first class provincial certificates in Mr. Somerset's Inspectorate, while sixty per cent of the whole number are third class. The statistics he appends to his report should awaken trustees to the fact that the low grade teacher is not the most successful. In every instance the second or first class teacher's scholars show the best results. The average attendance is but fifty-two per cent of the registered attendance. Though this is very low, it is higher than that for the whole province.

CORRECTION.—In the report of the proceedings of the North Hastings Teachers' Association which appeared in our last number, the name of the President of the Association, Mr. Wm. Mackintosh, I.P.S., by some inadvertence was appended to it, leading to the inference that the report was furnished by that gentleman. This was not the case, and it is due to Mr. Mackintosh to say so, lest any reader of THE MONTHLY should suppose that the personal reference to the President which appears in the report was made by the gentleman referred to. Mr. Mackintosh had nothing to do with drawing up the report or with its transmission to us.—ED. C. E. M.