Technical and Bibliographic Notes / Notes techniques et bibliographiques

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

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

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

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

Title on header taken from:/ Le titre de l'en-tête provient:

- ☐ Title page of issue/ Page de titre de la livraison
- ☐ Caption of issue/ Titre de départ de la livraison
- ☐ Masthead/ Générique (périodiques) de la livraison

☐ Additional comments:/ *Commentaires supplémentaires:*

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

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

No. 10. September, 1867.

THE JOURNAL OF EDUCATION.

FOR THE PROVINCE OF NOVA SCOTIA.

CORRESPONDENCE.

MR. EDITOR,—Suppose that on the day fixed for the October school meetings, any of the following possible circumstances should surround the Trustees of any section, what remedy or remedies does the School Law provide in the premises?

1. The Trustees neglected to issue the notices required by law.
2. The Secretary of the Trustees, or some important member of the Board, is unavoidably absent from the meeting.
3. The meeting forgets to elect a new Trustee.
4. The meeting elects as a new Trustee a person who is not a ratepayer.
5. The meeting refuses to elect a new Trustee.
6. The meeting refuses to vote any money, or a sum sufficient to carry on the school.

By answering the above enquiries through the *Journal of Education*, you will confer a favour upon me, and I doubt not upon other Trustees also.

A SCHOOL TRUSTEE.

ANSWERS.

[1. Should any section fail to hold its annual school meeting on the day appointed, in consequence of neglect on the part of the Trustees to notify the people, a petition of seven or more ratepayers should be sent immediately to the Board of Commissioners (or its standing committee), praying for the appointment of a new Trustee. See *Law*, sec.'s 30: & 13 (7). It will become, in such a case, the duty of the Inspector to determine which Trustee shall retire. See "Official Notices," I. The section having secured a legally complete Board of Trustees by the appointment of a new Trustee, can hold another meeting. See *Law*, sec. 30:—"And any Board of Trustees thus secured shall, as soon as practicable, convene a meeting of the ratepayers of the section, as provided for the annual meeting, and such meeting shall transact all business except the election of trustees, required of the annual meeting, and in the same manner." Trustees are liable to a heavy fine for neglect of duty, and any ratepayer could enforce the full penalty of the law upon Trustees for so grievous a neglect.

2. Trustees should make every exertion to place before the annual meeting all necessary information. If, however, from the absence of any person the business of the meeting could not be properly proceeded with, the proper course would be to adjourn the meeting to a fixed time.

3. In case the school meeting forgets to elect a new Trustee, the right of choice should revert to the people. The Trustees may, without any requisition from the ratepayers, call a special meeting to fill the "extraordinary vacancy" in the trusteeship. See *Law*, sec. 38 (8).

4. If the meeting unintentionally elects as a Trustee a non-ratepayer instead of a ratepayer, the mistake may be rectified as stated above, 3; but if the law was intentionally disregarded, a remedy will be had by petitioning the Board of Commissioners to *appoint a* Trustee. See answer to 1. If the meeting refused also to provide for the support of the school, se: answer to 6.

5. The remedy provided by the Law will be found in sec.'s 30 and 13 (7).

6. If a clear majority of the ratepayers of any section refuses to provide for the support of a school, there is no provision in the law by which the section can be compelled to discharge this duty. If the evils of ignorance are deliberately preferred to the blessings of knowledge, the Law does not thrust the latter upon an unwilling section. If the people do not want a school, there will not be one. But the Law does require, and justly, that those who refuse the means of knowledge to the children of their own section shall contribute towards the supplying of these means to the children of other sections. All pay a portion of the County Fund which is provided for distribution to the Trustees of the various sections supporting schools. The Provincial grant, moreover, is withheld from sections that do not support a school. As, however, there are very few sections in Nova Scotia where a majority of the people can be supposed to deliberately close their schools by withdrawing the means of support, the Law (Sec. 41) provides ample means by which the friends of education may rectify any such fortuitous act of the annual meeting,—unless indeed, the majority really prefer to be without a school:—

"Upon the requisition of a majority of the rate-payers of any section, the trustees shall convene a special meeting of rate-payers for the purpose of voting money or adding to any amount previously voted for any purpose authorized by this act, notice of which meeting shall be given by the Trustees, as provided in the case of the annual meeting, and such notice shall express the object of such meeting."

The Legislature has spared no means within its power to aid the people in supporting good schools. It remains for the people to do their part. We hope that there is intelligence enough in Nova Scotia to appreciate and render operative an educational system founded on principles in harmony with popular institutions, and resting largely upon the will of the people for its success.]

EXPLANATIONS OF THE NEW REGISTER.

A FULL supply of Registers has been forwarded to each Inspector. Trustees should obtain a copy by the beginning of the School year, (Nov. 1st).

With a view to economizing the educational funds of the province, a change has this year been made in the form of the School Register. Henceforth the cover and sheets will be furnished separately. Each section will be furnished with as many covers as there are Teachers employed in it. These covers being substantial and well-made will, with proper care, last many years. The sheets can be procured from the Inspectors, as required. They are stitched together in sets of three, making six leaves in each. For a school of 60 pupils or under, one set of these sheets will be sufficient for a school year. In such schools as have upwards of 60 pupils a new set will be required each term. The column headed "Pupil's Number" on page 8 is left blank, to be filled in by the teacher with the numbers from 1 to 60 or from 60 upwards, as the circumstances of each school may require.

In schools having upwards of 60 pupils, pages 3 and 6 of the Register will be left blank.

ENTRY OF NAMES.—It will be seen that one entry of names is sufficient for a half-year. The names are to be written, in a neat hand, on the faint lines.

DAILY MARKING.—In keeping the register of attendance teachers will make use of the following

MARKS.

For *Present* a short perpendicular line, thus..... *l*
" *Present* but *Tardy*, the same, with a horizontal over it..... *T*
" *Excused* on account of *sickness*, use..... *s*
" *Excused* on account of *weather*..... *w*
" *Excused* for any *other* sufficient reason..... *o*
" *Absent* without excuse..... *a*

The roll must be called each morning and afternoon. The space above the faint blue line is for the morning, and that below for the afternoon.

Where a pupil enters the school some weeks after its commencement for the term draw a horizontal line (thus

———) over the faint line across the columns of the register to the one for the day on which he enters. Draw a similar line opposite the name of any pupil leaving before the close of the school for the term.

Instead of numbering the weeks of the term (as in the former edition of the Register) a space has been left at the top of each set of columns for inserting the date of Monday in the week for which the set is used. It will not now be necessary to leave a blank in the Register where a *whole week* is given as vacation.

Daily Summary.—At the foot of the column for each day two items are to be entered: viz. (1) The total number of pupils present at the school during any portion of the day and (2) the total school attendance made during the day (expressed by the total "half-days' attendance.") The first will be found by counting the names having 1 or T opposite them for either half of the day; the second by counting the 1's or T's for the day. Suppose there are 40 pupils present in the forenoon, that 3 of them leave at noon, and that in the afternoon there are 45 present. The number "present during day" would be 48, and the "half-days' attendance" 85. From the first, taking the average of the numbers for the term, the "number of pupils daily present on an average" will be found; from the second, taking the sum of the numbers for the term, and dividing by *two* the "Grand Total days attended by all the pupils" (Half-Yearly Table,) will be found. It is important that the distinction between the two be carefully attended to.

Substitute Saturdays.—When school is open on Saturday, enter the record of attendance for the day under "substitute Saturdays." If it is to make up for a day lost during the same week, write it in one of the first set of columns (headed "school less than 6 days in week"); if for time lost outside of the week, write it under the other set (headed "school 6 days in week"). Of the latter the regulation allows only six in any one term. Of the former it has also been judged that not more than 6 will be likely to occur in one term. In each case the date is to be written at the top of the column.

Deportment.—In this edition the record of deportment has been separated from the register of attendance. The figures to be used are as before, 5, 4, 3, 2, 1, meaning respectively "very good," "good," middling," "bad" and "very bad." The numbers "1st week," "2nd week," &c., refer to the number of weeks school has been kept, not to the weeks of the term.

General Progress.—This is not to be marked till the close of the term. Use the figures 5, 4, 3, 2 and 1, to indicate respectively "very good," "good," "fair," "poor" and "very poor." The teacher will be able to decide sufficiently accurately at the close of the term, what progress pupils have made in each branch.

Half Yearly Examination.—There is nothing in this portion of the Register requiring explanation.—The Teacher should aim to preserve a respectable account of each examination.

Half-Yearly Tables.—*Pupils enrolled.*—In entering the number of pupils of the several ages, count those whose age is exactly 5 and 15 years with those "between 5 and 15 years of age." The age at the commencement of the term is required.

Attendance.—For *Grand total days attended by all the pupils*, add up the number of days the several pupils have been present during the term. The same result will be obtained by adding together the "half-days' attendance," for all the days school has been open during the term, and dividing their sum by two.—This latter is placed in the Register for the purpose of affording an easy and reliable test of the correctness of the work.

Number of Pupils daily present on an average.—This will be found by adding together the numbers opposite "present during the day" and dividing their sum by the number of days the school has been open during the term.

For "*Per centage of enrolled pupils daily present, on an average,*" multiply "the number daily present on an average" by 100, and divide the product by the number of pupils enrolled. The quotient will be the per centage required.

☞ By Section 5, (3) of the Law concerning Public Schools, it is enacted that it shall be the duty of teachers "To call the roll morning and afternoon, and otherwise keep an accurate Register in the manner prescribed by the Council of Public Instruction, on pain of liability to forfeiture of the public grants; the Register to be at all times open to the inspection of the Trustees, Visitors, Examiners, Commissioners, Inspectors, and Superintendent."

BENEKE'S PSYCHOLOGY.

In the August number of the *Journal* we published an address delivered by James Donaldson, LL.D., "On Teaching as a Profession." Intelligent readers could not fail to see that the existence of a scientific and thoroughly reliable Psychology was not only assumed by the very subject of address, but emphatically asserted in the course of the argument. Of Beneke's Psychology Dr. Donaldson said: "I believe that one philosopher of Germany has established psychology on a scientific basis, and that his system at every turn affords irrefragable principles of action and criteria of method. I mean Beneke."

Dr. Raue arranged Beneke's system on a simple progressive plan, for the use of teachers. This little work was subsequently improved and enlarged by Dretzler, head master of the Bautzen Seminary.

Dretzler in his preface remarks:—"It was the great Englishman Lord Bacon, who first earnestly pointed out as the only true method, that mode of inductive investigation which is now followed by all inquirers into the natural sciences, and he gave it as his confident expectation, in spite of the opposition with which this opinion was met, that one day the same method would be followed in regard to mental science (inward nature), and that not until then should an end be put to the obscurity and uncertainty in which this science has been so long involved. His expectation has not been in vain. After some preparation made by others for entering the path of inductive inquiry in the study of mental science, Beneke resolutely pursued it, and the number of his followers is visibly on the increase."

German t achers esteem this new psychology very highly, and apply it in determining their methods of instruction. In order that the teachers of our public schools may have the benefit of this little work, we propose to give in the *Journal* a translation of it, believing that it will be found extremely useful to those having in hand the training of our youth.

Part I.—Department of the Perceptions.

Section I—*Man's Senses.*

The sun shines; the flower blooms; gold is yellow; these things we *see.*

The bird sings; the dog barks; water rushes; these things we *hear.*

A stone is hard; down is soft; a mirror is smooth; these things we *touch.*

Vinegar is sour; honey is sweet; wormwood is bitter; these things we *taste.*

Mould is musty; the rose is fragrant; hartshorn is pungent; these things we *smell.*

(*a*) A needle pricks; the air is warm or cold; smoke makes the eyes smart; these things we *feel.*

(*b*) Hunger is painful; gout and cholic cause aching; thirst scorches; these things likewise we *feel.*

(*c*) Much walking tires the legs; much and rapid writing the arm; much speaking and singing the organs of the voice, &c.; and these things likewise we *feel.*

Because man can see, hear, touch, taste, smell, and feel, we say that he has six senses. These are called seeing, hearing, touch, taste, smell, feeling.

That the sense of touch is a separate sense, and distinguishable from that of feeling, will be proved as we proceed.

The sense of feeling also really divides itself into several senses,

for the feeling occasioned by outward impressions (as in example *a*), differs from that excited by internal causes (as in *b*), by muscular activity (as in example *c*). This sense (or these senses) is spread over the whole body within and without, as far as the nerves of feeling extend, and thus feeling dwells also in the organs of the rest of the senses, and might better be termed the vital sense, as we shall see by and by. The rest of the senses receives the name of organs, because the powers of which they consist, when called into exercise by excitement from without, demand the co-operation of special bodily organs.

Can it be said that man has also a muscular sense?

SECTION II.—*The Fundamental Cause and Conditions of Seeing, Hearing, &c.*

A dead man neither sees, hears, touches, tastes, smells, nor feels, for his soul is wanting, and thus a soul is needful if we would see, hear, touch, taste, smell, and feel. Further, a man in a faint or in profound sleep, though his soul is still within him, yet neither sees, nor hears, &c.

Still further. There are conditions of mental disease in which the patient may be punctured with needles, or burned with glowing iron, and yet he will feel nothing, neither will he hear the report of a pistol discharged close to his ears, nor smell the most pungent odors, and yet all the time his bodily organs may be perfectly sound.

It is well known that many a brave soldier has been severely wounded in the midst of the fight, and only became conscious of his wound when the battle was over. Surely you yourselves have many times played together so earnestly, that you did not see persons who passed close by you; and if you have been giving undivided attention to what I am now explaining to you, you will know nothing of what an inattentive companion beside you may have been doing. On the other hand, if your mind has been engaged thinking of something else, you will not have heard what I have been telling you. You remember how often I put the question of one and another, What have I just now said? and those whom I have asked have had no answer to give. And has it not happened to you sometimes, that you have read a whole page of a book, and coming to the foot, have not known one syllable of what you have been reading? This is no uncommon experience with some readers.

Thus it follows, that in order to see and hear, it is not enough that we have a soul: we must direct attention to the things without us, if we would bring our seeing and hearing, &c., into operation. Learn from this the following: Because, 1, in the absence of the soul, when a man is dead, the exercise of any one of his senses is impossible; and because, 2, a man can see and hear, &c., only when the soul directs its attention to the things outside of him, or as we may also express it, when he admits and entertains the stimuli of the outer world, therefore it is the soul which is the true real cause (*grund*) of the operation of the senses,—of seeing, hearing, &c. Accordingly the operations of the senses are activities of the soul itself, which, however, can be carried into effect only under the two following conditions:—(*a*) He who has become blind, no longer sees; he who is deaf, no longer hears; he whose finger is frozen can no longer touch with it. As long as one has a violent cold in the head he cannot smell, and if the tongue is much diseased, the taste is injured or destroyed, &c.

The sound eyes and ears, in short, the sound instruments of the senses, are necessary, if we would see, hear, &c. But it is not the eyes that see, nor the ears that hear, nor the fingers that touch, it is the soul that sees, the soul that hears. (*c*) Eyes and ears, &c., are merely the conditional instruments through which the soul acts. In other words, what belongs to the body is not the originating cause of the so-called operations of the senses, but merely a help and a support for these. This appears from the fact that men sometimes, in spite of the soundest instruments of the senses (compare the examples give above), yet neither see nor hear, &c., under certain mental states; and that, on the other hand, operations of the senses which have been suspended on account of injuries done to the bodily organs, are again brought into exercise as soon as those injured instruments are healed, provided the soul apply itself to the work of seeing, hearing, &c., whilst no independent exercise of the senses (apart from the co-operation of the soul) ever takes place. Hence, sound organs of sensation are the first condition of the operation of the senses through the soul. Can any one produce the sound of a trumpet without a trumpet? or will this instrument, if stopped up or perforated with holes, give forth the sound intended, even when the breath, image of the soul, is properly applied to it. Again, the branches and bark of the tree are not the cause of its blossom; nevertheless sound bark and branches are indispensable conditions of the blossom; and thus also it stands in regard to the co-operation of the body and soul.

b. When it is dark, I can see nothing even with the best eyes, and however much I may wish to see. Where nothing is stirring, I can hear nothing even with the finest ear, and the strongest wish for hearing. The apple that hangs on the topmost branch of yonder tree I can neither smell nor taste, nor touch, however great my longing may be towards it. For things external to us, if they would be perceived by the soul, must have power to act upon our senses, and must actually act upon them. This is the second condition of the soul's operation, which we call the operation of the senses.

Note.—The powers of seeing, hearing, &c., in the soul lie not merely in the organs of sense, but in the whole man, so that it is impossible to assign them any definite place. But as they lie also in the organs of sense, they are *there* manifestly laid open to impression, and come into direct contact with them.

SECTION III.—*Of the Original Faculties and External Stimuli.*

As soon as the child is born, if his bodily organs are sound, he can see, hear, taste, &c., although all this is done without consciousness on his part. He thus brings into the world with him the powers of seeing, hearing, &c. He does not yet know his father, mother, brothers, or sisters; he is unable to distinguish between one person and another, the capacity to do this comes later. Still less is he able to speak, read, reckon, think, imagine; all this must be laboriously acquired in the course of his gradual development. We therefore call the faculties the soul has for seeing, hearing, tasting, &c., original faculties, *i. e.* the first primordial faculties which are inborn with the soul,* and out of which all the other faculties and powers of the soul first take their rise. For everything, besides seeing, hearing, &c., which the child shall afterwards accomplish, special faculties will be needed, which must be separately acquired, and these cannot arise out of nothing. But even with the best original faculties, a child can perceive nothing, unless these are acted upon from without. He cannot see until objects have light thrown upon them, and being now made visible, begin to act on the soul; he cannot hear until a sound arises, and the undulations of sound stimulate the faculties of hearing, &c.

All these influences from external things upon the child, which are needful, in order that he may see, hear, &c., we express by this one word, stimulus. Thus now we can say, in order to see, to hear, to touch, taste, smell, feel, there are needed:

1. The original faculties of the soul.
2. The stimuli of the external world.

The connection of the one with the other, so long as we live in the body, always takes place by the aid of sound organs of sensation of the senses.

SECTION IV.—*Concerning the way in which the Original Faculties and External stimuli combine together.*

When we hold out anything before a child, he turns his eyes towards it in order to see the object, afterwards he graps at it with his little hands in order to touch it, and probably carries it to his mouth in order to gain a fuller perception of it.

We see an object at a distance, but cannot perceive it distinctly. Immediately our seeing faculties press eagerly towards the few light stimuli, in order as it were to draw to ourselves every one of these.

We hear a noise; it is not fully audible; how do our hearing faculties instantly lie in wait, as it were, to catch the stimulant of tiny sound that we may at least get complete possession of it.

In short the original powers receive the impressions (stimuli) of the external world, not passively, not inactively. They themselves struggle towards them, they go out eagerly to meet them, spontaneously.

*Or, more correctly speaking, of which the soul at its birth consists. The soul, and its inborn faculties, are not two different things; they are one. Man's psychical faculties constitute his soul. At the birth of the child these faculues are less numerous than they are later.

(To be continued.)

For the Journal of Education.

MEETING OF THE WEST HANTS LOCAL ASSOCIATION.

THE second meeting of this Association took place in the Court-House, Windsor, on the 30th of August, and was attended by nearly all the teachers of West Hants.

The president being absent, Mr. Fisk was called to the chair. After opening the meeting with prayer, the chairman made a few brief and appropriate remarks respecting the object of the Association.

A good part of the forenoon was taken up in reading the minutes of the previous meeting, enrolling new members and settling pecuniary matters; the rest in discussing the question;—"Should Mulhollands's Advanced Arithmetic be used in preference to Greenleaf's in common schools"?

In the afternoon Miss Willoughby read an excellent essay on the "Benefits of Music in Schools" which was listened to with delight. After a recitation given by S. E. Whiston, a very able and practical essay on "School Discipline" was read by S. S. Fisk, which was heard with great pleasure. Sometime was taken up in discussing questions given by the Teachers, in written form.

The following Teachers volunteered to prepare essays for the next meeting:—Miss Martin, Messrs. Daniels, Caldwell, and Malcolm. Mr. Fisk was appointed delegate to the Provincial Association. The meeting adjourned to meet on the last Friday of February, 1868.

S. E. WHISTON.
Secretary.

ERRATUM.—*Journal of Education*, p. 140, for $195.00, amount paid to Normal College, read $1950.00

THE INVOLUNTARY INFLUENCE OF THE TEACHER OVER HIS SCHOLARS.

DURING a large proportion of his active hours, the pupil is in the presence of one whose social position, strength of character, superior abilities, and momentary discipline, render him an object of the utmost attention and interest. He cannot raise his eye without observing him, and when his eye is not raised, he is, involuntarily, powerfully impressed by his presence and pervading spirit. Every act and habit of the instructor is swelled into importance as associated with his position. The tide of his emotions and thoughts and habits flows back upon these expanding capacities, filling them, and leaving its deposits there, as the tide wave of the ocean urges its way into all the bays and indentations of the coast and leaves its marks upon the yielding shores. There is a peculiar responsibility resting upon the teacher in this respect. He has assumed, in virtue of his office, the relation of parent to all his school, during the hours they remain in his presence, and the parents have a right to claim at his hand an honest fulfilment of all the duties of the relation, as far as it rests within his powers. All the wholesome, and courteous, and generous, and noble, and Christian impressions of home, may be distorted or effaced by the more powerful and continually repeated impressions of the schoolroom; or the lack of these in the families of the ignorant and vicious may be largely compensated by the more healthful atmosphere of the child's daily home for six hours. A most onerous and enacting relation is this. Its worldly rewards are small, yet its claims cannot be avoided without fearful retributions. The teacher receives not the pecuniary return of some forms of mechanical labor. He never could be paid, in money, for the severe self-discipline, daily anxiety, and mental earnestness, absolutely demanded in addition to the heavy routine tasks in the school, and yet the conscientious teacher can never escape these claims upon him. His rewards must be expected from the benedictions of his own heart, and from the decisions of a higher tribunal. "It is worthy of special observation," says a late writer, "that those professions which are most intimately concerned with the highest interests of the race are, more than others, remote from the operations of ordinary worldly motives, and, to a greater extent, left to the power of conscientious and religious considerations. The man who has nothing to bring to the duties of a teacher but so much work for so much pay, and who retires satisfied when the mechanical functions of his office are performed, may be pronounced wholly unfit for the responsibilities of a profession which acts upon mind. He might become a respectable artizan or laborer, but not a teacher of youth. He is not fit to be trusted with the culture of intellect. He does not sympathize with its wants or destinies. Whoever rightly comprehends these will shrink from the responsibility of the teacher's profession, or he will labor to satisfy them with all the solicitude that a sense of personal and religious obligation can inspire. He will habituate himself to reflect that he is engaged in making impressions that must remain ineffaceable—that he is giving to mind such developments and tendencies as it shall bear with it through eternity—that no other man can correct *his* mistakes, or supply his deficiencies, or atone for his faults. What he does must remain forever essentially unchanged; what he neglects to do will remain undone."

The general temper and spirit of the master becomes the prevailing spirit of the school. An observer cannot but be struck with the marked difference exhibited in different schools, giving a distinct and easily recognized character to each. Of the celebrated Rugby School in England, one of its pupils remarked: "Whatever peculiarity of character was impressed on the scholars whom it sent forth was derived, not from the genius of the place, but from the master. Throughout, whether in the school itself or in its after effects, the one image that we have before us is not Rugby but Arnold." If the master is easy and nerveless in his habit, the school will be dull and indolent; if he is cool and phlegmatic, the atmosphere of the school will be frigid and cheerless; if he is warm and affectionate, it will be genial and wholesome; if the master is of a bustling and noisy temper, whatever may be the discipline of the school, the pupils will be infected by it, and exhibit its effects out of doors, even if it is repressed within the school walls. If there is a roughness and want of refinement in the teacher's address, all his awkward and ungraceful phrases and manners, greatly exaggerated, will reappear in the conversation and intercourse of the scholars. The example of the teacher will be a thousand-fold more potent than his precepts. He may attempt to chasten the rudeness of his pupils, and point out the importance and beauty of a refinement of manners, of a chaste and pure speech, of a gentlemanly and courteous behavior; but if, in his personal manners, he lacks these graces—if he speaks roughly, and merely nods his recognition as he meets his pupils, and is careless of his movements when before them—the powerful undertow of his example will sweep away from the memories of the children the unillustrated precepts of his lips.

How powerful and permanent will be these impressons, and what an almost irresistible influence will they have over the lives of the youth now sitting under their instructions! By the character of his discipline, thorough and rigid though it be, but conducted on low, cunning, and often mean principles, the teacher may, unintentionally indeed, but none the less effectually, blunt the moral sensibilities, and blight all noble, magnanimous and generous impulses, uproot virtuous and honest principles, and implant deception and treachery. And the converse of this will be true, with the individual exceptions to be found in all schools of any number, not affecting the force of the argument, but illustrating the perversity of human nature. By a native and cultivated nobleness of manner on the part of the teacher, by continued appeals to such traits of character, and by conducting the daily discipline upon the presumption manifest to all the keen eyed and quickly impressed youths of the school, that they are ingenuous and truthful, these noble and ennobling virtues may be developed into maturity and into self-determining power. To secure this result, says the biographer of the model teacher to whom we have already alluded, "arose Mr. Arnold's practice, in which his own delicacy of feeling and uprightness of purpose powerfully assisted him, of treating the boys as gentlemen and reasonable beings, of making them respect themselves by the mere respect he showed to them, of showing that he appealed and trusted to their own common sense and conscience. Lying, for example, he made a great moral offence, placing implicit confidence in a boy's assertion, and then, if a falsehood was discovered, punishing it severely. He never seemed to be on the watch for boys, as if distrusting them, but always checked any attempt at further proof of an assertion. 'If you say so,' he would say, 'that is quite enough—*of course* I believe your word,' and there grew up in consequence a general feeling that 'it was a shame to tell Arnold a lie—he always believed one.'"

A punishment may be so administered as to appear to the child to be the personal revenge of the teacher, for the personal insult he seems to have received from his misconduct. It may appear to be the triumphant assertion of the master's unlimited power, and of the boy's utter defenselessness, begetting within him a sentiment of anger against the teacher, and of hatred towards the school; destroying his self-respect and quenching all ambition to improve his mind and habits. Or it may be so administered as to appear only the established and necessary penalty of a wholesome requirement, upon which he has made a voluntary breach—a matter of no small grief to the teacher, and awakening within his heart a pang of sorrow vastly more acute than the physical pain experienced from the punishment, and an inward determination never to bring upon himself a similar condemnation. The one is merely penal and painful, the other is disciplinary and corrective.

The teacher's heart should be the home of all noble and generous sentiments, that they may fall spontaneously from his lips, on all *proper occasions*. And these occasions will not be wanting. In the daily readings in the historical and geographical recitations, in allusions to current events, high, and noble, patriotic, and humane opinions, falling from his mouth, will become the seeds of thought and of future acts in the hearts and lives of the susceptible listeners before him.

There are some classes of scholars that will be more seriously affected than others by the bearing of the teacher towards them. In every school there will be found children of a peculiarly delicate mental and physical organization, sensitive to a weakness, lacking confidence in themselves, and yet earnestly craving, and actually requiring, for the full development of their capabilities, the manifest approbation of others. These minds may be encouraged, strengthened, and educated for high and important duties and offices in manly life, or they may be crushed and blighted, and sent out into the world with an uncorrected, morbid distrust of themselves, suspicious of their fellows, preying upon themselves, and experiencing a living purgatory. The teacher who cannot discern these temperaments has certainly not enough knowledge of human nature, or an adequate measure of common sense, to meet the requirements of his office. He may not bear himself carelessly or roughly before these minds; their very weakness, and delicacy, and promise, beseechingly appeal to his manhood, and also to his responsibility to the Giver of this peculiarly susceptible organism. The same discipline that would be indispensable when applied to a phlegmatic boy would be the ruin of these. It is not the rod on the back, or the blister on the conscience, that they need, but the encouragement of a kindly recognition and appreciation of their endeavors, and a hopeful prophecy of their future success. There are griefs in a school-room as rending in their agony to the heart-strings of the little sufferers as the sorrows that assail our maturer lives. The sensitive child startled from his usual wits by the austerities of his teacher, misunderstood in his best endeavors, doubted in his honest asseverations, discouraged by the most persistent prophecies of his utter failure as a scholar, scalds his already burning face with as hot a tear as that eye will ever shed again, and heaves his heart with as heavy a throb, in its measure, as will ever stir his bosom. Few sensitive men look back to their school-boy days without an involuntary shudder at the recollection of some such scene as this. We may not despise or offend these shrinking little ones; they have a high mission upon the earth, and in the skies, if properly developed. They are Eolian harps, and from their delicate and silvery chords the hand of God will hereafter sweep wonderful harmonies.

There is another class situated at almost the opposite pole from these. Its members are the dull and stupid pupils of the school. The slowness of their mental movements is distressing; all their advances are by short and painful steps. Almost *everything* in their case depends upon the bearing and patience of the teacher towards them. The bright boys would advance almost without aid; they are the pride of the school-room; they are continually commended. But these dull boys labor harder than they; their struggles are more incessant; it is their misfortune, not their fault, that they are so much in the rear of their bright competitors. How much do they need the most hopeful and kindly encouragements, and how

fatal must be the forbidding coldness and the impatient discouragements of the inexperienced, thoughtless, or heartless teacher?

By no means too strong is the language of a late writer upon this point. "The less gifted, the tardier mind, the timid, the thoughtless, and even the indolent youth has claims upon the teacher not less sacred; and the untiring zeal, and patient, conscientious fidelity with which he applies himself to the self-denying work of developing *such* minds, in so far as they are susceptible of improvement, and of *doing his best* with every individual committed to his instructions, constitute the highest test of excellency in his vocation. Whoever is above or below this toilsome detail—whoever does not think *any sane mind*, made immortal by its God, worthy to engage his solicitude and his labors—has no special calling to the work of a teacher. He may win a reputation by his success with apt, ambitious pupils, but his negligence, impatience, contempt for others, who are also to be trained for eternity, intellectually as well as morally, and the scantiness of whose resources the more urgently demands a painstaking culture, are offenses against humanity and morality which it would not be easy to characterize by epithets too strong." Arnold once out of patience from the peculiar dulness of such a boy as this, addressed him quite sharply, when the pupil looked up in his face and said: "Why do you speak angrily, sir? Indeed I am doing the best that I can." Years afterwards he used to tell the story to his children, and say: "I never felt so much ashamed in my life, that look and that speech I have never forgotten."—*Educational Monthly.*

ON LEARNING CHOICE PIECES BY HEART.

TILL he has fairly tried it, I suspect a reader does not know how much he would gain from committing to memory passages of real excellence; precisely because he does not know how much he overlooks in merely reading. Learn one true poem by heart, and see if you do not find it so. Beauty after beauty will reveal itself, in chosen phrase, or happy music, or noble suggestion, otherwise undreamed of. It is like looking at one of nature's wonders through a microscope. Again: how much in such a poem that you really did feel admirable and lovely on a first reading, passes away, if you do not give it a further and much better reading!—passes away utterly, like a sweet sound, or an image on the lake, which the first breath of wind dispels. If you could only fix that image, as the photographers do theirs, so beautifully, so perfectly! And you can do so! Learn it by heart, and it is yours for ever!

I have said, a true poem; for naturally men will choose to learn poetry—from the beginning of time they have done so. To immortal verse the memory gives a willing, a joyous, and a lasting home. However, some prose is poetical, is poetry, and altogether worthy to be learned by heart; and the learning is not so very difficult. It is not difficult or toilsome to learn that which pleases us; and the labour, once given, is forgotten, while the result remains.

Poems and noble extracts, whether of verse or prose, once so reduced into possession and rendered truly our own, may be to us a daily pleasure; better far than a whole library *unused*. They may come to us in our dull moments, to refresh us as with spring flowers; in our selfish musings, to win us by pure delight from the tyranny of foolish castle-building, self-congratulations, and mean anxieties. They may be with us in the workshop, in the crowded streets, by the fireside; sometimes, perhaps, on pleasant hill-sides, or by sounding shores;—noble friends and companions—our own! never intrusive, ever at hand, coming at our call!

Shakspeare, *Milton*, Wordsworth, Tennyson,—the words of such men do not stale upon us, they do not grow old or cold... Further: though you are young now, some day you will be old. Some day you may reach that time when a man lives in greater part for memory and by memory. I can imagine a chance renewal, chance visitation of the words long remembered, long garnered in the heart, and I think I see a gleam of rare joy in the eyes of the old man.

For those, in particular, whose leisure time is short, and precious as scant rations to beleaguered men, I believe there could not be a better expenditure of time than deliberately giving an occasional hour—it requires no more—to commit to memory chosen passages from great authors. If the mind were thus daily nourished with a few choice words of the best English poets and writers; if the habit of learning by heart were to become so general, that, as a matter of course, any person presuming to be educated amongst us might be expected to be equipped with a few good pieces,—I believe it would lead, far *more than the mere sound of it suggests, to the diffusion* of the best kind of literature, and the right appreciation of it, and men would not long rest satisfied with knowing a few stock pieces.

The only objection I can conceive to what I have been saying is, that it may be said that relish for higher literature belongs only to the few; that it is the result of cultivation; and that there is no use in trying to create what must be in general only a fictitious interest. But I do not admit that literature, even the higher literature, must belong to the few. Poetry is, in the main, essentially catholic—addressed to all men; and though some poetry requires particular knowledge and superior culture, much, and that the noblest, needs only the natural feeling and the light of common experience Such poetry, taken in moderation, followed with genuine good-will, shared in common, will be intelligible and delightful to most men who will take the trouble to be students at all, and ever more and more so.

Perhaps, also, there may be a fragment of truth in what Charles Lamb has said,—that any *spouting* "withers and blows upon a fine passage;" that there is no enjoying it after it has been "pawed about by declamatory boys and men." But surely there is a reasonable habit of recitation as well as an unreasonable one; there is no need of declamatory pawing. To abandon all recitation, is to give up a custom which has given delight and instruction to all the races of articulately speaking men. If our faces are set against vain display, and set against rational enjoyment of one another, each freely giving his best, and freely receiving what his neighbour offers, we need not fear that our social evenings will be marred by an occasional recitation, or that the fine passages will wither. And, moreover, it is not for reciting's sake that I chiefly recommend this most faithful form of reading—learning by heart.

I come back, therefore, to this, that learning by heart is a good thing, and is neglected amongst us. Why is it neglected? Partly because of our indolence, but partly, I take it, because we do not sufficiently consider that it *is* a good thing, and needs to be taken in hand. We need to be reminded of it: I hear remind you. Like a town-crier, ringing my bell, I would say to you, "Oyez, oyez! Lost, stolen, or strayed, a good ancient practice—the good ancient practice of learning by heart. Every finder should be handsomely rewarded."....

If any ask, "What shall I learn?" the answer is, Do as you do with tunes—begin with what you sincerely like best, what you *would most wish to remember, what you would most enjoy saying* to yourself or repeating to another. You will soon find the list inexhaustible. Then "keeping up" is easy. Every one has spare ten minutes; one of the problems of life is how to employ them usefully. You may well spend some in looking after and securing this good property you have won.—*Vernon Lushington.*

NUMBER.

A COURSE OF LESSONS PREPARATORY TO THE USE OF A TEXT-BOOK ON ARITHMETIC.

III.

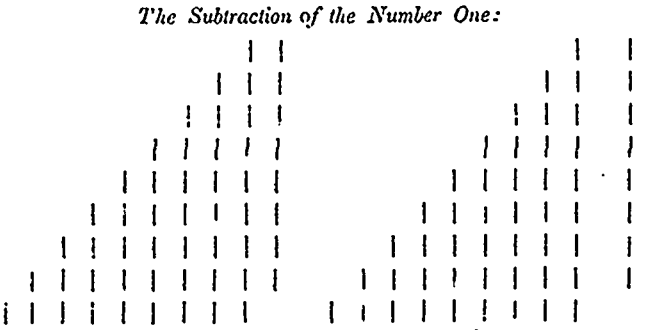
FIRST STEP.—*(Continued.)*

SUBTRACTION.

THE children, having acquired facility in increasing numbers, by combining them in the process of addition, must now be led on to the equally important operation of separating them in the process of subtraction. The use of objects must still be continued. The lessons in addition having been entered into at so much length, that which follows will be given more briefly. The teacher must not, however, suppose that the same patient repetitions, the same varied examples, are not necessary. Very young children cannot be *well* taught in any other way.

1. TO TAKE ONE GIVEN NUMBER FROM ANOTHER.

The Subtraction of the Number One:



Objects are to be arranged, or strokes to be made on the board, in the order indicated by the column on the left. The teacher should then remove one object to a little distance, or rub out one stroke from each line of strokes successively, the children repeating aloud, as this is done, "Two less one is one; three less one are two," &c., through the whole series of subtractions, and leaving the objects as represented in the right column; or, if lines are used, leaving the column on the right everywhere diminished by one.

It is important, as an exercise, that the operations of addition should be constantly returned to, and it is found in practice desirable to combine them with those of subtraction, as helping to a clearer comprehension of both processes. To effect this, after the above lesson on subtraction has been given, it may be recapitulated, or a second lesson may be given, with the additional exercise of recombining the numbers which have been separated by subtraction, thus:

Two less one is one.	One and one are two
Three less one are two.	Two and one are three
Four less one are three.	Three and one are four.
to	
Ten less one are nine.	Nine and one are ten.

After this lesson the children should be separately questioned on it, and exercised in its application to objects of daily use.

The subtraction of TWO should now be taught by objects or strokes, as in the case of the subtraction of one, and, after that, *the subtraction and addition of two in one operation*, thus:

Ten less two are eight. Eight and two are ten.
Nine less two are seven. Seven and two are nine.
Eight less two are six. Six and two are eight,
to
Three less two are one. One and two are three.

The subtraction of THREE, followed by the addition and subtraction of three in one operation:

Ten less three are seven. Seven and three are ten.
Nine less three are six. Six and three are nine,
to
Four less three are one. One and three are four.

Every successive number must be treated in the same manner till the number *nine* is reached, each lesson being frequently repeated, and each being illustrated by questions involving the practical application of the number under consideration.

2. SUBTRACTION AND RECOMBINATION OF SEVERAL NUMBERS IN SUCCESSION.

To subtract in succession the numbers one, two, three, and four, from the number five, recombining each by addition:

Five less one are four. Four and one are five.
Five less two are three. Three and two are five, &c.

To subtract the numbers one to five from six:

Six less one are five. Five and one are six.
Six less two are four. Four and two are six, &c.

The intermediate numbers to be similarly treated, as far as the subtraction of the numbers one to nine from ten:

Ten less one are nine. Nine and one are ten.
Ten less two are eight. Eight and two are ten,
to
Ten less nine are one. One and nine are ten.

This exercise should be followed by a series of miscellaneous questions.

3. TO FIND WHAT NUMBER MUST BE TAKEN FROM A GIVEN NUMBER IN ORDER TO REDUCE IT TO ANOTHER GIVEN NUMBER.

It will be seen that this lesson is the inversion of one of the exercises in addition. The teacher should draw two groups of lines on the slate, or arrange two sets of objects in unequal number, and require the children to decide how many must be taken from the larger number to make it equal the smaller number. The subtraction should also be practically carried out, that the result may be *seen* to be accurate. Begin with numbers having the difference ONE, increasing the difference progressively.

EXAMPLES.

What number must be taken from the number *ten*, to make it nine? eight? seven?—to one, successively.

What number must be taken from the number *nine*, to reduce it to seven? five? &c.

What from *eight*, to reduce it to five? three? two? &c.

The teacher must be careful that a sufficient number of examples are given and well understood before proceeding to a new lesson.

4. THE COMPARING TWO NUMBERS IN ORDER TO FIND THEIR DIFFERENCE.

This idea may be developed by simple questions. A few examples are given:

You have four apples, your brother has five apples; which of you has the more apples?

But if you have five marbles, and your brother four marbles, how many more have you than he?

If you have six peaches, and he four peaches, how many more peaches have you than he?

Objects may then be arranged on the table, or lines drawn on the slate in two groups, one containing five, the other four. The class may repeat, "Five is one more than four; four is one less than five." One by one the number may be diminished, the class in each instance explaining the result; thus:

Comparison of *five* with all numbers below it:

Five is two more than three.
Three is two less than five.
Five is three more than two.
Two is three less than five, &c.

Comparison of *seven* with all numbers below it:

Seven is one more than six.
Six is one less than seven.
Seven is two more than five.
Five is two less than seven.
Seven is three more than four.
Four is three less than seven.

The word "difference" may be used as these exercises become familiar:—"The difference between seven and six is one; the difference between seven and five is two," &c.

5. THE SUBTRACTION OF A GIVEN NUMBER FROM THE UNEXPRESSED SUM OF TWO OTHER GIVEN NUMBERS.

Take six from the sum of five and five.
" nine " three and seven.
" three " six and six.
" five " eight and two.
" eight " six and four.
" six " four and four.
" four " seven and three, &c.

These examples may be varied to a great extent, at the discretion of the teacher. They should be followed by a series of well-adapted miscellaneous practical questions.

6. THE SUBTRACTION OF A GIVEN NUMBER FROM THE UNEXPRESSED SUM OF THREE OTHER GIVEN NUMBERS.

Take six from the sum of three, three, and three.
" five " three, four, and three.
" four " seven, two, and one.
" seven " six, two, and three, &c.

7. THE SUBTRACTION OF THE SUM OF TWO LOW NUMBERS FROM THE SUM OF TWO NUMBERS OF HIGHER VALUE.

From the sum of six and four take that of five and three.
" six and three " four and two.
" five and five " four and four, &c.

8. THE SUBTRACTION OF THE SUM OF THREE LOW NUMBERS FROM THE SUM OF TWO NUMBERS OF HIGHER VALUE.

From four and five take two, two, and two.
" six and three " three, two, and one.
" four and four " two, three, and two.
" three and five " one, four, and two, &c.

9. PROMISCUOUS ADDITIONS AND SUBTRACTIONS.

Add seven to two, and take away five.
" six to three, " four, &c.
From the sum of seven and two take away six.
" five and three " four, &c.

At first, these exercises should, as far as possible, be carried out with the use of objects or lines, and the teacher should be careful not to discontinue the use of these too soon. A variety of miscellaneous questions, bearing upon all the lessons hitherto given under the heads of addition and subtraction, should be introduced before the next Step is commenced upon.

MULTIPLICATION AND DIVISION.—ONE TO TEN.

Multiplication.

Object.—To lead the children to the comprehension of the operation of multiplying numbers into each other, to prove to them that this is but a simplification and abbreviation of the process of addition which they have already acquired, and to make them familiar with the arrangement of numbers called the Multiplication Table.

Plan.—Illustrate the subject by means of objects or lines, as indicated in the following outline:

In the process of addition the children have learnt to find a new number, which is the sum of two, three, or four numbers, which may be of differing value. They are now to be taught to find the result of taking one and the same number a given number of times. Make one stroke on the large slate, and ask, What have I done? You have made one stroke. How many times have I made it? You have made one stroke once. What number do I get when I make one stroke once? You get one. If I put my hand into a basket once, and take out one apple, how many apples do I get? You get one. How much is one taken one time? It is one.

Make one stroke more on the slate beside the other. What have I done? You have put one stroke to one stroke, and now there are two strokes. Yes; one and one are?—Two. How many times have I made one stroke? Two times. Then two times one are?—Two. Pursue this exercise till one has been taken *ten* times; in each case, as one is added, first calling out observation on the process, as being one of addition, and then as being one of multiplication.

Place two cubes of wood on the table. How many cubes are there here? There are two. How many times have I now put two cubes on the table? Once. How many are two taken one time? Once two are two. Add two cubes to these. What have I done? You have added two cubes to the two which were there before. How many cubes are there on the table now? There are four. Yes; two and two are?—Four. How many times have I put two on the table? You have done so twice. How many are two taken twice? Twice two are four. Let two more cubes be added. What have I done? You have put two more cubes on the table. How many were there before I added them? There were two and two—four. How many are there now? There are two and two and two—six. How many times have I put two cubes on the table? Three times. Then two taken three times are?—Six. Repeat: Three times two are?—Six. This

lesson on the multiplication of two should be carried to "Five times two are ten."

Let the same plan be carried out with the number *three*, as far as "Three times three are nine;" with the number *four*, as far as "Two times four are eight;" and with *five*, as far as "Two times five are ten." These lessons should not be carried beyond this point as yet, because the children are not supposed to be familiar with numbers more than ten, the higher numbers being gradually introduced. Little is gained by pressing forward quick children to the higher numbers; it is far safer to proceed gradually and systematically.

It will be seen, that although the range of these exercises is necessarily limited, they are important, as awakening perception of a new mode of using numbers. When the children have gone through them, they should recapitulate the facts, thus:

Once two is two.	Once three is three.
Twice two are four.	Twice three are six.
Three times two are six.	Three times three are nine.
Four times two are eight.	
Five times two are ten.	
Once four is four.	Once five is five.
Twice four are eight.	Twice five are ten.

Miscellaneous practical examples should follow each exercise.

DIVISION.—ONE TO TEN.

Object.—To lead the children to the comprehension of the operation of dividing one number by another, and to teach them to divide other numbers by one, two, three, four, &c.

Plan.—This is illustrated in the following exercises:

1. Make two lines on the slate, and say, Rub out two lines from the slate. How many times can you take away two from two? Once. How many times is two contained in two? One time.

Make four lines on the slate, and say, Rub out two lines. What remain? Two lines remain. Rub them out. What remain now? There are none left. How many lines were there at first? There were four. How often can you take away two from four? Twice. How often is two contained in four? Twice.

Now I make six, eight, ten lines on the slate. Try how often you can take away two from each of these numbers.

Now I place three cubes on the table. How often can you take three cubes away from them? Once only. But if I put three cubes on the table, twice over, how many will there be? There will be two times three, or six cubes. How many times can I take three away from six? You can take three cubes away twice. How often are three contained in six? Two times.

Now I make three, six, and nine strokes on the slate. Tell me how often each of these numbers contains the number three, and how often you can take three away from each of them.

2. *The Division by Two of Numbers under Ten.*

The teacher may construct the following table upon the school-slate, in order to illustrate the subject. It will be seen that it includes to some extent the exercises on multiplication, as assisting to the comprehension of the process of division.

How much is twice 1?	2.	How many ones in 2?	2.
How much is twice 2?	4.	How many twos in 4?	2.
How much is twice 3?	6.	How many twos in 6?	3.
How much is twice 4?	8.	How many twos in 8?	4.

The questions should then be put in another form; as, How often is two contained in two? in four? in six? in eight? How much is two, four, six, and eight, divided by two?

A few miscellaneous questions might be introduced, even at this early stage of the subject, to make the nature of the operation clear.

If I measure four yards of cloth by a yard measure, how many times shall I have to apply it to the cloth?

If I measure four yards of cloth by a measure two yards long, how often will the length of the measure be contained in the length of the cloth?

Into how many sets of two can I divide eight marbles?

To how many boys can I give four pens, if I give one pen to each of them?

To how many, if I give two pens to each of them?

A farmer and his son are going to market; they wish to take four baskets of apples with them; how many baskets must each of them carry?

At the market they buy eight new spades; how many must each of them carry?

THE ANALYTICAL METHOD OF TEACHING ENGLISH GRAMMAR.

A NUMBER of interesting and important topics present themselves to the mind of the teacher, when he considers that portion of his work, which consists in imparting to his pupils a knowledge of the grammatical structure of their native language. For a long time, the study of English Grammar as a separate branch of instruction in schools was entirely neglected, notwithstanding the great amount of attention bestowed upon the classical languages. It is now, however, pretty generally admitted that separate instruction in the grammer of his own language is a necessary part of one's education. No object, indeed, can be of greater importance in education, than that of enabling the pupil to use, with facility and skill, the language in which he thinks, and which he ordinarily employs for the expression of his thoughts. And this object cannot be thoroughly attained without theoretical study of the structure of the language. It is evident that an English boy will most readily and thoroughly acquire a knowledge of the general principles of grammatical science from the study of the English language. Should not, then, the study of the English precede that of Latin grammar? This and many other questions which our subject suggests, we shall not, however, dwell upon in the present paper, but proceed at once to that which we have more immediately in view.

We propose briefly to consider the analytical method of teaching English grammar. The ordinary method employed is a synthetical one. The synthetical method commences with the *word*, and having shewn how many and what are the different kinds of words, or parts of speech, then proceeds to explain how these words are modified or inflected, and how they are arranged to form sentences, so as to express thought. The analytical method begins with the *sentence*, as the expression of a *thought*, examines the parts into which the sentence is divisible, and the relations between these parts, and then arrives at the consideration of the words of which they are made up.

Which of these methods should be adopted in the teaching of English grammar? We answer, neither exclusively; the analytical method should be employed for imparting the first knowledge of the subject, and especially for bringing out its general principles; and the synthetical method is proper for a more detailed subsequent course, and for storing up in the memory the facts and rules of the subject. As Archbishop Whately has well expressed it,—"The Synthetical form of teaching is indeed sufficiently interesting to one who has made considerable progress in any study: and, being more concise, regular, and systematic, is the form in which our knowledge naturally arranges itself in the mind, and is retained by the memory; but the analytical is the more interesting, easy, and natural kind of introduction, as being the form in which the first invention or discovery of any kind of system must originally have taken place." One investigates by analysis, and then arranges the facts and principles thus obtained in a synthetical form, in order that they may be the more readily at command for future use and application.

Neither method, as we have already observed, should be used exclusively. Upon this point we quote the following from Sir William Hamilton's Lectures on Metaphysics:—"Analysis and Synthesis, though commonly treated as two different methods, are, if properly understood, only the two necessary parts of the same method. Each is the relative and the correlative of the other. Analysis, without a subsequent Synthesis, is incomplete; it is a mean cut off from its end. Synthesis, without a previous analysis, is baseless; for synthesis receives from analysis the elements which it recomposes."

We have already indicated the nature of the synthetical method as applied to our subject, and it will be quite unnecessary to describe it at greater length, since it is the method employed in almost all works on English grammar. We shall more usefully employ our time and space, in proceeding to a more detailed examination of the analytical method, and of the way in which it may be best carried out; after which, we purpose to answer one or two objections, which have been, or may be made to its employment.

The analytical method commences with the consideration of the *sentence*, as the expression of *a thought*. We have several kinds of sentences; there are simple sentences, each of which is the expression of the relation between two or more thoughts. We shall, of course, begin by the consideration of simple sentences; and not only so, but since simple sentences are of many degrees of complexity, we shall select for our first consideration those whose structure is the least involved, and which consist of the fewest and simplest parts, viz., those containing a simple or unenlarged subject, and an unextended simple predicate, not requiring an object; such a sentence in fact, as *James writes*.

The pupil is easily made to perceive that this sentence consists of two parts; that the first part, *James*, expresses WHAT WE ARE SPEAKING ABOUT; whilst the second part, *writes*, expresses WHAT WE SAY ABOUT James. A few more such examples being given, it is established that all sentences are divisible into two parts, expressing respectively—

(1.) THE PERSON OR THING of which we are speaking.

(2.) WHAT WE SAY about that person or thing, the former being called the *subject*, and the latter the *predicate* of the sentence.

After being sufficiently exercised in analysing sentences such as the above into these two parts, the pupil's attention is directed more particularly to the *subject;* and he is shewn by examples, such as *John runs*, and *He runs*, that the subject may consist either of the name of the person or thing, when it is called a *noun*, or of a word used instead of the name, and called a *pronoun*. A sentence, such as *The man runs*, is then taken, in which he observes the word *The* prefixed to the noun *man* in order to particularise or point it out. By the help of other examples he becomes acquainted with three such words, viz., *A*, *An*, *The*, which he is told are called *Articles*.

The teacher will now select three sentences, such as *The man walks*, *The man is beaten*, and *The man is a painter;* where the predicate *walks* expresses something which the man does; the predicate *is beaten*, shews what the man has done to him, or, in grammatical language, what the man suffers; and the predicate *is a painter*, shews neither what the man does, nor what he suffers, but simply what he is. We thus get three kinds of predicates,—predicates of *doing*, of *suffering*, and of *being*. Predicates of doing are easily shewn to consist of one or more words expressing an action

done, and called *verbs*; predicates of suffering, of two or more words expressing an action suffered, and also called verbs; and predicates of being, of two or more words, one of which at least is a word expressing being, called a verb, and is joined to another word which may be either a noun, a pronoun, an adjective, or an adverb. Examples to be used here, are such as, *James is a boy, James will be good, It is he, He has been here.* A verb is thus shewn to be a word expressing doing, suffering, or being.

Having now become acquainted with the noun, pronoun, article, verb, adjective, and adverb, we should next proceed to the consideration of the kinds, numbers, persons, and genders of nouns and pronouns; and of the kinds, voices, moods, tenses, numbers, and persons, of verbs. With regard to voice, it will only be necessary to state that the verb in a predicate of doing is in the active voice; and that in a predicate of suffering, in the passive voice. Of the moods, those only will at this period be referred to, which are used in sentences such as those with which we now have to do, viz., the indicative, potential, imperative, and infinitive, and the participles.

In all this, care must be taken to introduce each point to the notice of the pupil by suitable examples, deducing the facts or principles to be learnt from those examples, and then, and not till then, furnishing him with the technical terms in which the facts and principles are embodied. If this course be strictly adhered to, it will be found to give an interest to the subject, which can be imparted to it by no other method of treatment. The pupil is, as it were, investigating for himself, the teacher only serving as a guide, and bringing before his notice the different things to be learnt in the most natural and advantageous order. The examples given are made to serve the purpose for which experiments are employed in the teaching of chemistry and other branches of natural science. Indeed, they have, in one respect, an advantage over such experiments. Chemical experiments will most frequently present things to the pupil's observation, which are quite new and strange to him; he would probably have not been able to contrive them for himself. But such sentences as those used above for examples, he is continually employing every day and hour of his life. In other words, he has already, from the practical acquaintance which he has obtained with his own language, an implicit knowledge of very many of the principles and facts to be learnt, which has only to be rendered explicit and fixed in the memory, by his attention being properly directed to those principles and facts, and his being furnished with suitable technical terms.

Every step must be not only illustrated and made clear by numerous examples, but the teacher must make sure that his pupil has thoroughly grasped what is presented to his mind, by causing him to perform numerous exercises, requiring him to analyse a number of sentences such as those given above, and to parse each word as far as his knowledge goes. A similar remark will apply to the whole of the course here described.

Having made these remarks, we will proceed with the sketch of our proposed course. We now come to deal with sentences, consisting of other parts in addition to the simple subject and predicate. We shall employ such examples as *John tears the book, John killed it, Peter wishes to read, They made Henry king, etc.;* by which we shall shew what is meant by the Direct and Indirect Objects, and of what parts of speech each of these may consist. We are also now in a position to explain the difference between the nominative and objective cases, and to classify verbs into Transitive and Intransitive. The next step will be to shew, by proper examples, how the subject or the object may be *enlarged* by an adjective or participle, a noun or pronoun in apposition, or a noun or pronoun in the possessive case. When we have in the same way made the pupil acquainted with the several modes in which predicates are *extended*, we shall have pretty well completed our survey of simple sentences, consisting of what Dr. Morell calls elements of the first degree.

The pupil will next be introduced to the consideration of sentences, some of the parts of which consist of phrases, or elements of the second degree. He will be shewn that all phrases may be classified into three kinds, the noun, adjective, and adverb phrases, according to the part of speech whose function in the sentence it is capable of performing. He will also become acquainted with the preposition, a part of speech which only occurs as a constituent part of a phrase.

It will be unnecessary to state at any length the way in which the method is applied to the consideration of complex and compound sentences. This will be sufficiently evident from what has gone before. The pupil must be led to observe how they are analysed into the simple sentences of which they are made up; the distinction between subordination and co-ordination must be brought out; and the component simple sentences must be classified, like phrases, into noun, adjective, and adverb sentences, according to the function they perform when considered as parts of the principal sentence. It is in this part of our course that we shall first meet with conjunctions, and with the conditional mood of verbs.

Our method is evidently based upon what is called *Analysis of Sentences*, and instead of the uses and functions of different kinds of words being learnt, as in the synthetical method, from bare definitions, they are deduced from an intelligent consideration of the structure of the sentence, and thence of the relations existing between its different parts.

The reader will of course understand that many variations in detail might be made in the course above sketched out, without in any way sacrificing the analytical method upon which it proceeds. It will be found of great importance to cause the pupil to work out numerous and well graduated exercises. In fact, he should analyse and parse as constantly as he is made to do *sums* in his arithmetical course.

Two principal objections have been made to the use of the analytical method, as the basis of a first course of instruction in English grammar. In the first place, it has been urged that it mixes together two different subjects, viz., analysis of sentences, and what is ordinarily understood by the term grammar, and thus distracts the attention of the child, by requiring him to learn two things at the same time. This would be a very serious objection if there were any valid foundation for it. Our answer is simply that those who look upon analysis of sentences and ordinary grammar as two separate and independent subjects, are altogether in the wrong. They form when rightly considered, but one whole; so that it is impossible to teach the latter, without, at least implicity and blindly, recognising the principles and facts which it is in the province of the former to investigate. Does not, for instance, a comprehension of the meaning of such terms as nominative case, and objective case, necessarily involve an understanding of what is meant by the subject and object of a sentence, although the words subject and object may never have been used by the pupil? Does not, again, a comprehension of the office of the adverb, as expressing the time, place, &c., of the action indicated by the verb, necessitate also a knowledge of what is intended, when we speak of the extension of the predicate? And can the pupil possibly tell what noun or pronoun the finite verb agrees with, unless he is able to discover the subject of that verb? In fact, it is impossible to *parse* without implicity *analysing*. This objection then falls to the ground.

But, in the next place, we are told, the analytical method burdens the memory of the pupil with an additional set of technical terms; the study of grammar already involves the learning of a large number of technical terms, and it will be by no means a good plan to add to this difficulty by the introduction of new ones. It is a sufficient answer to this objection to point out how very small is the number of new technical terms introduced. They might almost be counted on the fingers; we have—simple, complex, compound, subject, predicate, object, direct, indirect, enlargement, extension, principal, subordinate, co-ordinate. These are positively all that can be considered as essential. And it must be further observed that these words serve, like all technical terms, to fix and give precision to the ideas which they represent, and therefore render the acquisition and retaining of the subject so much the easier, and the knowledge of it so much the more thorough and lasting. This is indeed nothing but the object and use of all technical terms. So that the knowledge of the principles of analysis being, as we have shewn above, necessary for the study of the remaining portion of grammar, these technical terms must simply be looked upon as so many aids in the attainment of such knowledge.

Our conclusion, therefore, is, that a first course of instruction in English grammar should be analytical, and should be directed mainly to the thorough comprehension of the *general principles* of grammar, and the *principal* facts to be learnt in connection with that of the English language. This analytical course will be naturally and necessarily succeeded by the usual synthetical treatment of the subject, by which more detailed facts may be filled in, and the pupil's knowledge systematized and fixed in the memory. —*English Journal of Education.*

PROFESSOR TYNDALL ON SOUND.*

(*From the Saturday Review.*)

PROFESSOR TYNDALL deservedly holds a place among the foremost of our lecturers on science. His style is clear, connected, and animated. He has the art of seizing at once the most essential and prominent features of his subject, while at the same time throwing himself into the mental position of his auditors, so as to appear a fellow-learner with them. It is thus that he seems to make himself a link of intelligence between them and the body of facts under illustration, and to enable them, so to say, to see through the medium of his own mind. His experiments are unsurpassed in neatness, and never miscarry. The lecturer's voice and manner join with the habitual perspicuity of his language in engaging the attention and kindling the intelligence of his hearers. A certain glow of enthusiasm acting upon a fine imagination and a happy command of language gives an air of poetry to what in common hands is often bald, prosaic, and uninviting in the extreme, and throws an artistic finish over the hard substratum of fact. We are glad to have the opportunity of studying in print the series of lectures on Sound which during the last season drew full and attentive audiences to the lecture-room of the Royal Institution. We cannot say that these lectures strike us as equally interesting with the previous series on Heat. Not that they exhibit by comparison any defect in the lecturer's treatment of the subject, in the fluency of his language, or the clearness of his experiments. The falling off, if any, is due to the subject itself. In dealing with the phenomena of sound we find ourselves shut up at once in a comparatively restricted area. The medium within which we move is more

* *Sound.* A Course of Lectures delivered at the Royal Institution of Great Britain. By John Tyndall, LL.D., F.R.S., &c. London: Longmans and Co. 1867.

limited, and affords less scope for widespread and glowing speculations. The phenomena of light and heat connect us immediately with the furthest range of cosmical forces, and carry us on the wings of imagination to the extremes of infinite space. But the facts relating to sound lie essentially within the narrow bounds of our atmosphere. They are not cosmical, but terrestrial. Imagination itself is distanced the moment we try to pass beyond the limited aerial envelope which swathes our planet, and which conveys to us all we are capable of knowing of the nature of sound. Observation gives us direct evidence of the agencies of light and heat affecting worlds of untold remoteness from our own, and theory can roam at will over realms of space without any misgiving that the analogies of physics as taught us by experience here will fail us wheresoever the eye can extend its range. But what of the nature of sound, when fancy ventures to branch out beyond the few hundred miles within which we seem compelled to limit the acoustic medium, or ocean of air, in whose lower depths we live? Take, as the nearest instance, the moon. Who shall say what are the relations of sound to a planet in which the indication of an atmosphere, if appreciable at all, are so slight and indeterminate? In the presence of vast cosmical convulsions such as the telescope *seems to certify as even now in progress in the moon, are we to* divest our thoughts of all that class of effects which to us forms perhaps the most emphatic evidence of physical change? Is the crash of worlds before our eyes going on *in vacuo?* Is the moon's rigid metallic crust upheaved and broken, or does the titanic crater sink down into the abyss of central fire, without awaking a vibration in the eternal silence? We can only come back baffled from the feeblest flight into space to make the most that we can of the narrower and more commonplace facts actually within our ken. Even here, too, we soon encounter a further cause of limitation. The widest range of acoustics can be, as we have said, but conterminous with the atmosphere whose vibrations give rise to the property of sound. But there are limits, too, to the powers of the ear or the brain to receive or to appreciate the vibrations of that medium. The range of hearing is no doubt infinitely various among different classes of sentient life. It differs, we find by experience, among individuals in the case of mankind. But the human ear itself at its best is limited in both directions of the scale in its perception of sounds, whether grave or acute. The most satisfactory test of this fact lies in the sensibility of the ear to sounds so sustained as to have a definite or musical pitch. The experiments of men of science have resulted in an arithmetical scale for the normal power of the organ of hearing:—

Savart fixed the lower limit of the human ear at eight complete vibrations a second; and to cause these slowly recurring vibrations to link themselves together, he was obliged to employ shocks of great power. By means of a toothed wheel and an associated counter, he fixed the upper limit of hearing at 24,000 vibrations a second. Helmholtz has recently fixed the lower limit at 16 vibrations, and the higher at 38,000 vibrations, a second. By employing very small tuning forks, the late M. Depretz showed that a sound corresponding to 38,000 vibrations a second is audible. Starting from the note 16 and multiplying continually by 2; or more compendiously raising 2 to the 11th power, and multiplying this by 16, we should find that at 11 octaves above the fundamental note the number of vibrations would be 32,768. Taking, therefore, the limits assigned by Helmholtz, the entire range of the human ear embraces about 11 octaves. But all the notes comprised within these limits cannot be employed in music. The practical range of musical sounds is comprised between 40 and 4,000 vibrations a second, which amounts, in round numbers, to 7 octaves.

Dr. Wollaston was the first to take note of the difference that exists in the power of hearing between different persons. While employed in estimating the pitch of certain sharp sounds he was struck with the total insensibility of a friend to the sound of a small organ pipe which, in respect to acuteness, was far within the ordinary limits of hearing. The acoustic sense in this case extended no higher than four octaves above the middle E of the pianoforte, while other persons have a distinct perception of sounds two octaves higher. Professor Tyndall has accumulated various instances of the limits at which the power of hearing ceases in different individuals. The squeak of the bat, the sound of the cricket, even the chirrup of the common house-sparrow, are unheard by some persons who possess a sensitive ear for lower sounds. The ascent of a single note is sometimes sufficient to produce the change from sound to silence. Two persons, neither of them deaf, may be found, the one complaining of the penetrating shrillness of a sound, the other maintaining that no sound exists. In the *Glaciers of the Alps*, Professor Tyndall has referred to a case of short auditory range of this kind. While crossing the Wengern Alp his ear was rent with the shrill chirruping of the insects which swarmed in the grass on either side of the path, while a friend by his side heard not a sound of all this insect music. The pitch of sounds has something closely analagous to the various hues of light, which are excited by different rates of vibration. Both alike arise out of the pulses or waves of their respective media. But in its width of perception the ear greatly transcends the eye. The chromatic scale over which the eye ranges consists but of little more than a single octave, while upwards of eleven octaves lie within the compass of the ear. The quickest vibrations or shortest waves of light, which correspond to the extreme violet, strike the eye with only about twice the rapidity of the slowest or extreme red of the spectrum; whereas the quickest vibrations that strike the ear as a musical sound have, as Professor Tyndall remarks, more than two thousand times the rapidity of the slowest.

An admirable adjunct to our instrumental means of measuring the lengths of velocities of sonorous waves lies in the syren, the invention of M. Cagniard de la Tour, improved by Dove and Helmholtz. This ingenious little contrivance, of which instructive and amusing use was made by the lecturer at almost every period of his course, is explained at length with the aid of very clear illustrations. A brass disc pierced with four series of holes, 8, 10, 12, and 16 in number, disposed along four concentric circles, is arranged so as to revolve upon a steel axis which passes through a fixed cylinder of brass pierced with a corresponding series of holes. These perforations being made oblique to the surface of the cylinder in one direction, and to that of the disc in the other a stream of air forced through both series by means of bellows causes the disc to rotate more or less rapidly according to the force of the current.—A simple device for registering the number of revolutions enables us to determine the number of vibrations or waves of sound corresponding to the pitch of the notes given out by the syren when in motion. When turned slowly, a succession of beats or puffs of sound is heard, following each other so slowly that they may be counted. But as the motion increases, the puffs succeed each other with increasing rapidity, till they blend into a deep continuous musical note. With the increased velocity of rotation the note rises in pitch, till it becomes so shrill as to be painful to the ear, and if urged beyond *a certain point becomes even inaudible to human* ears. Not that this last result would prove the absence of vibratory motion in the ear. It would but show the incompetence of our auditory apparatus to take up vibrations whose rapidity exceeds a certain limit, or that of our brain to translate them into sound. The eye, as Professor Tyndall proceeds to show, is in this respect precisely similar to the ear.

By means of the syren the rapidity of vibration of any sonorous body can be determined with extreme accuracy. The body may be a vibrating string, an organ-pipe, a reed or the human voice.—We might even determine from the hum of an insect the number of times it flaps its wings in a second. A tuning-fork to a certain note is sounded for one minute, and the number of revolutions of the disc when kept in unison with it, is found registered as 1,440. Multiplying this figure by 16, the number of holes open during the experiment, we get 23,040 as the number of puffs of air or waves of sound passing through the syren in a minute, corresponding to the number of vibrations executed by the tuning-fork. Dividing this total by 60, we find the number of vibrations in a second to be 384. We can now ascertain with the same facility the length of the corresponding sonorous wave. The velocity of a sound wave in free air at the freezing-point has been found to be 1,090 feet in a second. In air of the ordinary temperature of a room the distance may be taken at 1,120 feet. Dividing 1,120 by 384, the number of sonorous waves embraced in this distance, we find the length of each wave to be nearly 3 feet. Taking the rates of four different tuning-forks we find them to be 256, 320, 394 and 512, corresponding the wave lengths of 4 feet 4 inches, 3 feet 6 inches, 2 feet 11 inches, and 2 feet 2 inches respectively. "The waves generated by a man's organs of voice in common conversation are from 8 to 12 feet, those of a woman are from 2 to 4 feet in length. Hence a woman's ordinary pitch in the low sounds of conversation is more than an octave above a man's; in the higher sounds it is two octaves."

These experiments refer exclusively to the velocity of sound in atmospheric air. An entirely different scale of vibratory motion comes in when we consider the transmission of sound through media of various kinds. The researches of Dulong have given us an experimental table of the velocities of sound through different gases at a uniform temperature. It thus appears that the velocity of sound in oxygen is 1,040 feet in a second, in carbonic acid 858, in carbonic oxide 1,107, and in hydrogen no less than 4,164, the velocity in common air being 1,092. According to theory, the velocities of sound in oxygen and hydrogen should be inversely proportional to the square roots of the densities of the two gases. Oxygen being sixteen times heavier than hydrogen, the velocity of sound in the latter gas ought to be four times its velocity in the former. Experiment shows it to be so very nearly. The velocity of sound in liquids may be determined experimentally as well as by theory, and a table with this view has been drawn up by the late M. Wertheim. Hence we learn that sound travels with very different velocity through different liquids. A salt dissolved in water augments the velocity, and the salt that produces the greatest augumentation is chloride of calcium. Sea-water transmits sound more rapidly than fresh. In water, as in air, the velocity increases *with the temperature. Thus at 15°C. the velocity in Seine* water was 4,714 feet, at 30° it was 5,013 feet, and at 60° 5,657 feet, a second. The less the compressibility, the greater the elasticity; and the greater in consequence the velocity of sound through the liquid. In solids, as a rule, the elasticity as compared with the density is greater than in liquids, and consequently the propagation of sound more rapid. In Wertheim's table the velocity of sound through lead at 20°C is but 4,030 feet a second, that through gold 5,717, through silver 8,553, through copper 11,666, through cast-steel 16,357, and through iron 16,822. As a rule, here too, velocity is augmented by temperature. But in the case of iron a remarkable exception exists. While in copper a rise from 20° to 100°C, causes the velocity to fall from 11,666 to 10,802, the same rise produces in the case of iron an increase of velocity from 16,882 to 17,386. Between 100°, however, and 200°, iron falls from the last figure to 15,483. In iron, that is, up to a certain point, the elasticity is augumented by heat; beyond that point it is lowered. Silver, we learn, is an example of the same

kind. The rate of transmission through a solid body depends further upon the manner in which the molecules of the body are arranged. Heat is found to be conducted with different facilities through wood according as it passes along the fibre or across it, and again as it follows or crosses the igneous layers or rings. In like manner, wood possesses three unequal axes of acoustic conduction. For example, in acacia wood the velocity along the fibre is 15,167 feet in a second, across the rings 4,840, and along the rings 4,436 In pine, the corresponding figures are 10,900, 4,611, and 2,605; in oak 12,622, 5,036, and 4,229. To the extreme elasticity of woody fibres, especially when in a highly dry state, are due the wonderful effects of sound drawn out of the violin, or the sounding board of the piano. There is practically no limit to the distance through which sound may be transmitted through tubes or rods of wood. The music of instruments in a lower room may be made to pass to a higher floor, where it is excited by a proper sounding-board, being all the while inaudible in the intermediate floors through which it passes. It would be possible to lay on, by means of wooden conductors, the music of a band to a distance in all directions, much as we lay on water. Mr. Spurgeon's voice might be turned on from a main in the great Tabernacle, or Mr. Beale's eloquence from a platform in Hyde Park, to the ears of admirers in every parlour in the metropolis.

The fourth and fifth lectures reproduce and illustrate with much force and neatness the beautiful experiments of Chladni, Wheatstone, Faraday, and Strehlke, by which sonorous waves are made visible by means of the vibrations of metal plates strewn with fine sand. The curved lines, nodes, and other modifications of form which sand or the fine seeds of lycopodium exhibit under different degrees of excitement enable the eye to realize the rhythmical relations which belong to the phenomena of sound. The Pythagorean theory of figures, as applied to music, has its counterpart in the geometrical as well as in the arithmetical laws which are shown to govern the movements of sonorous waves. No portion of the present course, however, is more original and striking than that which treats of "sounding flames," or the effects produced by sound upon ignited jets of gas. Some experiments in this direction were made by Chladni and De la Rive towards the beginning of the present century, and Professor Faraday, as early as 1818, showed that certain tones were produced by tubes surrounding the flames of a spirit-lamp or a jet of carbonic oxide. After these experiments the first great novelty in acoustic observations was due to the late Count Schaffgotsch, who showed that a flame in such a tube could be made to quiver in response to a voice pitched to the note of the tube or to its higher octave. Where the note was sufficiently high the flame was even extinguished by the voice. Following up this rudimentary idea, Professor Tyndall was led to take note of a series of singular effects with flames and tubes, in which he and the Count seem to have been running a race of priority. A number of these curious and beautiful phenomena are described in the sixth lecture. The cause of this quivering or dancing of the flame is best revealed by an experiment with the syren. As the pitch of the instrument is raised so as to approach that of the tube, a quivering of the flame is seen synchronous with the beats. When perfect unison is attained, the beats cease, but begin again when the syren is urged beyond unison, becoming more rapid as the dissonance is increased. On raising the voice to the proper pitch the Professor showed that a flame which had been burning silently began to sing. The effect was the same, whenever the right note was sounded, at any distance in the room. He turned his back to the flame. Still the sonorous pulses ran round him, reached the tube, and called forth the song. Naked flames uncovered by tubes will give forth the same effects if subjected to increased pressure, or suffered to flare. Professor Tyndall ascribes the discovery to Professor Leconte, of the United States, who noticed at a musical party the jets of gas pulsate in synchronism with the audible beats. "A deaf man," he observes, "might have *seen* the harmony." The tap of a hammer, the shaking a bunch of keys, a bell, whistle, or other sonorous instrument is answered by the sympathetic tongue of flame. An infinite variety of forms is assumed by the luminious jet, according as the fish-tail, the bat's-wing, or other burner is employed, or a greater or less column of flame allowed to rise. The most marvellous flame of the series is that from the single orifice of a steatite burner reaching a height of twenty-four inches. So sensitive is this tall and slender column as to sink to seven inches at the slightest tap upon a distant anvil. At the shaking of a bunch of keys it is violently agitated and emits a loud roar. The lecturer could not walk across the floor without agitating it. The creaking of his boots, the ticking of his watch, set it in violent commotion. As he recited a passage from Spenser the flame picked out certain sounds to which it responded by a slight nod, while to others it bowed more distinctly, and gave to some a profound obeisance, to other sounds all the while turning a deaf ear. There is also the "vowel" flame, so called because the different vowel sounds affect it differently. Hence we get a scale of vowel sounds in perfect accord with the analysis of Hemholtz. The pitch of the pure vowel sound A (as in "arm") is the highest. E (or I in French and Italian) contains higher notes than O, and O higher notes than U. This flame is peculiarly sensitive to the sound of *s*. A hiss from the most distant person in the room would forcibly effect it. To a musical-box it behaved like a sentient creature, bowing slightly to some tones, but curtseying deeply to others. We look with lively interest for the developement of this novel and highly curious branch of discovery in the hands of Professor Tyndall. The seventh lecture contains some interesting remarks upon the graphic representation of musical and other sounds by means of beams of light thrown upon a screen. The continuity or intermittence of sound is made to announce itself by the alternate lengthening or shortening of the luminious band. We should have expected here some reference to the ingenious attempts of the Abbé Moigno to render musical and spoken sounds self-recording by means of sheets of sensitive paper. Experiments of this kind are of course as yet vague and rudimentary in the extreme. It is impossible to say how far off we still are from the time when a sonata or a speech will register its own acoustic pulsation in fixed and legible characters. For the existing state and prospects, however, of the science of acoustics, we cannot point to a more succinct and intelligible statement than that contained in the course of lectures before us. We would draw the attention of our readers in particular to the concluding paragraph of the last lecture. They will find there briefly and lucidly explained the recent discoveries of Professor Schultze and the Marchese Corti regarding the manner in which sonorous motion is transmitted to the auditory nerve. If not as yet scientifically conclusive, these ingenious speculations open up a new and promising passage in the anatomy and physiology of that wondrous organ the human ear.

PHENOMENA OF A TOTAL SOLAR ECLIPSE.

BY C. PRITCHARD, F. R. S., HULSEAN LECTURER IN THE UNIVERSITY OF CAMBRIDGE, ENG.

SECOND PAPER.

THE *Himalaya* sailed from Plymouth on the morning of Saturday the 7th of July, having on board about fifty persons who were to be engaged more or less actively in the observation of the eclipse. Among them were Mr. Airy, M. Otto Struve, the accomplished astronomer of Pulkowa, and Mr. de la Rue; to mention the others would be to name the greater part of the flower of British amateur observers; a few ladies also from the families of Mr. Airy and M. Struve and Mr. Vignolles contributed to the pleasure and the comfort, and in that degree to the success also of the expedition. Mr. Airy rightly considered that on board the *Himalaya* a pianoforte would be no less appropriate than a telescope on the table-land of the Pyrences.

As we steamed close to the Eddystone and down the Channel in smooth water, Mr. Airy assembled his fellow-voyagers, and after once more explaining to them the principal objects of the excursion, took a list of their names, and the probable localities where they proposed to remain. Several photographs were then taken of the passengers in various groups; but even the gentle roll of the noble vessel seems to have put very decided limits to the success of these operations In the evening a stiff breeze and the Bay of Biscay very perceptibly thinned the saloon; on Sunday but very few partook of the hospitality so liberally provided by the Admiralty, but Monday morning brought the *Himalaya* to anchorage in the Roads of Bilbao, and not a few of its passengers to the end of their temporary misery.

At the mouth of the river Nervion, which leads up to Bilbao, Mr. Vignolles had provided a small steamer for such of the expedition as proposed to land there. Among these were the astronomers of Greenwich and Pulkowa, Mr. de la Rue, and the writer of this article; the others proceeded in the *Himalaya* westward to Santander.

On the following morning, Tuesday, July the 10th, the members of the expedition assembled at the office of the railway, and there, after many explanations from Mr. Airy and Mr. Vignolles, each selected the place at which he proposed to prosecute his observations. Chronometers also were compared, and in many instances interpreters were assigned to different parties. The main difficulties which beset us were two:—First, there was the difficulty of transit for persons and for instruments of no slight weight; and secondly, there was the climate. The kindness of the estimable Engineer-in-Chief, and the liberality of the resident contractor, Mr. Bartlett, overcame the former; and as to the climate, we were advised to post ourselves as far from the coast and as far south of the Pyrenees as we could. But then, on the other hand, if we left the works in construction along the railway, other difficulties of a formidable nature would intervene; our party therefore considered ourselves eminently fortunate in being taken under the protection of Mr. Bartlett. Mr. Vignolles undertook to provide for Mr. Airy, M. Struve, and the ladies; while Mr. de la Rue, for prudential reasons connected with the weather, engaged for his party and his instruments the whole of a diligence, and determined to proceed further south than any of the rest of us. He had taken with him, in detached pieces, the fabric of an Observatory which he had constructed in England for the shelter of his photographic instruments, and this he re-erected near to Miranda del Ebro, about fifty miles south of Bilbao. At Pobes, about twelve miles north of Mr. de la Rue, the Astronomer Royal and M. Otto Struve were posted; and about the same distance further north still, near to Gujuli, the writer of this article and his party took up their position. Several circumstances induced us to stop here. First, near to this point was situated the chief depôt of the railway in course of construction, hence assistance, if needed, was at hand; secondly, we were

there offered the kind hospitality of Mr. Bartlett during our stay; and thirdly, we there found an almost uninterrupted panoramic view of the country for upwards of twenty miles, presenting thereby an opportunity of witnessing the grand sweep of the moon's shadow, and the various atmospheric effects which we anticipated would accompany the eclipse. Nor were we disappointed.

Our station was on a small table-land at the culminating point of the Spanish Pyrenees, and of one of the steepest and most elevated railways in Europe. It formed the watershed of streams which on the one hand flow into the Atlantic, and at the distance of a quarter of a mile on the other, find their way into the Ebro and the Mediterranean. Before leaving Bilbao we took the height of the barometer on the shore of the river Nervion, and again immediately on our arrival at Gujuli. These observations gave us on calculation 2,200 feet as our height above mean high water at Bilbao—a result in very satisfactory accordance with the railway levellings.

Our instruments had been conveyed from Bilbao to Gujuli in the railway ambulance, and ourselves in Mr. Bartlett's carriage. Comfortable lodgings were arranged for us at the little village of Izara in the house occupied by Mr. Rhodes, the very intelligent and amiable foreman of the works of the railway; nothing, in fact, was wanting to us, that the most liberal hospitality and thoughtful care could suggest.

On Thursday, the day after our arrival, the workmen of the railway erected for us a most convenient observing hut, about half a mile from the workshops, railing it off with a palisading, lest we should have "the misfortune to be oppressed with too much company." The Spanish authorities also offered us a guard of soldiers, for the protection of ourselves and our instruments by night and by day. This we respectfully declined.

So there was our party of four posted in a little hut on the culminating edge of the Spanish Pyrenees, amidst scenery of no ordinary wildness and grandeur; alone, and yet with no impression of solitude. Our days were spent in the hut and its little enclosure, endeavouring, as the weather permitted, to adjust our instruments; now and then strolling, as opportunity presented itself, into the neighbouring villages, and in the evening returning through a forest of ilex and pine, and by the side of beech-ponds, to our hospitable quarters. A few months before our arrival, but few Englishmen had ever traversed that wood, or perhaps could have traversed it alone and in safety; but now we wondered at, and we welcomed as the precursors of civilization, the scream of the steam-whistle and the screech of the saw-mill. To us, strangers as we were in a foreign land rarely visited, many were the strange scenes, and strange incidents, and strange ways of men. As to the maxims of political economy, they were of course set utterly at nought. You would be imprisoned if you bought a ham, or a cheese, or a joint of mutton, or a pigskin of wine, from the unlicensed person. More than once we tried to intercede with the Alcalde in behalf of a recalcitrant Irishwoman who would not or could not understand that, while she herself took care to sell her commodities in the dearest of markets, she was interdicted from purchasing in the cheapest. Imprisonment was also threatened to one of our young engineers, because on the Sunday after our arrival he permitted Divine Service after a Protestant model to be performed in his house. We were ourselves supposed to be in league with the Evil One, from whom, for a consideration, we had purchased our knowledge of the eclipse. But what struck us beyond other things was the little respect in which a man's self and the life of a man were held. The native workmen, by day, were as coarsely fed as the domestic animals among ourselves, and, by night, they were packed away very much like herrings in a box: if they died they were buried with apparently little more ceremony than the dogs. These were the first impressions made upon our minds by what we witnessed with our eyes and ears; but, on further and more quiet reflection, we came to the conclusion that we Englishmen, not being without our own peculiar sins and shortcomings, were not justified in casting stones at our neighbours; time also, patience, and civilization, would do that for them which they had done for ourselves.

Our instruments consisted of an excellent telescope, wth an aperture of 3¼ inches, mounted equatorially, and an altazimuth for the determination of our time and our latitude. The telescope was provided with the Herschelian contrivance of a plane glass diagonal reflector in the eye-piece, already referred to, and by means of which we could observe the sun's disc with the entire aperture of the telescope, without the risk of the splitting of the slightly-tinted eye-shade, through the concentration there of the solar heat. This plane glass reflector had a sliding motion in its frame, one half of it was covered with a polished silver film, and could be slipped into use when the solar light during the eclipse had become sufficiently feeble.* The meteorological instruments consisted of a barometer, several thermometers of various constructions, especially one with a blackened bulb *in vacuo*, intended for the estimation of the solar radiation; and an actinometer, all of th m being of standard excellence. We took with us no rain-guage, for we at least desired fine weather; had we taken one, it would have been in almost constant use.

With the exception of Sunday, the 15th, the state of the weather was such as to fill us with the greatest anxiety for the success of the expedition. It was with much difficulty we could adjust our equatorial telescope to the latitude of our position, and at last it was effected mainly by observations on a sun-spot fitfully visible through the clouds or the mist. Throughout Sunday night there was a violent storm of thunder and rain, the usual precursor of broken weather in those districts. On the Monday and Tuesday following nothing could be done beyond a constant register of the meteorological instruments, for the sky was persistently covered with clouds. We amused ourselves, however, with the barometrical measurement of the height of the precipice on the very brink of which our hut was built, and at the end of which the Altube fall rushed sheer down into the plain below in its course to swell the waters of the Ebro. Its height exceeded 600 feet. Anticipating the possible failure of our enterprise, some of our party arranged for the purchase of half a sheep, in order that if the eclipse failed them, they might, through holes bored in the side of our hut, at least study the manners and customs which our neighbours the eagles and vultures observed at their banquets.

On the evening of the 17th, the day before the eclipse, many of the engineers and *employés* assembled by appointment in our lodgings at Izara. We there detailed to them the principal phenomena to which it was desirable to direct their attention. Various selections from these were drawn up on small pieces of paper, each person selected that which pleased him best, and to that he promised in the main to devote his attention. The meteorological observations, which had been carefully conducted at short intervals since the time of our arrival at Gujuli, were still to be entrusted to the accurate and experienced eyes of Mr. Fasel. Mr. Wright undertook to expose for a definite time certain pieces of photographic paper which had been carefully marked and arranged in order in the pages of a book; the purport of this arrangement being to obtain a formal estimation of the diminishing amount of light as the eclipse advanced. This arrangement, however, which was purposely put into execution half-an-hour before the commencement of the eclipse, wholly failed through the imperfection of the photographic paper supplied to us by a London photographer. Of course we ought properly to have tested our materials before leaving England.

Our kind friend, Mr. Bartlett, with a companion, agreed to adjourn to the summit of the Undiagan Hill, a conical eminence, about half a mile from our station, rising about 500 feet above the level of our hut. From this elevated post he undertook to watch and record the position of such coloured prominences as might become visible to the unaided eye. For the accurate performance of this duty, the author of this paper contrived a sort of rough natural micrometer, which was found to be singularly effective for the observations in question. The observer was directed to erect a plumb-line,—in plain language, a string with a heavy stone attached to it; he was then to place his eye in such a position behind it, that the plumb-line should appear to divide the sun in front of it into two halves. The sun he was mentally to regard as the face of a clock. Where the plumb-line struck the upper limb of the sun he was mentally to regard as XII. o'clock; the point opposite to it on the lower limb he was to regard as VI. o'clock. Whatever phenomenon occurred on the edge of the sun, or in the corona, was to be recorded as having occurred at the corresponding hour and minute of the imaginary clock face. This mode of observation was found to be practically very convenient, and susceptible of considerable accuracy. For the want of some such easy contrivance determining the vertical point of the sun's upper limb, many even modern observations of solar spots have been deprived of very much of their practical value. In order to impress upon the observers the necessity of attending to this matter, each paper of directions was headed with the words, "MIND YOUR PLUMB-LINE," and this continued to be an adage among many of our party for months afterwards, and may no doubt be profitably remembered by some of our readers under circumstances by no means astronomical.

M. Schwartz and Senor Don A. Fuente were furnished with slips of paper taken from various parts of the *Times* newspaper, printed in the various types employed in that journal, the object being to ascertain in a practical form some measure of the amount of light still existing during the obscuration of the sun.

Mr. Russell Scott and a friend undertook to observe what stars and planets became visible during the eclipse, and for this purpose they were furnished with Mr. Hind's valuable star-chart already referred to. These gentlemen were also specially charged with a careful scrutiny of the neighbourhood of the eclipsed sun, in search of M. Lescarbault's suspected planet Vulcan, or any other intra-Mercurial planet.

Our intelligent friend, Mr. Rhodes, and an assistant, charged themselves with observing the form and dimensions of the corona, and in particular with noting the position of any luminous radiations which might occur, and with this view they were enjoined to be careful to "*mind their plumb-line*," and the imaginary clock face.

Mr. Bartlett's groom was to be in charge of a pair of spirited horses, and a dog or two, and undertook to watch the effects produced upon them and on other animals during the totality of the eclipse. The writer reserved the observations with the telescope for himself. Mr. Fasel undertook to watch the approach and recession of the moon's shadow. Thus, each person having selected that portion of the work which suited him best, we separated, looking forward to the morrow with more fear than hope.

The morning of Wednesday the 18th, and the day of the eclipse,

* See here page 19, and *passim*, The Bakerian Lecture, by Mr. de la Rue, fo. Phil. Transr 1862.

was as unpropitious as cloud and rain and mist could make it. Had the railway been completed, assuredly we should have left our mountain height, and have proceeded *anywhere* along the line in quest of clear weather somewhere. Nor were we alone in our anxiety. Mr. Airy at Pobes, Mr. de la Rue at Miranda, were involved in similar apprehensions. A party of French *savans*, acting under M. Leverrier had posted themselves and certain ponderous instruments on a hill some seventy miles south of us, and distressed at the threatened disappointment, that eminent astronomer actually did what we only desired to do—he quitted the height and his friends, and the ponderous instruments, and, unembarrassed with such impediments, hastened down to the plain below in quest of the sun: happily he found it in time; but so also he would have done had he remained with his friends on the hill.

Notwithstanding the unpromising state of the weather and the sky, some of us, as our duty was, proceeded at seven A.M. to our observing hut, there to make all the preparations, and to be ready for the best or the worst. At noon we saw Mr. Scott leisurely and reluctantly ascending our hill under the shelter of an umbrella. By way of chiding the water, or of concealing their chagrin, he was assailed with the notes of "Rule Britannia," but a trifling break in the clouds occurring at the moment of his arrival, the telescope was adjusted as on a former occasion by means of an imperfectly visible sun-spot, while the object glass was protected from the drizzling mist by the friendly umbrella.

Matters now began to mend, the weather clearing up rapidly in the direction of Pobes and Miranda, and we rejoiced for our friends there. Soon after noon the whole population of the country seemed to have turned out, and assembled as near as they could to our hut and the large telescope. To our infinite surprise, and in the first instance not without some apprehension on our part, scores of soldiers were seen in the distance marching evidently in the direction of our hill: we found in due time that they had been dispatched by the kind thoughtfulness of the Spanish authorities from Ordûna, partly to act as a protection for us, and partly as a guard of honour. At the polite request of the officer in command, we accepted two of them as a patrol round our little enclosure, while the rest dispersed themselves to see what might chance to occur.

At one o'clock, to our great relief, not a cloud was to be seen in the heavens from the horizon to the zenith, with the exception of a dense mist which enveloped, as usual, the shoulders and summit of the Gorbea mountain, under which inhospitable canopy we suspected, and subsequently were assured, that Mr. Vignolles, the very Coryphæus of our expedition, was vainly attempting to see the sun. And now among our neighbours there commenced a very active demand for pieces of smoked glass, which we gratified to the best of our power, the supply of the raw material coming from the workshop of the railway. Our party then separated, each to his post and to the particular line of observation which he had selected.

The first contact of the sun and moon was well observed with the telescope at 1h. 47m. 20s. G.M.T., but the remaining part of the disc of the dark moon itself thus striking the sun was wholly invisible: this phenomenon, though usual in eclipses, nevertheless is always remarkable. As the black moon silently crept over the sun's face, its uneven mountainous character became clearly displayed. There were several spots on the sun, and faculæ, or huge mountainous ridges of its luminiferous envelope, were heaped up in abundance towards the eastern or left-hand limit. At 2h. 27m. the landscape had become perceptibly dim, reminding us of the light of an autumn sunset. At 2h. 44m. some of the assistant engineers were observed to shrug their shoulders and put on their oilskin coats, while many Spaniards, who sat on the grass, watching the eclipse, began to push themselves into the heather to warm their backs. Our black bulb thermometer, inclosed *in vacuo*, which to a certain extent resembles a human back with a black coat on, had now fallen some 40° since the commencement of the eclipse; the ordinary thermometer in the shade had fallen only 8°. About 2h. 51m., that is, ten minutes before the totality, compliments began to be freely passed among our party on the grim, sepulchral hue assumed by the human countenance, and excitement was now becoming general. The corona became partially visible to us some seconds before the extinction of the sun's light, and on the side opposite to the remaining light. A rose-coloured prominence was also reported as having been seen distinctly near the highest part of the sun, many seconds before the totality. The last light of the sun was not extinguished like an unbroken luminous thread, but in an undulating line; it was not broken up into *detached* brilliant beads. Mr. Fasel, whose duty it was to look for it, saw, or as it were *felt*, the mighty rush of gloom which came sweeping at an awful speed from the N.W. like a storm over the waters, and yet suddenly wrapping objects and men in an unexpected, windless silence and calm. In an instant the corona now broke forth in its beauty around the black moon, surrounding it like a radiated crown of glory, in width fully extending to half its diameter. The hundreds of Spaniards who lay warming themselves in, rather than on, the heather, now sprang up as if electrified, shouting, "Mire a la luna! Mire a la luna!" "Look at the moon! Look at the moon!" Our friendly Alcaldes soon quieted them, and they lay down again watching in silence.

But other circumstances besides the apparition of the corona, contributed to the grandeur and excitement of the scene. Our entire distant horizon, where it was at all visible, became tinged with such hues as are not seen by mortal eyes on other occasions. They did not precisely resemble the gorgeous variegated tints of sunset, for the source of those tints is a light shining *from below*, but the vapours of our horizon were illuminated with the radiations of the corona shining *from above*. The distant hills were blue, with a sharp outline, the immediate foreground at their bases was a distinct orange, while the sky above them for several degrees assumed a strong rosy tint, and then rapidly shaded off to a dark indigo blue, right up to the black moon and the corona, near to which planets and stars were shining. But that indigo sky seemed not in its proper place, it descended ominously near to the earth, while the moon, like a round black patch, hung in the mid air with a strange huge open space between it and the corona. The aspect of things was unearthly and seemed inverted.

* * * * * * *

Mr. Scott, who was charged with that especial duty, reported that he had seen four planets,—viz., Mercury, Saturn, Jupiter and Venus, during the totality; the two latter were visible for some minutes both before and after. He saw also Regulus, Sirius and Procyon. He could discern no trace of the hypothetical Vulcan, nor of any other intra-Mercurial planet.

The effects produced on animals reported by Mr. Bartlett's groom, and by others, was very various. The horses and dogs which he had taken with him appeared to be unconcerned, The former continued to graze and the latter to eat. Not so with a large assemblage of sheep; they divided themselves into small flocks and scampered off in as many directions; we subsequently learned that these directions were towards their several homesteads. Small birds were terribly frightened, some ran among the spectators, and two, as a reward for their confidence, were caught. An eagle came wheeling in disagreeable propinquity round the head of one of the assistant engineers, who was posted a few miles away from us.

Nevertheless, the darkness was rather peculiar than intense. There was no difficulty in reading the chronometer. The smallest type employed in the *Times* newspaper was deciphered by the aid of the light reflected from the corona by the masses of now white cloud which enveloped the Gorbea mountains, and alas! our kind friend Mr. Vignolles also. It is said that shadows thrown by the corona were visible, but none of our party testified to that.

Such, then, were the remarkable, not to say the sublime, phenomena witnessed by us during this eclipse. Alas! they were almost as evanescent as they were grand: for three minutes only they were beheld in astonishment, and then they vanished as suddenly as they burst on our view. The returning light came, to our regret, and yet, in a certain sense, it came also to our relief.

The neighbourhood of our enclosure, which during the last two minutes had been enveloped in deep silence, now became animated with the hum and the movements of hundreds of men and women who came crowding round us. Some of the officers of the guard, and the Alcaldes, and the Priests, were gratified with the sight of the waning eclipse through the telescope; to our regret we could explain nothing but by dumb show. One of them, to Mr. Fasel's horror, removed a minimum grass thermometer from the ground, turning the bulb towards the sun in the vain endeavour to use it as a telescope. Of course the indications were destroyed, and there is a corresponding hiatus in our friend's meteorological register, but this is the sole trifling mishap which befel us on the day; nothing could exceed the good behaviour and good humour of our rustic companions.

We continued to observe the meteorological instruments until the time of the last contact and the termination of the eclipse: this occurred at 4h. 9m. 20·8s. G.M.T. We then adjourned to the little inn at Gujuli, where a substantial and not unwelcome meal was provided by the liberality of Mr. Bartlett for some five-and-twenty, who more or less contributed to the observations of the day. Those of our party who had brought in the written results of what they had seen, kindly submitted to a cross-examination, not unnecessary for the sifting of fact from imagination; one of them whose accounts did not exhibit a complete cohesion, finding himself a little confused, at length broke out into the naive confession, "*En fin, Monsieur, j'etais un peu distrait.*" Perhaps if we admitted the truth to ourselves, there was hardly one among us who had not been a little *distrait*. As one instance of this, we may record that such was the astonishment or the mental absorption of one of our party at the sudden apparition of the corona, that he did not hear or did not heed the notification of the moments when the totality commenced or ended, although distinctly announced by the observer at the telescope. The reader will not be far wrong if he considers the middle of the eclipse to have been at 3 P. M.

* * * * * * *

Such was, and thus ended, our share of the observations of this memorable eclipse. Happily there were few failures owing to the weather among any of the parties who located themselves anywhere near to our longitude in Spain. Father Secchi, the eminent astronomer of Rome, obtained available photographs at Desierto de las Palmas; the French savans near Tarrazona, our own Astronomer Royal and M. O. Struve at Pobes. Mr. de la Rue at Miranda de Ebro, and, we may add, ourselves at Gujuli, were all successful in our respective efforts. It is with regret we record that the weather was unpropitious for those able observers who left us at Bilbao, and proceeded westward in the *Himalaya* to Santander. The late eminent philosopher, Dr. Whewell, had posted himself in the plains near to Ordûna, about five miles to the N.W. of us, and many

hundred feet below us, and there he was enveloped in mist. Mr. Joseph Beck skilfully pioneered the way to a future determination of the nature of the light of the corona by means of an ingenious polarizing apparatus; and Mr. Bonomi made some exquisite drawings tinted on the spot, of the wonderful light visible round his horizon. Both these gentlemen were attached to the party who accompanied Mr. de la Rue. But there can be no doubt that the most important contributions to our knowledge of the real features of a solar eclipse were made at Miranda de Ebro, through the skill, the perseverance, and the genius of self-reliance exhibited by the last-named gentleman.

The reader who may feel interested in the subject of this article, will find in the South Kensington Museum, a magnificent model of the Tudela railway, and the remarkable country through which it passes near to our station, executed by its talented engineer, and the pilot of the *Himalaya* expedition, Mr. C. Vignolles. He may also see at that institution enlarged positive copies from *the actual* negatives, taken by Mr. de la Rue in Spain. These impressions were displayed in the International Exhibition of 1862, and were afterwards presented to the South Kensington Museum.

Of course the question recurs again, What, after all, are those mysterious tongues of coloured light, or those substantial prominences of which so much has been written, and which even now excite so lively a curiosity? This much may be said, it is at least something to know that they are *real existences*, and not, as some philosophers have imagined them to be, mere interactions of waves of light; it is still more to know *where* they are, and now we are sure they are entities attached to the sun. It is more, also, to be assured that they are not connected in locality with solar spots, for they are abundantly visible in many parts of the sun's photosphere, where spots have never been known to occur. What then, are they after all?

It *may* be they are enormous masses, and, in some instances, detached masses, of cloud-like vapours floating in an atmosphere, surrounding the incandescent photosphere of the sun, and being illuminated from below, become, by reflection, visible to us. It *may* be they are masses of incandescent materials similar to those which constitute the sun's photosphere itself, but less luminous because lower in temperature.

We have not now the space at our command to enter at any length upon those modern speculations regarding the nature of the sun's envelopes, which are proposed in explanation of solar phenomena when viewed through powerful telescopes, or observed during solar total eclipses such as we have described. Nevertheless a few rapid remarks may be acceptable to some of our readers. The sun's photosphere, as now seen with all the aids of recent scientific inventions, appears to be strongly mottled and porous: it does not resemble a continuous blazing sheet, but by some of our best observers is described as broken up into detached filaments, more or less elongated in form; and the average surface which each of these filaments presents to the eye probably exceeds the area of Great Britain. These detached entities are presumed to be vaporous, cloud-like masses of elementary substances chiefly metallic, and in a state of vehement incandescence; they are presumed to float in some intensely heated transparent medium, and are to us the sources of solar heat and light.

Sometimes, and it is believed in recurring cycles of about ten years, this photosphere, towards its equatorial parts, becomes violently disturbed; as it were, by cyclones, and in places is whirled or torn into holes of an unknown but enormous depth, occasionally large enough to receive the entire terrestrial globe. In the depths of these holes are seen dark areas constituting what appear to the eye to be solar spots. These dark areas or spots are probably portions of a luminous atmosphere below the photosphere, but appearing to be dark through contrast with the intolerable brightness of that which is above it. Within this dark area Mr. Dawes observed (and others have confirmed the observation) a still darker area, which, as far as we know, may be the dark body of the sun itself, or it may be another envelope possessing a lower degree of luminosity than the two others described above it. These are the main appearances disclosed by the telescope, except so far as that the photosphere itself is often observed, in places, to be piled up like gigantic waves above the general level of the luminous surface: these are called *faculæ*. There are competent philosophers who begin to suspect that they see evidences of *fiery tides* on the sun's surface caused by the action of the nearer planets.

The other phenomena surrounding the solar disc, but which are visible solely during a total eclipse, we have already described, and we shall now merely add that Father Secchi believes that he has seen more than once either the red prominences themselves, or something analagous, when viewed *on the dark background of a solar spot*. But, strange to say, so rapid has been the progress of physical knowledge during the six or seven years since the *Himalaya* started from Plymouth in 1860, with its freight of astronomers, that the next eclipse of the sun will probably suffice for the deciphering of the enigma in which the real nature of these coloured prominences is at present involved. Nor shall we have to wait long for the opportunity. In August next, 1868, there will be visible over a large area of Central India a total solar eclipse, the duration of which will, fortunately, be double that which we have endeavoured to describe. We have reason to believe that skilful and properly instructed persons have undertaken to apply to these mysterious lights, among other suitable processes, the simple but efficacious methods of spectrum analysis.

OFFICIAL NOTICES.

EXTRACT FROM THE MINUTES OF THE COUNCIL OF PUBLIC INSTRUCTION, JULY 7TH, 1866.—"Provision being made by the School Law for the publication of a *Journal of Education*, the Council of Public Instruction directs that the said *Journal* be made the medium of official notices in connexion with the Educational Department."

T. H. RAND,
Sec'y to C. P. I.

I.

The following Order of the Council of Public Instruction, made in October last, under authority of the 12th sub-division of the 6th Sec. of the *Law concerning Public Schools*, is re-published for the guidance of Inspectors, after the annual meetings in October next:—

"In cases where sections failed to determine, in annual meeting, which member of the Board of Trustees should retire from office, and to fill the annual vacancy in the Trusteeship, it shall be the duty of the Inspector to determine which Trustee shall retire; and the Commissioners shall fill such vacancy in the manner directed by Law."

September, 1867.

II.

The Council of Public Instruction has been pleased to make the following appointments:

To constitute the Provincial Board of Examiners—

Department of Language:
REV. J. M. HENSLEY, D.D., *King's College.*

Department of History and Geography:
REV. THOMAS J. DALY, *St. Mary's College.*

Department of Mathematics:
D. F. HIGGINS, M.A., *Acadia College.*

Department of School Management, Teaching, &c.:
REV. JAMES ROSS, D.D., *Dalhousie College.*

September 26th, 1867.

III. *Holidays and Vacations.*

Notice is hereby given to Trustees of Schools and others, that CHAPTER XI. of the COMMENTS AND REGULATIONS OF THE COUNCIL OF PUBLIC INSTRUCTION. "Of Time in Session, Holidays, and Vacations" has been revised as follows:

HOLIDAYS.

The following Regulations have been added to SECTION 3, of the Chapter above named.

a. When for any cause the Trustees of a school shall deem it desirable that any prescribed Teaching Day should be given as a Holiday, the school or schools may be kept in session on the Saturday of the week in which such Holiday has been given, and such Saturday shall be held to be in all respects a legal Teaching Day.

b. When, owing to illness, or for any other just cause, a teacher loses any number of prescribed teaching days, such teacher shall have the privilege of making up for such lost days, to the extent of SIX during any Term, by teaching on Saturdays; But

c. No school shall be kept in session more than five days per week for any two consecutive weeks;

d. Nor shall any Teacher teach more than FIVE DAYS PER WEEK on the average (vacations not being counted) during the period of his engagement in any term.

The Anniversary of the QUEEN'S BIRTHDAY shall be a Holiday in all the Public Schools, as heretofore.

VACATIONS.

The following Regulations have been made in lieu of SECTION 4, of the Chapter above named:—

1. The CHRISTMAS VACATION shall remain as heretofore, the "eight days" being held to mean week-days other than Saturdays.

2. Instead of two vacations during the summer term (a week at seed time and a fortnight at harvest) as heretofore, THREE WEEKS (15 week-days other than Saturdays,) shall hereafter be given as vacation during the summer term, at such time or times as the Trustees shall decide: Nevertheless

3. In order that the due Inspection of Schools as required by law, may not be interfered with, each Inspector shall have power, notwithstanding anything in the foregoing Regulations, to give notice of the day or days on which he proposes to visit any school or schools in his county for the purposes of Inspection, and to require that on the day or days so named such school or schools shall be kept in session.

July, 1867.

IV. *To Teachers not supplied with Registers.*

As a much larger number of schools are in operation this term than was anticipated, the edition of Registers is insufficient to supply a copy for each teacher engaged. All teachers who have been unable to procure a Register are notified that till the close of the present term, Oct. 31st, a careful record of the daily attendance of pupils will be accepted as a compliance with the requirements of the school law with respect to registration. In every such case, before signing the certificate contained in the TRUSTEES' RETURN, the teacher is authorized to erase the words "the prescribed Register," and insert in their stead, "a record of the daily attendance of the pupils."

May, 1867.

V. Teachers' Agreements.

The attention of Teachers and Trustees is again called to the necessity of complying with the provision of the Law in relation to the disposal of the County Fund. It appears from the School Returns of the past Term that some teachers have in their agreements with Trustees in respect to salary, *assumed all risk as to the amount to be received from the County Fund.* Such proceeding is contrary to the provisions of the law and directly subversive of a most important principle of the school system, since the pecuniary penalty imposed upon the inhabitants of the section by the absence and irregular attendance of pupils is thereby inflicted upon the teacher, while the pecuniary rewards consequent upon a large and regular attendance of pupils at school is diverted from the people to the teacher. These results clearly tend to prevent the growth and development of a sentiment of responsibility and interest among all the inhabitants of each section, and thus measurably defeat the object of the whole system—the education of every child in the province.

The Superintendent of Education, therefore, calls the attention of Teachers and Trustees to the following

NOTICE.

1. The COUNTY FUND is paid to the TRUSTEES of the section. The amount depends upon the number of pupils, the regularity of their attendance, and the number of prescribed teaching days on which school is open in any section during the term.

2. Teachers must engage with Trustees at a *definite sum or rate.* The Provincial grant is paid to teachers *in addition* to such specified sum.

3. The following form of agreement is in accordance with the law:

[Form of Agreement.]

Memorandum of Agreement made and entered into the —— day of ——— A.D. 186 , between *(name of teacher)* a duly licensed teacher of the —— class of the one part, and *(names of trustees)* Trustees of School Section No. —— in the District of ——— of the second part.

The said *(name of teacher)* on his (or her) part, in consideration of the below mentioned agreements by the parties of the second part, hereby covenants and agrees with the said *(names of Trustees)* Trustees as aforesaid and their successors in office, diligently and faithfully to teach a public school in the said section, under the authority of the said Trustees and their successors in office, during the School Year (or Term) ending on the thirty-first day of October next, (or the thirtieth day of April, as the case may be).

And the said Trustees and their successors in office on their part covenant and agree with the said *(name of teacher)* Teacher as aforesaid, to pay the said *(name of teacher)* out of the School Funds under their control, at the rate of —— dollars for the School Year (or Term.)

And it is hereby further mutually agreed that both parties to this agreement shall be in all respects subject to the provisions of the School Law and the Regulations made under its authority by the Council of Public Instruction.

In Witness whereof the parties to these presents have hereto subscribed their names on the day and year first above written.

Witness, *(Name of Teacher.)*
(Name of Witness.) *(Names of Trustees.)*

4. Each Inspector is instructed to report every case of illegal stipulation on the part of teachers, in reference to the County Fund.

May, 1867.

VI. To Trustees of Public Schools.

1. "A relation being established between the trustees and the teacher, it becomes the duty of the former, on behalf of the people, to see that the scholars are making sure progress, that there is life in the school both intellectual and moral,—in short, that the great ends sought by the education of the young are being realized in the section over which they preside. All may not be able to form a nice judgment upon its intellectual aspect, but none can fail to estimate correctly its social and moral tone. While the law does not sanction the teaching in our public schools of the peculiar views which characterize the different denominations of Christians, it does instruct the teacher "to inculcate by precept and example a respect for religion and the principles of Christian morality." To the trustees the people must look to see their desires in this respect, so far as is consonant with the spirit of the law, carried into effect by the teacher."—"*Comments and Regulations*" *of Council of Public Instruction. p.* 51, *reg.* 5.

2. Whereas it has been represented to the Council of Public Instruction that Trustees of Public Schools have, in certain cases, required pupils, on pain of forfeiting school privileges, to be present during devotional exercises not approved of by their parents; and whereas such proceeding is contrary to the principles of the School Law, the following additional Regulation is made for the direction of Trustees, the better to ensure the carrying out of the spirit of the Law in this behalf:—

ORDERED, That in cases where the parents or guardians of children in actual attendance on any public school (or department) signify in writing to the Trustees their conscientious objection to any portion of such devotional exercises as may be conducted therein under the sanction of the Trustees, such devotional exercises shall either be so modified as not to offend the religious feelings of those so objecting, or shall be held immediately before the time fixed for the opening or after the time fixed for the close of the daily work of the school; and no children, whose parents or guardians signify conscientious objections thereto, shall be required to be present during such devotional exercises. *March*, 1867.

3. "The hours of teaching shall not exceed six each day, exclusive of the hour allowed at noon for recreation. Trustees, however, may determine upon a less number of hours. A short recess should be allowed about the middle of both the morning and afternoon session. In elementary departments, especially, Trustees should exercise special care that the children are not confined in the school room too long."—"*Comments and Regulations*" *of Council of Public Instruction, p.* 48, *reg.* 2.

VII. The procuring of Books and Apparatus.

1. WHEREAS, by the 20th Section of the Amended School Law, the ratepayers of each school section are empowered to assess themselves for the purchase of prescribed School Books, Maps, and Apparatus; and WHEREAS, by the 15th subdivision of the 6th section of the said law, an annual Provincial Grant is provided to enable the Superintendent of Education to furnish the above articles at half their cost, to School Trustees,—

NOTICE IS HEREBY GIVEN,

That the Superintendent of Education will furnish, as below, School Books, Maps, and Apparatus, to the extent of the Provincial Grant in aid of the same.

2. Trustees must carefully comply with the following Regulations:—

Reg. 1.—Applications must be made in the following form, and addressed to MESSRS. A. & W. MACKINLAY, HALIFAX, who have been duly authorized to attend to all orders.

[Form of Application.]

(Date)

Messrs. A. & W. Mackinlay,
Halifax.

SIRS,—We enclose *(or forward by ——)* the sum of $———, for which you will please send us the following articles provided by the Superintendent of Education for use in the public schools. The parcel is to be addressed———*(here give the address in full)* and forwarded by———*(here state the name of the person, express company, or vessel; and, if by vessel, direct the parcel to be insured, if so desired.)*

LIST OF ARTICLES.

(Here specify distinctly the Books, Maps, &c., required, and the quantity of each sort.)

We certify that each and all of the articles named in the above list are required for use in the Public School (or Schools) under our control, and for no other purpose whatsoever; and we engage strictly to carry out the Regulations of the Council of Public Instruction for the management and preservation of school books and apparatus.

(Signed) ———— } *Trustees of——School Section,*
———— } *in the County of——*
———— }

Reg. 2.—Any application not accompanied with the money will not be attended to.

Reg. 3.—All costs and risk of transportation of parcels must be borne by Trustees, (*i. e.* by the Sections on behalf of which they act, and not by the Educational Department.)

☞ If Trustees so direct in their application, goods (except Globes,) transported by *water* will be insured for the amount paid for the same by them, at the following rates:—

Parcels shipped during the First Term of the School year, 2½ per ct.
" " Second Term " " 1½ per ct.

Trustees must forward with their application the amount required to effect the insurance, otherwise parcels will not be insured. No charge will be made for policies.

Reg. 4.—Applications will, as far as the articles in stock and the annual grant permit, receive attention in the order of their receipt.

Regulations.

3. The following are the regulations of the Council of Public Instruction with reference to all Books, Maps, and Apparatus furnished to Trustees, under the operation of Sec. 6 (15) of the law concerning Public Schools:—

Reg. 1.—They shall be the property of the School Section, and not of private individuals (except as specified in Reg. 5.)

Reg. 2.—Any pupil shall be entitled, free of charge, to the use of such school books as the teacher may deem necessary.

Reg. 3.—Any pupil shall have the privilege of taking home with him any books, &c., which, in the opinion of the teacher, may be required for study or use out of school.

Reg. 4.—Pupils, or their parents or guardians, shall be responsible for any damage done to books beyond reasonable wear and tear.

Reg. 5.—Any pupil desiring it, may be allowed to purchase from the trustees the books required by him, provided the same be done without prejudice to the claims of other pupils; the price to be, in all cases, the same as advertised in the official notice published from time to time in the *Journal of Education.* No pupil who has been allowed to purchase a book shall have any claim on the trustees for the free use of another of the same kind.

Reg. 6.—Any section neglecting to provide a sufficient supply of books, maps, and apparatus, may be deprived of the public grants.

Reg. 7.—Trustees shall make such further regulations, agreeably to law, as may be necessary to ensure the careful use and preservation of books, maps, and apparatus belonging to the section.

Any section infringing in any way upon the above regulations will forfeit the privilege of purchasing books, &c., at half cost.

4. List of Text-Books, Maps and Apparatus.

☞ The following list of Books will be extended, and other articles of apparatus included as the fund at the disposal of the Superintendent permits. The Wall-Maps (including one of the United States) now in course of preparation, under the supervision of the Educational Department, will be added to the list as soon as published.

THE NOVA SCOTIA SERIES OF READING BOOKS.

Book No. 1.....	$0.22½ doz.	Book No. 6.....	$0.17 ea.
" 2.....	0.50 "	" 7.....	0.23 "
" 3.....	0.06 each.	The art of Teaching Reading	0.07½" *Or,*
" 4.....	0.10 "	Bailey's Brief Treatise on Elocution	0.05 "
" 5.....	0.11 "		

SPELLING BOOK.

The Spelling Book Superseded, (Rev. Ed.) 8½ cents each.

GRAMMAR AND COMPOSITION.

English Grammar.*
Morell's Analysis, 5 cents each.
Reid's Rudiments of Composition, 20 cents each.
Bain's Rhetoric, 40 cents each.

MATHEMATICS.

Arithmetic.—Nova Scotia Elementary Arithmetic,.....	10	cents each
Nova Scotia (advanced) Arithmetic.....	15	" "
Nova Scotia Arithmetical Table Book.....	19	" doz.
Algebra.—Chambers' Algebra, (as far as Quadratics).....	20	" each.
Do. Do. (complete).....	30	" "
Plane Geometry.—Chambers' Euclid, (including Plane Trigonometry).....	15	" "
Practical Mathematics.—Chambers', (including Land-surveying, a brief treatise on Navigation, &c.).....	45	" "
Solid and Spherical Geometry.—Chambers', (including Spherical Trigonometry, Conic Sections, &c.).....	15	" "
Mathematical Tables.—Chambers'.....	30	" "

Navigation.—Norie's, (an extended treatise).....$1.60 " "
Ball Frames.....70 " each.
Slate Wipers, (to be used *without* water).....18 " doz.
Slates.—Common Slates, (beveled frames) 6½ in. by 8½ in....37 " "
" " 8 in. by 10 in....40 " "
" " 9 in. by 13 in....60 " "
Prepared Slates, 5 in. by 7 in.....1 " each.
" 8 in. by 12 in.....3 " "
Blackboard Chalks, 20 cents per box, (1 gross); Slate Pencils, 7 cents per box, (100).

☞ The Prepared Slates are ruled for writing, and for separate columns of figures, units, tens, hundreds, &c. They are folded once (like a sheet of writing paper), are very *light*, and will *not* break by falling. These slates are suitable for *beginners* only.

WRITING.

STAPLES' PROGRESSIVE SERIES OF COPY BOOKS:

For both girls and boys.
- Book No. 1, 2½ cts. each.
- " No. 2, " "
- " No. 3, " "
- " No. 4, " "
- " No. 5, " "

For girls only.
- Book No. 6, 2½ cts. ea.
- " No. 8, "

For boys only.
- " No. 7, "
- " No. 9, "

Ruled Card to accompany copy books, 6 cts. per doz.
Penholders, 20 cents per gross.
Staples' Circular Pointed School Pens, 24 cents a box (*1 gross*).
Inkpowders, 38 cents per doz.
Rulers, 12 in. (for pupils' use,) 20 for 12½ cents.
Lead Pencils, 8 cents per doz.
India Rubber Erasers, 12 cents per doz.
Pink *Blotting* Paper, 15 cents per quire.

DRAWING.

BARTHOLOMEW'S SCHOOL SERIES OF PROGRESSIVE DRAWING LESSONS.

For beginners. Set of 72 Model Cards, Nos. 1 to 6.....42 cents per set.
For advanced lessons. Sketch Book (models only), Nos. 1 to 5....$1.00 per set.

Packages (12 slips) of blank drawing paper, for model cards, 3 cts. per pack.
Blank drawing books, for model cards, 8½ cts. each.
Blank drawing paper, for Sketch Books, or model cards, 23 cts. per quire.
Drawing Pencils, F, 23 cts. per doz.
" B, " "
" BB, " "
" BBB, " "
" H, " "
India Rubber Erasers, 12 cts. per doz.

DIAGRAMS.

For purposes of illustration, and "Oral Lessons."

Forest Trees (12)	$0.30 per set.
Natural Phenomena (30)	0.60 "
Botanical Prints (roots, stalks, leaves, &c., 26)	1.00 "
Notes of Lessons on do. do. do.	0.06 "
Poison Plants (44)	0.60 "
Wild Flowers (96)	2.00 "
Geometrical Figures (2 sheets)	0.06 "
Mechanical Forces (6, on cloth) with exp. sheets.	1.00 "
Patterson's Plates of Animals (set of 10, mounted and varnished)	11.00 "

GEOGRAPHY.

Calkin's Geography and History of Nova Scotia, 8½ cts. each.
" School Geography of the World.*

Series of Wall Maps.—		Scotland	$1.35 each.
Nova Scotia	$0.55 each.	Ireland	1.35 "
North America	1.35 "	British Isles (in relation to the Cont. of Europe)	1.35 "
Western Hemisphere	1.35 "	Europe	1.35 "
Eastern Hemisphere	1.35 "	Palestine	1.35 "
England	1.35 "	Gen'l Map of Bible Lands	1.35 "

Globes.—The Terrestrial Globe (12 in. diameter, bronze meridian and Quadrant).....$4.50
The Celestial Globe.....4.50

Classical Wall Maps.—		Græcia Antiqua	$1.20 each.
Orbis Veteribus Notus	$1.20 each.	Asia Minor Antiqua	1.20 "
Italia Antiqua	1.20 "	Orbis Romanus	1.20 "

HISTORY.

Hodgins' School History of British America..25 cts. each.
Curtis' Chronological Outlines of Eng. History 6 "

For use in adv. Com. Schools.
- Collier's School History of the British Empire (Revised Edition).....20 "
- Collier's History of Rome.....15 "
- Collier's History of Greece.....15 "

For use in Co. Academies.
- Smith's Smaller History of Rome.....35 "
- Smith's Smaller History of Greece.....35 "
- Chambers' Ancient History.....25 "

NATURAL SCIENCE.

Chambers' Chemistry, (with new notation).....35 cents each.

ECONOMIC SCIENCE.

The Chemistry of Common Things....15 cents each.

CLASSICS.

Latin,—Bryce's First Latin Book,.....20 cts. each.
Bryce's Second Latin Book.....35 "
Edinburgh Academy Latin Grammar..20 "
or, Bullion's Latin Grammar.....50 "
Arnold's Latin Prose Composition.....60 "

AUTHORS—OXFORD EDITIONS.

CÆSAR, de Bello Gallico, *paper*, 20 cts.: *bound*, 25 cts.: Lib. I.—III. (with short notes), 1 vol., *paper*, 10 cts.
VIRGIL, (complete), *paper*, 20 cts.: *bound* 25 cts.: the Georgics (with short notes), 1 vol., *paper*, 20 cts.: the Æneid, Lib. I.—III. (with short notes), *paper*, 10 cts.
CICERO, de Off., de Sen., de Amicit., 1 vol., *paper*, 15 cts.: *bound*, 20 cts.: de Sen., and de Amicit., 1 vol., (with short notes,) *paper*, 10 cts.: Oration for the Poet Archias, (with short notes,) *paper*, 10 cts.
HORACE, (complete), *paper*, 15 cts.: *bound*, 20 cts.: the Odes, (with short notes), *paper*, 20 cts.

DICTIONARY.

White's Junior Scholar's Latin-English Dictionary....93 cts. each.

Greek,—Bryce's First Greek Book,.....25 cts. each.
Bryce's Second Greek Book.....35 "
Bullion's Greek Grammar.....55 "
or, Edinburgh Academy Greek Grammar, 35 "
Arnold's Greek Prose Composition.....55 "

AUTHORS—OXFORD EDITIONS.

XENOPHON, Anabasis, *paper*, 15 cents: *bound*, 20 cts.
EURIPIDES, Alcestis, (with short notes), *paper* 10 cts.
XENOPHON, Memorabilia, *paper*, 10 cts.: *bound* 14 cts.
HOMER, Iliad, (complete), *paper*, 30 cts.: *bound*, 35 cts.: Lib. I.—III. (with short notes), 1 vol., *paper*, 20 cts.

LEXICONS.

Liddell & Scott's Greek-English Lexicon (abrgd.).....$0.93 each.
Yonge's English-Greek Lexicon.....1.06 "

FRENCH.

DICTIONARY.

Contanseau's French-English and English-French Dictionary..$0.43 ea.

* The Council of Public Instruction has authorized the preparation of a General Geography, and an English Grammar for use in the Public Schools, and until these works are published the Superintendent of Education *will not procure any text-books on these subjects.* In the mean time, Trustees are authorized by the Council to use whatever Geography or Grammar they prefer. Campbell's or Lovell's Geography will be found to be about the best; and Lennie's Grammar, if followed by Morell's Analysis, will, perhaps, give as good results as any.

VIII. The Provincial Normal School.

FIRST TERM begins on the second Wednesday in November, and closes on the last Thursday in March.
SECOND TERM begins on the second Wednesday in May, and closes on the last Thursday in September.
*** Students cannot be admitted after the first week in each term, except by the consent of the Principal.

FACULTY OF INSTRUCTORS.

NORMAL COLLEGE.

Method, and the Natural Sciences:—REV. ALEXANDER FORRESTER, D.D. Principal of the Normal College and Model School.
English and Classics:—J. B. CALKIN, ESQ.
Mathematics:—W. R. MULHOLLAND, ESQ.
Music:—MR. CHESLEY.
Drawing:—MISS L. CROWE.

MODEL SCHOOL.

High School Department, MR. EDWARD BLANCHARD.
Preparatory " MR. JAMES LITTLE.
Senior Elementary " MISS LOGAN.
Junior do. " MISS A. LEAKE.
Janitor:—MR. DODSON.

None but holders of valid licenses will be admitted to the Normal School as pupil-teachers. The licenses must be presented to the Principal at the opening of the Term.

Extracts from the Regulations of Council of Public Instruction.—"Before being enrolled a Student at the Normal School, every pupil-teacher shall make the following declaration, and subscribe his or her name thereto: '*I hereby declare that my object in attending the Provincial Normal School, is to qualify myself for the business of teaching; and that my intention is to teach, for a period not less than three years, in the Province of Nova Scotia, —if adjudged a Certificate by the Examiners.*' In consideration of this declaration, instruction, stationery, and the use of text books (except Classical) shall be furnished pupil-teachers, free of charge."

Persons wishing to enrol as Candidates for High School or Academy certificates must, in addition to a good knowledge of English, be thoroughly familiar with the Latin and Greek Grammars, and be able to parse with ease any passage in some elementary work in each language. In mathematics, they must be competent to solve any example in the advanced Nova Scotia Arithmetic, to work quadratic equations in Algebra, and to demonstrate any proposition in the first four books of Euclid."

IX. Bond of Secretary to Trustees.

"The Secretary of the Trustees shall give a bond to Her Majesty, with two sureties, in a sum at least equal to that to be raised by the section during the year, for the faithful performance of the duties of his office; and the same shall be lodged by the Trustees with the Clerk of the Peace for the county or district."—*School Law of 1866, Sect. 42.*

This bond is to be given annually, or whenever a Secretary is appointed, and Trustees should not fail to forward it by mail or otherwise, to the Clerk of the Peace, immediately after they have appointed their Secretary. The following is a proper form of bond:—

PROVINCE OF NOVA SCOTIA.

KNOW ALL MEN BY THESE PRESENTS, THAT WE, (*name of Secretary*) as principal, and (*names of sureties*) as sureties, are held and firmly bound unto our Sovereign Lady VICTORIA, by the Grace of God, of the United Kingdom of Great Britain and Ireland, Queen, &c., in the sum of of lawful money of Nova Scotia, to be paid to our said Lady the Queen, her heirs and successors, for the true payment whereof, we bind ourselves, and each of us by himself, for the whole and every part thereof, and the heirs, executors and administrators of us and each of us, firmly by these presents, sealed with our Seals, and dated this day of in the year of our Lord one thousand eight hundred and and in the year of Her Majesty's reign.

WHEREAS the said ——— has this day been duly appointed to be Secretary to the Board of Trustees of —— School Section, No. —— in the District of ———

NOW THE CONDITION OF THIS OBLIGATION IS SUCH, That if the said *(name of Secretary)* do and shall from time to time, and at all times hereafter, during his continuance in the said Office, well and faithfully perform all such acts and duties as do or may hereafter appertain to the said Office, by virtue of any Law of this Province, in relation to the said Office of Secretary to Trustees, and shall in all respects conform to and observe all such rules, orders and regulations as now are or may be from time to time established for or in respect of the said Office, and shall well and faithfully keep all such accounts, books, and papers, as are or may be required to be kept by him in his said Office, and shall in all respects well and faithfully perform and execute the duties of the said Office; and if on ceasing to hold the said Office, he shall forthwith, on demand, hand over to the Trustees of the said School Section, or to his successor in office, all books, papers, moneys, accounts, and other property in his possession by virtue of his said Office of Secretary—then the said obligation to be void—otherwise to be and continue in full force and virtue.

Signed, sealed, and delivered in the presence of [*Name of Witness.*] [*Name of Secretary.*] (*Seal*) [*Names of Sureties.*] (*Seals*)

WE, THE SUBSCRIBERS, two of Her Majesty's Justices of the Peace for the County of ——— do certify our approbation of ——— *(names of Sureties,)* within named, as Sureties for the within named——— *(name of Secretary,)* and that they are to the best of our knowledge and belief persons of estate and property within the said County of ——— and of good character and credit, and sufficiently able to pay, if required, the penalty of the within bond. Given under our hands this day of A. D. 186 [*Names of Magistrates.*]

X. *List of Inspectors.*

J. R. Miller	Halifax.
Rev. D. M. Welton, M A	Windsor.
William Eaton	Kentville.
Rev. G. Armstrong, M. A	Bridgetown.
Rev. P. J. Filleul, B. A	Weymouth.
G J. Farish, M. D	Yarmouth.
Rev. G. M. Clark	Shelburne.
Rev. D. O. Parker	Liverpool.
W. M. B. Lawson	Lunenburg.
H. C. Upham	Great Village.
Rev. James Christie	Amherst.
M. T. Smith	Pictou.
Rodk. McDonald	Antigonish.
S. R. Russell	Guysboro'.
James Macdonell	Port Hood.
C. R. Macdonald	Baddeck.
Edmund Outram, M. A	Sydney.
W R Cutler	Arichat.

The Journal of Education,

Published monthly, under authority of Act of Parliament, and furnished gratuitously to Trustee-Corporations, and to Teachers as specified in Sect. 6 (15) of the law concerning public schools.

Any person not entitled to a copy free of charge, will have the *Journal* sent to his address on payment of $1.00 *per annum*, in advance. The Inspectors in the several Counties are authorized to receive subscriptions.

The number of copies required for distribution to Trustee-Corporations and to Teachers entitled to receive them, will be forwarded to the Inspectors. Subscribers will receive their copies direct from Halifax.

Trustees will file and preserve this *Journal* as the property of the section they represent, to be handed over to their successors in office. Each number should be properly stitched and cut open before being read.

Teachers wishing situations will have the privilege of inserting a brief advertisement (class of license, experience, references, salary, and address,) for one month, free of charge. Trustees in want of teachers will be allowed a similar privilege.

A limited number of advertisements in connection with education and kindred subjects, will be inserted at 20 cents a line for the first and 10 cents a line for each subsequent insertion.

Communications to be addressed EDUCATION OFFICE, HALIFAX, N. S.

Printed by JAMES BARNES, Corner of Sackville and Granville-sts., Halifax.