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THE CANADIAN JOURNAL.

NEW SERIES.

No. II.—FEBRUARY, 1856.

THE PRESIDENT'S ADDRESS.

BY GEORGE WILLIAM ALLAN, PRESIDENT.

Read before the Canadian Institute, 19th January, 1856.

In fulfilling the duty which devolves upon me as President, of addressing you upon the present condition and future prospects of the Institute, I have reason to congratulate both myself and my brother members, that the prosperous state of the Society is such as to render a review of its past history and proceedings, and a comparison between the first struggling years of its existence, and its present efficient organization, not only an agreeable task, but one full of hope and encouragement for the future.

Established at first under circumstances of great difficulty and discouragement, the Institute has, through the zealous efforts of its friends and supporters, been gradually increasing in efficiency and usefulness, until it has at length attained a standing, and attracted to itself a degree of sympathy and support, which warrant us in entertaining the most favorable anticipations as to its future progress.

If, then, I venture to occupy your time for a few moments, to advert to some of the circumstances connected with its early career: it is with the hope that *past* success may excite to increased exertion, and that a review of what has been already accomplished, may induce us to take the greater heed, that the vantage ground the Institute has gained may never be lost through supineness or indifference on the part of its members.

Of the difficulties and discouragements with which the first promoters of the Society had to contend, some idea may be formed from a sketch given in one of the early numbers of the Journal, of the history of the Association, in which the writer, after alluding to the various disheartening circumstances attending their first efforts, goes on to describe the attendance at the monthly meetings, as having at last "dwindled down to *two*," and "the prospects of the young Institute as being gloomy in the extreme."

How these prospects have brightened since that period of despondency, is, perhaps, best attested by the numerous assemblage we now see drawn together here at every weekly meeting, and amongst them I trust are still to be found the never-to-be-forgotten *Two*, whose names ought certainly to be had in honor by all who wish well to our Society.

The year 1851 may properly be looked upon as the period from which the Canadian Institute, as at present constituted, dates the commencement of its existence.

It was in that year that the first steps were taken to divest the Society of the strictly professional character it had assumed on its first establishment, and which, by giving a wider scope to its operations, and inviting the co-operation of all interested in scientific and literary pursuits, secured an amount of support and sympathy it could never otherwise have obtained.

In May, of the same year, the first Conversazione was held, and in the following November the Royal Charter of Incorporation was granted: and by it the gentleman whose scientific labors, more especially upon a very recent occasion, have contributed to make Canada most widely and favorably known—W. E. Logan, Esq.—was appointed first President of the incorporated body. But the Society, although thus regularly organized, was still, as it were, without a mouth-piece. It possessed no accredited organ to record its proceedings, or serve as the medium of publication for those papers which were read before the Society from time to time. In August, 1852, that want was supplied by the issue of the first number of the Canadian Journal, a publication which, it may be safely averred, has assisted most materially to keep alive an interest in the Society's proceedings, contributed to make it widely and favorably known throughout the Province, and attracted the support of many living at a distance, who, but for it, would in all probability never have become members of the Institute.

Indeed from the period of the re-establishment of the Journal may

be dated the rapid progress in the numbers of the Society, which have since that year increased from 112 to 420.

The Journal established, the number of its members steadily increasing, and the weekly meetings during the session fully attended: the Society has continued to progress without any very marked or interesting occurrence until the past year, during which two events have taken place, both of much importance, and both likely to exercise considerable influence upon the future prospects of the Institute. I allude to the completion of the union with the Toronto Athenæum, and the commencement of the new building destined to become the future permanent home of the amalgamated body. The union with the Athenæum cannot fail to be productive of the most beneficial results, by securing the combined support of so many persons interested in the pursuits of literature and science, instead of that support being divided, as heretofore, between two bodies, both having kindred objects in view.

Nor need we fear that by this arrangement we have narrowed the field of usefulness, or circumscribed the bounds within which all may find full employment who are able and willing to make their talents or acquirements subservient to the advancement of knowledge in any of its departments.

The Institute has been well described as "an attempt to unite under one roof, and in one organization, a full representation of the active mind of the community." And there is surely ample scope afforded by the wide range of subjects embraced within the sphere of the Society's objects, for "*the active mind*" to find full employment. Whether its "*representation*" be "*full*" and complete, must ever depend upon the readiness of each individual member to communicate the results of his observations or researches, in that department of literature or science which he may have made the object of his more special study or pursuit.

But through our union with the Athenæum we have also gained a most valuable addition to our library and museum, and if the condition attached to this acquisition be faithfully carried out, the beneficial effects of the arrangement upon the future welfare and prosperity of the Institute can hardly be overrated.

It is stated in the report which was laid before you the other evening, "that 850 volumes, including the transactions of the leading scientific and literary societies of Great Britain, as well as other works of a strictly literary and scientific character," have been added to our library. By the terms of our amalgamation, the joint library is to be thrown open to the public, under certain restrictions; and if

in addition to this, our museum, when properly arranged, and so far increased as to render it one of general interest, is also thrown open, we shall have effected an arrangement which will make the Institute essentially a *Provincial* Institution, and establish for it the strongest possible claims for the sympathy and support of every Canadian.

I may be thought, perhaps, by some, rather to overrate the importance of this matter, but we should recollect that Upper Canada at all events does not boast of a single *public* library, in the strict sense of the term, or of any thing that can be called a Provincial Museum. True it is that the universities of University and Trinity Colleges possess valuable libraries; and University College being a provincial institution, and having ample funds at its command, its library and museum will no doubt continue to receive important additions every year, which must ultimately render them very complete and valuable collections.

But, although these institutions are most liberal in affording every facility to strangers who may be desirous of visiting either their libraries or their museums, the practical benefits to be derived from either the one or the other must necessarily be almost entirely confined to those more immediately connected with the Universities themselves.

Under these circumstances, therefore, it cannot but be a matter of rejoicing, to all who are interested in the intellectual progress of the people of this country, that a most favorable opportunity is now afforded to us of supplying a great public want, and more especially have we, as Members of the Institute, reason to congratulate ourselves that this is likely to be effected through the instrumentality of this Society.

That the Institute, from its very nature and constitution, uniting as it does all parties in its pale, is peculiarly fitted for being the medium for carrying out this undertaking, cannot, I think, admit of question. For it is undoubtedly one of the unfortunate results consequent upon the divided state of public opinion on educational questions in this country, that our efforts in the cause of knowledge have in many cases been rendered less effective by the different views entertained as to the best mode of imparting it; and the means and energies of those most anxious for its advancement, which, if united, would produce the most splendid results, are by their division weakened and impaired.

Much as this is to be lamented, it was perhaps impossible that it could have been otherwise, and I only allude to this subject now, for the purpose of bringing more forcibly before you the immense advantages which the Institute possesses in presenting, as it does, a *com-*

mon ground on which all can meet, and the golden opportunity now presented, if we would but avail ourselves of it, of enlisting all classes and parties in the support of *one great institution*, in contributing to whose library and museum, all may feel that they are not assisting to build up a collection belonging to any one section or party in the community, but that in adding to the contents of the one, and aiding to make the other the depository of all that is interesting in the natural history, mineral productions, and historical antiquities of the country, they are assisting to form a collection which will ever be regarded with feelings of common interest and pride by every Canadian.

But these bright anticipations could hardly be realized, unless the want which we have long felt, of a convenient and permanent home, of such a character as would meet the necessary requirements of the society, was also about to be provided for, and we have therefore scarcely less reason to congratulate ourselves upon another event which has occurred during the past year, viz. the commencement of our new building, which I trust the liberality of the members will enable the Council to push forward to completion, with as little delay as possible. We have only to look round upon the limited space afforded by our present rooms, to feel convinced that, with such an increase as may reasonably be looked for in the number of our members, and in the extent of our collections both of books and specimens, the means of accommodation here would soon be found wholly inadequate, and I do regard it as a fortunate circumstance for the Institute, that the proposed arrangements with respect to the Library, to which I have before alluded, will undoubtedly give us a strong claim upon the public for pecuniary aid towards the erection of a building, in which they will in many respects have a common interest with ourselves.

The time which we have chosen for this undertaking is, in many respects, a most favorable one. The Government, whose liberality we have upon many occasions already experienced, is now established here. Its removal hither has brought amongst us many gentlemen who take a lively interest in those pursuits, for the furtherance and management of which this Institute was founded; and we may reasonably hope that our hands will be strengthened by the active sympathy and support of many whom distance before precluded from taking an active part in the proceedings of our Society. Indeed, that we are already gainers by the change is evinced by the fact, that we have this year the pleasure of numbering amongst our vice-presi-

dents one whose name has long been familiar to us as an active and efficient officer of one of the learned societies of the Sister Province.

The meeting of the Legislature will also bring together many who have taken a warm interest in the advancement of this Association, and who have given the most substantial proofs of that interest, in the aid and support which they have uniformly extended to us, whenever the question of pecuniary assistance to the Institute has been brought before them in their places in parliament.

All these are considerations, which supply the strongest possible motives to renewed exertion on our part, and we should endeavor to shew that the countenance and support which have been extended to us, have not been bestowed in vain, or without producing corresponding fruit.

And this naturally leads me to the consideration of another subject, which from its importance deserves to be specially alluded to on an occasion like the present. I mean the number and character of the papers which have been read before the Institute during the past session, as this must, after all, afford the surest index of the vitality and energy of the Society itself.

A glance at the list contained in the report will satisfy us, I think, that both in point of numbers and interest they will bear a favorable comparison with those of former years, and what is also *very desirable*, a large proportion were upon subjects connected with the natural history, and the history of the aboriginal races of this country, and the public works of the Province. But there is nevertheless, I fear ground for the complaint made in the report, of "*apparent supineness*' on the part of the members, as shewn in the fact that the labor has been borne by comparatively few, and that to the members of the Council is due the credit of having furnished by far the largest proportion of the papers of the session.

The members of the Institute should never forget that in the words of one of our first Presidents—"it is not organization which makes the difference between things animate and inanimate, but life. Stone walls do not a prison make—nor do apartments and paraphernalia make the learned society, but learning. It is not enough for us to have combined ourselves to effect certain useful objects, if having done so we, *individually*, leave those objects to take care of themselves."

Composed, as an association of this kind must always be, of very many whose occupations do not admit of their devoting any considerable portion of their time to the pursuits of literature or science, and who have joined the Society more for the sake of acquiring

information and instruction, than with any expectation of being able to contribute to the general stock of knowledge themselves: we should, nevertheless, remember that it is not *only* to those amongst us whose scientific attainments and extensive learning pre-eminently fit them for the task of sustaining the character of the Society, and carrying out its objects, that we look for assistance and support. There are many subjects of enquiry and observation which come within the reach of every intelligent person. Subjects connected with the peculiarities of our climate and soil, and the geology and natural history of the country, upon all of which much valuable information might be collected at the cost of a comparatively small expenditure of time and trouble on the part of individual observers, while many important facts might be thus elicited which might form the basis for future enquiry and research, on the part of those whose talents and acquirements more peculiarly fit them for the task.

Upon the individual exertions then of the members of the Institute, and their hearty co-operation in the furtherance of its objects, must we depend for that degree of life and vigor in this Association which alone can enable it to take rank worthily among the scientific societies of the world.

The inducements to the prosecution of scientific enquiries are as great here as in any other part of the world—indeed it may be said that there are peculiar reasons why those who desire to promote the best interests of our country, should exert themselves in the prosecution of such studies.

Canada has lately made herself most favorably known through her products and manufactures, at the great exhibitions of 1851 and 1855.

Now, I think it will be readily admitted that the results of these exhibitions have clearly proved that, in the present advanced state of civilization, "*a competition in industry must be a competition of intellect,*" and that the material greatness and prosperity of individual countries must largely depend upon their advancement in science.

Possessing, as we undoubtedly do, many advantages over other countries, in the fertility of our soil, and the extent and excellence of our mineral productions, still, if we neglect or overlook the cultivation and promotion of those scientific enquiries which tend to the effective application of increased power, be it in agriculture or manufactures, both with regard to the economy of labor and of time—

the increasing wants of civilization, and the effects of competition, will undoubtedly leave us far behind in the race of progress.

We should do well ever to bear in mind the words of one well qualified to speak on such a subject:—"The progress of science and industry in countries which have reached a certain stage of civilization, ought actually to be synonymous expressions; and hence it follows, that it is essentially the policy of a nation to promote the one which forms the springs for the action of the other."

If, then, we desire to see our country attain that position, which its boundless natural advantages, if properly turned to account, entitle it to assume, let us use our best exertions that this Institute may become the channel for the diffusion of the fullest information as to our peculiarities of soil and climate, our agricultural and mineral productions, and our means of internal communication and improvement; and, while uniting together in a common bond all who possess a taste for literature or science, may more especially prove the means of fostering those studies and enquiries which are not only of vital importance in enlarging and strengthening the mental powers of those who engage in them, but must also have a directly practical effect upon the progress and advancement of the country to which we belong.

And now, gentlemen, allow me, in conclusion, to thank you for the honor you have conferred upon me, in electing me as your President. The only drawback to the pleasure and gratification which I feel in having been honored by your choice on this occasion, is the consciousness of my want of ability, as compared with those who have preceded me in the occupation of this chair, worthily to fill so honorable a post, and I can only suppose that a deep interest in the welfare of the Society, and an earnest desire (which I trust I have always exhibited) to further its objects and promote its advancement, have been kindly accepted by you in lieu of many higher qualifications which I feel to be wanting in me for this important office.

I have reason to congratulate the Institute that its Vice Presidents and the members of the Council are gentlemen whose talents and acquirements well qualify them for sustaining the reputation of the Society, and I trust that under their able direction the Institute may continue to make as rapid progress as it has hitherto done, and attracting to itself the undivided support of the learning and science of the Province, may continue to attest that the intellectual progress of Canada is ever keeping pace with her rapid advancement in material prosperity.

AN EXAMINATION OF PROFESSOR FERRIER'S THEORY OF KNOWING AND BEING.

BY THE REV. GEORGE PAXTON YOUNG, A. M.
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Read before the Canadian Institute, January 26th, 1856.

In the Institutes of Methaphysic, or Theory of Knowing and Being, by Professor Ferrier of St. Andrews, we have an investigation of the question: What exists? And the conclusion which the author comes to, is, that "Absolute Existence is the synthesis of subject and object." In other words, to constitute Absolute (that is, real and independent) Being, two factors are requisite: a conscious subject, and an object apprehended by it.

The doctrine that Mind is an invariable factor of Being, is, I need not say, altogether opposed to the common view, which attributes to Matter an absolute existence apart from mind. While it is obvious, for example, that the hues of a rainbow do not absolutely exist, but exist only as perceived; the raindrop which produces the phenomenon by its refraction of the sun's light, is regarded, not only by the vulgar, but by the majority of philosophers, as a thing of which existence can be affirmed, without taking into view any other thing whatsoever; a thing which exists as well when no mind is employed about it, as when it is the object of intelligent apprehension, and whose existence would not be a contradiction, even on the supposition of all intelligent minds being annihilated. But to this Professor Ferrier gives a direct denial. No such thing, he holds, as matter any where exists, or can exist, save in synthesis with a mind *apprehending it. Matter is merely a contingent factor of existence; per se* it is a contradiction. Our author's theory, however, is no less opposed to the idea that Mind has an absolute existence. Even those who hold the view against which Locke argues so strenuously, that the mind always thinks, are for the most part ready to allow that the case might have been otherwise, and that the supposition of there being no object present to the mind—no thing or thought apprehended by it—does not involve a contradiction. But this is not the opinion of Professor Ferrier. Mind *per se*, like matter *per se*, he relentlessly brands as nonsense. Mind according to him, is merely one of the factors necessary to existence: *per se* it is a contradiction. Existence is constituted by the union of mind (the Ego), a factor which must be invariably present, with objects, which may contingently be either matter (the Non-ego) or states of the Ego —either things (elements contradistinguished from the mind), or thoughts (modifications of the mind.) Let it be particularly observed

that the doctrine of the Institutes is not that the existing thing called matter is incapable of existing, except as apprehended by the existing thing called mind, and that the existing thing called mind is incapable of existing, except as apprehending an existing object. Matter is not viewed as one existing thing, and mind as another existing thing at all. Mind and its object are considered to be two factors, each of which is indispensable to existence; and the only things which really and independently exist are Minds-in-union-with-Somewhat.

It is apparent that this doctrine cannot be established empirically; for even should all the things whose existence is discovered to us by experience be Minds-in-union-with-Somewhat, it would not follow that these are the only existences possible. Professor Ferrier accordingly disdains the aid of empiricism. Throughout the Institutes he makes not a single appeal, for the purpose of proving the main doctrine of the work, to contingent facts; but starting from what is regarded as a position of necessary truth, he essays to work out his system by a chain of strictly demonstrative reasoning.

His conclusions with respect to Being are based upon a peculiar theory of Knowing. His Ontology has an Epistemology for its forerunner; and, as the doctrine of the former is, that what *exists* is the synthesis of subject and object; so that of the latter, in which the way is paved for the Ontology, is, that what is *known* is the synthesis of subject and object. It will of course be understood, after what is stated in the preceding paragraph, that the Epistemology of the Institutes is a theory, not of the contingent structure of our cognitions, but of the necessary structure of all cognitions. A subject (self) cannot be known *per se* by any intelligence; neither can objects (things or thoughts) be known *per se* by any intelligence. The object (properly so called) which any intelligence apprehends, is constituted by the union of two factors, the object (popularly so called), and the apprehending mind. The result of the whole investigation may be summed up in a quasi-algebraical formula, which we may call, in Professor Ferrier's own phraseology, "the equation of the "known and the existent." Let k be what is known; and e, what exists; then $k=e$=self-cum-alio.

As a condition of the possibility of demonstrating that what any intelligence knows is a synthesis of subject and object, we must at the very outset have a definition of knowledge; for, from the nature of the case, no necessary conclusions can be established regarding that of which a definition has not been laid down. Should any one say that we are unable to render an account of what knowledge is,

then (I answer) the attempt of the Institutes must be abandoned as hopeless; just as it would have been hopeless for Euclid to attempt to make out a single necessary proposition respecting the circle, if he had not first fixed what a circle is. One would stare who should be asked to demonstrate that the object of X Y Z must always be self-cum-alio: but it would not be more unreasonable to demand this of him, than to ask him to prove that the object of knowledge must be self-cum-alio, the nature of knowledge being undetermined.

Professor Ferrier was thoroughly aware of this. He saw that a solution of the question: What is knowledge? is the prime condition of a system of necessary propositions respecting knowledge, and indeed must contain in itself the whole concentrated essence of an Epistemology. Has he then answered the question? He thinks that he has. But his answer is in reality none. It is not a definition of the matter needing to be defined, but a statement regarding a different point altogether. Let us consider what is implied in a definition of knowledge. This is brought out with great clearness in the Theætetus, a dialogue of Plato, which our author quotes and comments upon very felicitously. The interlocutors are Socrates, and a young man called Theætetus. Socrates puts the question: "What "does science (knowledge) appear to you to be"? Theætetus answers, "It appears to me that sciences are such things as one may "learn from Theodorus: geometry, and the others which you just "now enumerated." To which Socrates with exquisite raillery rejoins, "Nobly and munificently, answered my friend, when asked for one thing, "you give many:" adding, "The question asked was not "this: of what things there is science; for we did not enquire with a "view to enumerate them, but to know what science itself is." He illustrates his meaning by supposing a person to be asked, What is clay? The person would answer, not by enumerating the different kinds of clay: potters' clay, ovenbuilders' clay, brickmakers' clay, and the like, but by stating what is common to all clay—that it is earth mixed with water. In like manner, it is no reply to the question, What is knowledge, to specify various kinds of knowledge, the knowledge of geometry, the knowledge of music, &c.; but the thing on which information is desired, is: What common element belongs to all cognition?—"Come," said Socrates to his young friend, "endeavour "to designate many sciences (kinds of knowledge) by one notion" He therefore who would explain what knowledge is, must, if Plato has reasoned well, show us the one notion designative of the many varieties of knowledge. Has Professor Ferrier done this? He has not. He thinks that he has. In the opening proposition of the

Institutes, it is affirmed that, along with whatever any intelligence knows, it must have some cognisance of itself. This is made the basis of our Author's Epistemology, and it is in this proposition that his answer to the question, What is knowledge, is embodied. He fancies that by indicating the Ego as an object known in all cognition, he has set before us "the common point in which all our cognitions unite "and agree." "The Ego," he says, "is this feature, point or element; "it is the common centre which is at all times known, and in which "all our cognitions, however diverse they may be in other respects, "are known as uniting and agreeing; and besides the Ego or one's self, "there is no other identical quality in our cognitions." But is it not plain that the Professor is here labouring under a delusion? To say, that, along with whatever any intelligence knows, it knows itself, is not informing us what knowledge is. Mr. Ferrier may have succeeded in pointing out an object which is apprehended in every cognitive act; but this is not tantamount to pointing out an element common to all cognition: it is not designating the many varieties of knowledge by one notion: it is saying nothing about knowledge, but only something about its object. Our author has lost himself, therefore, at the very outset of his course; and has failed to secure the basis indispensable for the structure which he proposes to erect.

The force of these strictures will be still more apparent, if, admiting Professor Ferrier's starting position, that the Ego must know itself in all cognition, and accepting this as an explanation of what knowledge is, we proceed to examine the conclusion deduced. He argues that because an intelligence must, along with whatever it cognizes, have some cognizance of itself, the object (properly so called) —the perfect object—of cognition, is not self simply, nor the thing or thought simply which in ordinary thinking is viewed as the object; but that it is self-cum-alio—self *plus* the object (popularly so called) —that, in short, it is Mind-in-union-with-Somewhat, or the synthesis of subject and object. Now is such an inference legitimate? Assuredly not. At least the conclusion cannot be deduced from the premises by a purely logical process. For what is there, as far as has yet been shewn, to hinder a person who admits that the Ego is known in all cognition, from holding that a knowledge of self may accompany a knowledge of whatever things or thoughts the mind apprehends; yet not so as that self, and the thing or thought apprehended along with it, form by their synthesis a single object of cognition, but so as that self forms one complete object of cognition, and the thing or thought apprehended along with it forms another complete object of cognition? There is no absurdity, as far as the form of

Professor Ferrier's argument goes, in maintaining that the Ego is known, and that the Non-ego, or some state of the Ego, is also known, the two cognitions taking place simultaneously. Perhaps the one position, that the Ego knows itself along with whatever it cognises, does imply the other: that what is known is the synthesis of subject and object; but the latter cannot be evolved out of the former by a barely logical process; and the validity of the inference (if it possess validity) can be made apparent only by an exposition of what is meant by the Ego knowing itself in all cognition; in other words, by a definition of knowledge, not in respect of its object, but in respect of its essential nature. Such a definition requires, in fact, to be given, before we are entitled to speak of an *object known* at all. Professor Ferrier appears to have had no qualms of conscience in introducing his readers, at the very beginning of his Institutes, to what he calls the *object of cognition*—defining cognition by means of its object; but he ought to have reflected that, until we have determined what cognition itself is, we cannot so much as form an idea of what the words, *object of cognition*, signify.

It will be observed that Professor Ferrier's Epistemology being a theory of the necessary structure of all knowledge, his answer to the question: What is knowledge? must hold good not only for the cognitions of finite minds, but for the divine knowledge likewise. Now, even if all the cognitions of finite minds could be supposed to have certain common characteristics, in virtue of which they might be designated by one notion, can it be legitimately taken for granted that there is anything whatsoever in common between knowledge in God, and knowledge in his creatures? From the poverty of language, we are compelled to use the same term *knowledge*, to describe the exercise of intelligence by God, which we employ to describe the exercise of our own intelligence; but that the knowledge of God has anything whatsoever in common with the knowledge of created beings —that there are any necessary laws of cognition to which the divine knowledge, and ours, and that of all other creatures, are alike subject —is certainly not a thing to be lightly assumed. Must not God, (Professor Ferrier will ask), know himself in every exercise of his infinite intelligence? And this is the sole respect in which it is contended that knowledge in God and knowledge in us are governed by a common law. (It is difficult to conduct such discussions in a becoming manner; and there is nothing which I am more anxious to avoid, than the appearance of employing the name of God as though it were an unmeaning symbol. But the point under consideration, and others that will arise before the close of the paper, have so vital

a connection with the highest moral and religious interests, that it is indispensable to speak in terms which, without sufficient cause, might be open to the charge of irreverent familiarity). Must not God, then, know himself—it will be said—along with all that he knows? Undoubtedly, *in some sense*; but the question that must be determined before this admission can serve Professor Ferrier's purpose, is: In what sense? If God's knowledge of himself should be altogether of a different kind from our knowledge of ourselves—which I believe it to be—and which at all events, Professor Ferrier has not disproved—is it designating the divine knowledge and ours by one notion; is it reducing them under the dominion of a common law; is it laying a foundation for a series of propositions applicable to both alike: to tell us that God knows himself in all the acts of his understanding, and that we know ourselves in all the acts of our understanding? Let it be shewn that the word *know* means the same thing in both cases, and let its import be pointed out, and then Professor Ferrier will be in a position to commence his argument. He will have got a fixed nail on which to hang his chain.

In the following passage our author replies to the charge of presumption which he anticipates that some will bring against him for endeavoring to reduce all intelligence, whether divine or human, under the dominion of necessary laws. "It may seem to adopt a "somewhat presumptuous line of exposition in undertaking to lay "down the laws, not only of *our* thinking and knowing, but of *all* "possible thinking and knowing. This charge is answered simply by "the remark that it would be still more presumptuous to exclude "any possible thinking, any possible knowing, any possible intel-"ligence, from the operation of these laws—for the laws here refer-"red to are necessary truths—their opposites involve contradictions "and therefore the supposition that any intelligence can be exempt, "from them is simply nonsense." And with reference to a supposed enquiry on the part of a reader, whether it might not have been sufficient to lay down the alleged necessary laws of cognition as absolutely authoritative over human intelligence only, he goes on to say; "Good reader, this is not sufficient. It is absolutely indispensable, "(this must be confessed in the plainest terms)—it is absolutely in-"dispensable for the salvation of our argument, from beginning to "end, that these necessary laws should be fixed as authoritative, not "over human reason only, but as binding on all possible intelligence. "It is not possible, therefore, for the system to adopt any such sug-"gestion as that thrown out. And if the reader had any further "misgivings as to the propriety of our course, we would recommend

"him to consider whether *he* does not hold that *all* reason is bound "by the law of contradiction as expounded in sec. 28. Of course, if "we may assign to intelligence universally *any one* necessary condi- "tion of thought and knowledge, the whole question is at an end, "and must be held to be decided in favor of the views of this sys- "tem." As this is the only passage in the Institutes where any thing having the semblance of argument is advanced in support of the principle that all intelligence is governed by certain necessary laws, it merits special examination. In the first place when Professor Ferrier affirms that it would be wrong to exclude any possible thinking from the operation of the laws in question, because they are necessary laws, this remark has plainly no force as an argument; for the very point in dispute is whether there are any such necessary laws. Again, it is said that the opposites of these laws involve contradictions. But how so? In what way is it a contradiction to hold that knowledge in God may be something so entirely different from knowledge in us, that they cannot be designated by any single notion? Let us consider what Professor Ferrier means by a contradiction. He means that which no intelligence can possibly conceive. Matter, for instance, according to him, is a contradiction, it is nonsense, it is an absurdity, because *per se* it is incapable of being conceived by any intelligence. On what grounds then is it asserted that knowledge essentially different from ours—so different as not to admit of being brought under any common law with ours—is a thing inconceivable by any intelligence? Though it may be inconceivable by us, this will not entitle us to pronounce it inconceivable absolutely. But Professor Ferrier gives an example in which he thinks it plain that a necessary and universal law of intelligence is expressed; and he argues that if one such law can be apprehended by us, others may be so likewise. The example is the law of contradiction—that a thing must be what it is—that A is A. But what a gross fallacy, to cite a logical principle in illustration of a question of Real Being! Granting that by no intelligence can the law of contradiction be conceived untrue, what does such a concession amount to? To this and nothing more—that where a thing is conceived (in any sense of the term), the conception is exactly what it is. But does this in the least degree go to prove that there cannot be knowledge or conception so radically different from ours, that the two do not admit of being designated by any common notion? "Of course," says Professor Ferrier, "if we assign to intelligence universally *any one* necessary condition of thought and knowledge, the whole question is at an end." Not so, by any means—if a logical principle is

to be called (as it ought not to be) a necessary condition of thought and knowledge. Plato being judge—and our author will not dissent from Plato here—what is requisite to bring the question to an end, is, that some common characteristic of all cognition should be indicated. *But we do not indicate any thing common to all cognition when we say that the law of contradiction is binding on reason universally.* By the law of contradiction, the exercise of the Divine Intelligence is what it is. By the same law the exercise of the intelligence of a creature is what it is. Does this imply that the two are distinguished by any common characteristic? Not at all. They may be essentially and in all respects different from each other, and yet each be what it is. The question, therefore, is not at an end, even though the universality and necessity of the law of contradiction be admitted. It will be at an end, when the knowledge of the Infinite Being, and that of finite beings like ourselves, have been designated by one notion; and that there is any notion designative of both alike, remains yet to be evinced.

As a series of necessary propositions regarding knowledge could only be established on condition of a definition of knowledge being first given, so before a series of necessary propositions regarding existence can be established, it is indispensable that existence be defined. In some systems of philosophy, the identity of knowledge and existence, the equation of the known and the existent, is assumed. Were such an assumption legitimate no definition of existence over and above the definition of knowledge would require to be given; nor would an Ontology be any thing distinct from an Epistemology. The task of the metaphysician would be ended, when he had worked out his theory of knowing; or at least, he would merely have to draw the inference, that, since knowledge and existence are coincident, real being consists in that (whatever it might be) which was proved to be the object of cognition—the object in this case being identical with the existence knowing. But Professor Ferrier does not allow us to assume that the known and the existent coincide. He finds fault with his great idol, Plato, for virtually making this assumption. "Here it was," he says, "that Plato broke down. Instead of proving the coincidence of the known and the existent, he assumed it." Now, if it be not legitimate to assume that knowledge is identical with existence, and to change our Epistemological conclusions at once into Ontological, then I repeat that just as a definition of knowledge is the *conditio sine qua non* of an Epistemology, so a separate and distinct definition of existence is the *conditio sine qua non* of an Ontology. Yet, strange to say, Pro-

fessor Ferrier has not given us. Of course, he cannot reason upon existence without in reality assuming something about it; and when we look into his argument, so as to discover the notion of existence on which he implicitly proceeds, we find that it is essentially the same with that of Spinoza—"per substantiam intelligo id quod in "se est, et per se concipitur; hoc est id, cujus conceptus non indi-"get conceptu alterius rei, a quo formari debeat." Substance or absolute existence is that which is conceived by itself (the conclusions of Spinoza do not at all depend on the clause *in se est* as distinguished from *per se concipitur*), or to the conception of which the conception of nothing else is required. This is precisely the view taken by Professor Ferrier; though, as I have said, he does not present it in the form of a definition, but gives it as a result of reasoning. The third proposition of his Ontology is, that "Absolute Existence, or Being in itself, is not the contradictory;" that is, it admits of being conceived by some intelligence. Without examining the demonstration which is given of this proposition, it is enough to observe that, as an argument, it cannot but be inconclusive, no definition of absolute existence having been furnished, except what the proposition itself affords. So long as absolute existence has not been defined, we can no more prove that it is not the contradictory, than we can prove that the *relplum scalclath* of Gulliver's philosopher is not the contradictory.

The fact is, that even in the way of definition, it is not legitimate to describe Absolute Existence or Real Being as that which may be conceived *per se*. It may perhaps be thought that a writer is at liberty to define terms as he pleases; but the definition in question —which contains the germ of all Spinoza's hideous conclusions— cannot be allowed; because if it does not covertly beg the whole question in dispute, it is without meaning. When it is said that Real Being is that which may be conceived *per se*, what, I ask, is it for a thing to be conceived? The term *conception* is used either as descriptive of our thinking specially, or in some wider sense. If it be employed in the former way then, in defining Real Being as that which can be conceived by itself, it is denied that any thing exists beyond the possible grasp of our apprehension—a doctrine which cannot be allowed to creep in surreptitiously under the guise of a definition. But if the term be taken in the latter sense, then the statement that Real Being is not the Contradictory or the Absolutely Inconceivable, is one *to which I can affix no meaning*. I understand what is meant by a thing being the inconceivable to me, but not what is meant by its being the inconceivable absolutely.

Professor Ferrier remarks in one place that philosophy stands much "in want of a clear and developed doctrine of the Contradictory." No question but it does—and I humbly think that the Professor's own disquisitions afford evidence of this. Not casually or *per incuriam*, but formally, and as a vital part of his system, he lays down the position, that Real Being is not the absolutely inconceivable—as if the words did, or could to us convey any idea! Let it be distinctly understood that *we cannot speak of absolute inconceivability, without saying we know not what*—speaking in an unknown tongue, or rather in a tongue which is no tongue at all—becoming barbarians alike to ourselves and to others. It is ridiculous here to adduce such examples as a square circle, or a stick with only one end, to illustrate the assertion that it is within our power intelligibly to talk of absolute inconceivability in certain cases. Examples of this sort are nothing to the purpose. I can conceive a square. I can also conceive a circle. These two conceptions are mutually repugnant. In this sense, a square circle may be pronounced the absolutely contradictory; that is to say, the expression *square circle* brings forward two ideas incapable of agreeing with one another in any mind in which the ideas separately can be realised. The same may be said, *mutatis mutandis*, of the stick with only one end, which is so mighty a favorite with our author. But who does not see, that though an expression significant of two conceptions, each of which we are capable of realising, but which are irreconcilable with one another, may in a perfectly intelligible sense be called a contradiction absolutely, it is not thereby proved to be competent for us to speak of an absolutely inconceivable, *where no ideas are brought before the mind at all?*

When Being has been identified, whether by definition or by supposed proof, with the Non-Contradictory, our author's task would seem to be ended. For, if nothing can be known by any intelligence, except a subject in synthesis with an object; and if Absolute Existence is not the Contradictory, and is therefore knowable, Absolute Existence must be the synthesis of subject and object—which is the ultimate conclusion of the Institutes—their grand Q. E. D. The equation not only of the known and the existent with each other, but of each of them with a subject united to an object, is made out. Professor Ferrier, however, is not satisfied to enter port so easily. Betwixt the Epistemology and the Ontology, he has introduced a cumbrous series of propositions forming an Agnoiology (as it is euphoniously entitled) or Theory of Ignorance, which he considers indispensable to a legitimate procedure in the On-

tology, and in which he prides himself as though it were a great philosophical discovery. The Institutes, he says, "claim to have "announced for the first time the true law of ignorance, and to have "deduced from it its consequences." But when scrutinized, the *theory of ignorance is found to amount to nothing more than* an expression of the results of the Epistemology as a function of a new term arbitrarily, though not inappropriately, introduced. What the Agnoiology seeks to determine is, the object of ignorance; and it teaches that the object of ignorance, like that of knowledge, is a synthesis of subject and object. In Prop. I. ignorance is defined to be "a privation of something consistent with the nature of intelligence." Hence (Prop. II.) "all ignorance is possibly remediable; and (Prop. III.) we can be ignorant only of what can possibly be known; and hence also—if the Epistemology of the Institutes be supposed correct—the object of ignorance can be neither the Ego or subject *per se*, nor objects (popularly so called) *per se*, but only a synthesis of subject and object. Now it is plain that every thing here depends on the definition of ignorance as a "privation of something consistent with the nature of intelligence." The definition is a very good one; and the deductions made from it are perfectly logical; but where is the wonderful merit of defining a word and then expressing the results of the Epistemology in terms of that word? Or what occasion was there for the show and parade of demonstration with which this is done by our author? Indeed, for any purpose that it serves, the Theory of Ignorance might very well have been omitted altogether. The use to which it is put will be seen when I mention that the Ontology opens by announcing three alternatives of Being. "Absolute Existence or Being in itself is either *first*, that which we know; or it is *secondly*, that which we are ignorant of; or it is *thirdly*, that which we neither know nor are ignorant of." By showing (as he thinks he has done) that what we neither know nor are ignorant of is the contradictory, and also that Absolute Existence is not the contradictory, Professor Ferrier eliminates the third alternative, and concludes that Absolute Existence is either what we know or what we are ignorant of. But (by the Epistemology) that which we know is the synthesis of subject and object; and (by the Agnoiology) that which we are ignorant of is the synthesis of subject and object; therefore, whether Absolute Existence be the one or the other of the two alternatives to which it has been reduced, it must be the synthesis of subject and object. Now surely it was unnecessary to create an Agnoiology, merely to play the part here assigned to it. Why might the alter-

natives of Being not have been assumed as two, viz ; either *first*, that which admits of being known, or *secondly*, that which is unknowable, in other words, the contradictory? (The former of these alternatives would comprehend the two first of our author). Then, when Absolute Existence was proved to be not the contradictory, it would at once follow that it must be the synthesis of subject and object ; for (by the Epistemology) nothing except a synthesis of subject and object is capable of being known.

The whole may be thus summed up. The Theory of knowing (that what is known in the synthesis of subject and object) is unproved. The condition on which alone it could be proved, even if true, (viz , that knowledge be defined) is not fulfilled. A definition of knowledge is no doubt supposed to be involved in the proposition, that along with whatever any intelligence knows, it must know itself. But, on the one hand this is not a definition of knowledge, but a statement regarding what is known ; and on the other hand it is impossible to form any idea of what is meant by an *object known*, till an exposition of knowledge itself has been rendered. There is no reason to think that a definition of knowledge, in the most unrestricted sense, admits of being given. Even were it possible to designate all the cognitions of finite minds by one notion, the assumption that the knowledge of the uncreated infinite God has any thing in common with that of his creatures, would be unwarrantable. The fundamental error of the Epistemology, that there are necessary laws by which all intelligence is governed, extends itself to the Ontology, where it is affirmed that what exists is not the contradictory. This, though presented, not as a definition, but as the result of reasoning, is in reality our author's definition of existence. That he does not demonstrate it, is evident from the consideration that no definition of existence, besides what the proposition itself affords, is furnished as the starting point of a demonstration. Absolute Existence, then, is defined as the Non-Contradictory. In other words it is what can be conceived *per se*. But unless some common characteristics of all thinking, whether divine or human, can be specified, the word *conception* must either be taken otherwise than as descriptive of our thinking specially—in which case we can attach no idea to it, and the definition of existence is meaningless ; or it must be used of our thinking specially—in which case the definition (implying as it does, that nothing exists except what we are contingently capable of conceiving) is a palpable begging of the great question at issue.

As Professor Ferrier in more than one passage illustrates his

views by comparing them with those of Bishop Berkeley, and as Berkeley is the sole metaphysician of modern times whom he admits to have made an approximation to truth, it may not be useless or out of place to notice the relation in which the system of the Institutes stands to that expounded in the "Dialogues between Hylas and "Philonous," and in the "Treatise concerning the principles of human knowledge." Berkeley did not aspire to frame a necessary theory of knowledge. He limited himself to the knowledge of which we are the subjects; and this is, in fact, urged in the Institutes as the main defect of his philosophy. "Berkeley's system," we are told, "was invalidated by a fundamental weakness, which was "this, that it was rather an exposition of the contingent structure "of *our* knowledge than an exposition of the necessary structure of "*all* knowledge." And on this account "his Ontology," it is added, "breaks down; for his conclusion is, that the subject and object "together, the synthesis of mind and the universe, is what alone "truly and absolutely exists or can exist." Berkeley considered the objects of perception to be sensible qualities; and it was an essential point in his doctrine that these are incapable of existing except in a mind. He made no distinction in this respect between what are termed the secondary qualities of matter—taste, warmth, colour, audible sound, and so forth—and those which have been called primaries—extension, figure, motion, &c. The extension, figure, &c., which we perceive, are in the mind as truly, and in the same manner, as the warmth, the sweetness, the redness, or the sound which we perceive. Berkeley has often been represented as denying the real existence of sensible things: but he himself repeatedly and vehemently protests against the imputation. The real existence of sensible things is, he says, incontrovertible; but they do not exist apart from the mind. Their *esse* is *percipi*. Must not matter however, an unthinking, inactive substance, be assumed as the substratum of sensible qualities? Berkeley answers that such a substratum is inconceivable. Nay, the conception of it which we are asked to form, involves a contradiction: for sensible qualities being incapable of existing out of a mind, how can they, without contradiction, be spoken of as existing in an unthinking substratum, that is, in what is not mind? But granting that nothing besides sensible qualities is perceived; and that the existence of matter, as a substratum of sensible qualities, is an absurdity; may we not still believe in matter as the cause or occasion or instrument of our perceptions? Berkeley examines this question very minutely; and endeavours to show that in any meaning which we are able to affix to

the words, an unthinking, inactive substance cannot be the cause, or occasion, or instrument, of our perceptions. Should it finally be urged that perhaps matter, an unthinking, inactive something, of which we have no positive idea whatever, exists without the mind: Berkeley replies (and here the weak point of his Ontology becomes apparent) that in affirming that matter may exist, while at the same time we acknowledge that we attach no positive idea to the term, we mean nothing. I quote the following passage from the 2nd dialogue between Hylas and Philonous. *Phil.*—"Can any more be required to "prove the absolute impossibility of a thing, than the proving it im- "possible in every particular sense that either you or any one else "understands it in?" *Hyl.*—"But I am not so thoroughly satis- "fied that you have proved the impossibility of matter in the last "most obscure, abstracted and indefinite sense." *Phil.*—"When is "a thing shown to be impossible?" *Hyl.*—"When a repugnancy "is demonstrated between the ideas comprehended in its definition." "*Phil.*—"But where there are no ideas, there no repugnancy can be "demonstrated between ideas?" *Hyl.*—"I agree with you." "*Phil.*—"Now in that which you call the obscure indefinite sense "of the word *matter*, it is plain by your own confession, there was "included no idea at all, no sense except an unknown sense, which "is the same thing as none. You are not therefore to expect I "should prove a repugnancy between ideas, where there are no "ideas, or the impossibility of matter taken in an unknown sense, "that is, no sense at all. My business was only to shew that you "meant nothing, and this you were brought to own. So that in all "your various senses you have been shewed either to mean nothing "at all, or if any thing an absurdity. And if this be not sufficient "to prove the impossibility of a thing, I desire you will let me know "what is." *Hyl.*—"I acknowledge you have proved that matter is "impossible; nor do I see what more can be said in reference to it." Now, in my judgment, Hylas was a fool to give up his case in this fashion. The impossibility of a substance different from spirit, is *not* proved, by proving its impossibility under any particular notion of it that we can form. But, says Berkeley, in affirming the possibility of matter, in some unknown sense of the word, you mean nothing. Well, what then? We may not be able, attaching any positive meaning to our words, to assert the possibility of an existence distinct from spirits; but this does not imply that such an existence is impossible. Existence may not be limited to what we are capable of conceiving. "Where there are no ideas there no re- "pugnancy can be demonstrated between ideas." Most true. Con-

sequently, it would be unreasonable to expect that matter in some unknown sense, should be demonstrated to be a contradiction. Such a demonstration is, from the nature of the case, impossible; and just because this is so, it never can be competent for us to affirm matter to be a contradiction. Professor Ferrier, therefore, was right in saying that Berkeley's Ontology, in which necessary conclusions as to Being are drawn from a consideration of the contingent structure of our knowledge, breaks down. The very utmost that Berkeley can be admitted to have made out (even if we subscribe to his Epistemological doctrine, that the objects of perception are sensible qualities existing in the mind—and allow moreover the conclusiveness of his reasoning about causes, occasions, and instruments) is, that it is impossible for matter to exist as the substratum of sensible qualities, or as the cause, occasion, or instrument of our perceptions—a conclusion altogether different from that which he believes himself to have established, viz: that mind is a constituent factor of all existence.

The affinity between Berkeley and our author plainly consist in two things—first, that both ascribe a subjective character to the objects of our perception (the latter only going further, and maintaining the Ego to be a constituent factor of every object known)—and secondly, that both reject as absurd, the idea of any thing existing apart from mind. I have endeavored to make it plain that Professor Ferrier's position, that the Ego is an ingredient in every object known; neither has been proved by him, nor (even if true) would admit of being proved. But suppose the enquiry, instead of being extended to all possible knowledge, to be restricted, as it was by Berkeley, to our perceptive cognitions; what shall be said in that case? Is the object of perception, a synthesis of the Ego and of the Non-ego? And if this can be in any sense maintained, how will our conclusions as to what exists be thereby affected? With a few remarks on these points, I shall bring my paper to a close.

That both Professor Ferrier and Bishop Berkeley should leave their respective systems not only unproved, but even of an ambiguous import, was an unavoidable result of their having omitted to enter, the one into an exposition of knowledge, and the other into an exposition of perception. Berkeley says that sensible qualities are the objects of perception; while, according to Professor Ferrier, the Ego in synthesis with the Non-ego is always the object of perception: but what either statement amounts to, depends on the meaning affixed to the words *objects of perception;* and it is impossible to affix any precise meaning to them until *perception* itself has been explained.

What, then, is perception? It is a relation of a certain kind between the Ego and the Non-ego: in other words, it is the Ego and the Non-ego standing related to one another. Perception is not different from sensation; but a sensation, and the perception usually spoken of as acompanying it, are the same relation—the same indivisible consciousness—differently denominated. When we wish to designate the relation, so as especially to affirm the existence of one of the correlative terms, the Ego, we call it sensation; and when we wish to designate it so as specially to affirm the existence of the other of its correlative terms; the Non-ego, we call it perception. Whether correct or not, this answer to the proposed question is at at all events to the purpose: for, to ask what knowledge is, is equivalent to asking what is the common characteristic of all knowledge. Now, our perceptions or sensitive cognitions, in their manifold diversity, have this in common—that each of them is a relation between the Ego and the Non-ego. I do not here, like Professor Ferrier, represent a variety of cognitions as having something common in their objects; but I designate the cognitions themselves by one notion. Take any act of sensitive consciousness that you please, it (the cognition) is a relation between the Ego and the Non-ego. In the case, for example, when (to speak popularly) one is looking at a red object, the knowledge realised is that particular relation between the Ego and the Non-ego which we describe by saying that a red object is perceived, or that a sensation of redness is experienced.

Having defined *pereeption*, we are in a position now to speak of the *object of perception*, and to determine whether the object which we at any time perceive be a synthesis of the Ego and the Non-ego. In sensitive consciousness, the Ego and the Non-ego are apprehended together, both terms being necessary to the relation in which sensitive consciousness consists. The Ego is manifested to itself—not absolutely, but in its relation to the Non-ego; and at the same time, the Non-ego is manifested to the Ego—not absolutely, but in relation to the Ego. Such being the case, shall we say with Professor Ferrier that the sole object (properly so called) of perception, is a synthesis of Self and Not-self? or shall we say that the two objects, Self and Not-self, are cognized simultaneously? Which alternative must we choose? We may adopt either, by giving a proper definition to the word *object*. *Object*, in a case of sensitive perception, might be defined as that term in the relation constituting the perception, which stands in correlation to the Ego or *subject;* or, more fully, both terms, the Ego as well as the Non-ego, might be called *objects known*—the former a subjective, and the latter an objective, object.

But if such a definition were laid down, it would require to be kept in view that there are not two separate cognitions corresponding to the objects thus discriminated. It would be incorrect to say that in one cognition, the Non-ego is the object known; and that in another distinct (though simultaneous) cognition, the Ego is the object known: for the apprehension of the Non-ego by the Ego and of the Ego by itself, is a single indivisible act of consciousness; the relation betwixt the Ego and the Non-ego, having two terms indeed, but not being thereby rendered plural in its character as a relation. On the other hand, *object* might be defined in such a way as not to differ, except logically, from *act*. In this case, as the act of perceiving is nothing else than the Ego in a certain relation to the Non-ego, so the object perceived would be the Ego in a certain relation to the Non-ego; which may be not inappropriately expressed by saying that the object of perception is a synthesis, in which the Ego is an invariable, and the Non-ego a variable, factor. *In this sense*, Professor Ferrier's doctrine: that which is perceived is the synthesis of subject and object, may be admitted. Only let there be no misunderstanding as to what the admission involves. It simply means—what might have been also conveyed by the more common phraseology which recognizes the Ego and the Non-ego as two separate objects—that a relation is constituted between the Ego and the Non-ego—a single indivisible relation—whose character is partly due to the one factor (the Ego), and partly due to the other factor (the Non-ego).

By subscribing, in the sense indicated, to the doctrine of Professor Ferrier, that the object of perception is always a synthesis of the Ego and of the Non-ego, does it become necessary to go along with him in inferring that absolute (real and independent) existence cannot be predicted either of the Ego *per se*, or of the Non-ego *per se*, but only of the Ego in synthesis with the Non-ego? The answer which must be given to this question depends altogether upon the idea attached to the word *absolute*, which qualifies existence.

If absolute be the opposite of relative, then, according to the views above presented, there is no evidence warranting us to attribute absolute existence either to the Ego or the Non-ego? Is the Ego ever known to exist out of relation to the Non-ego? Do we ever catch ourselves (to use Hume's expression) without a perception? Never. Is the Non-ego ever known to exist out of relation to the Ego? On the contrary, the very knowledge of it which we realize, consists in a relation betwixt the Ego and the Non-ego. As regards the Ego, the question under consideration is the same with that which Locke discussed so unsatisfactorily: Whether the mind

always thinks—for all our thinking, even the most abstract, implies perception. Now there is no proof that the mind is ever in an unthinking state; it can never catch itself without a thought; because in catching itself, it is thinking. Will it be urged that a relation implies the independent existence of the correlated terms, and that the Ego and Non-ego by whose relation to one another perception is constituted, must consequently be acknowledged as independent existences? Of course, it cannot be meant that they exist independently while the perception is taking place, for they are then in relation to one another. And why is it necessary that they should have had an independent separate existence previously to their becoming related? Perception, at all events, does not bear witness to this: it testifies only of the present: it reveals the relation, but nothing antecedent to it. I shall not in detail pursue the various possible windings of the problem into the region of mediate or inferential knowledge. Enough to remark generally, that while on the one hand it is a contradiction in terms to assert the present absolute or independent existence of an Ego and a Non-ego which are in relation to one another; on the other hand, to assert their absolute or independent existence prior to the formation of the relation at present constituted, is to utter words without meaning. Never having been conscious of the Non-ego out of relation to Self, how can we reason about the Non-ego absolutely (the Non-ego-per-se), or propose to prove anything respecting it, or speak of it all? It is utterly inconceivable by us. We may use the phrase, Non-ego-per-se; but mean nothing thereby. In like manner, never having been conscious of the Ego out of relation to the Non-ego, (for all the modes of our present Being involve an exercise of sensitive consciousness), how can we reason about the Ego absolutely (the-Ego-per-se), or propose to prove anything respecting it, or speak of it all? It is utterly inconceivable by us. We may use the phrase, Ego-per-se; but we mean nothing thereby. The conclusion therefore is, that the existence which comes to light in the diversified operations of our consciousness, is never either the Ego-per-se, or the Non-ego-per-se, but always the one related to, or (if Professor Ferrier pleases) in synthesis with, the other—the Ego in synthesis with the Non-ego, or the Non-ego in synthesis with the Ego. I say *or*, not *and*: for though philosophical writers commonly teach, that perception manifests a twofold existence, the Ego existing in relation to the Non-ego, and the Non-ego existing in relation to the Ego, there is in reality no difference between these. Self-existing-in-relation-to-Not-self is Not-self-existing-in-relation-to-Self. Each expression sets forth the rela-

tive (not independent) existence of Self; and each sets forth at the same time the relative (not independer existence of Not-self. The two equally describe a relation, which, whether you call it X-in-relation-to-Y or Y-in-relation-to-X, is still the same relation.

It has perhaps been made sufficiently plain in the course of the preceding remarks, yet to prevent mistake I may repeat, that the existence, whether of the Ego or of the Non-ego, must not be presumed to be dependent upon the maintenance of such relations as those in which we at any time know them to exist. Though we have no evidence, for example, to shew that our minds ever exist out of relation to matter, it is not therefore demonstrated that a relation between mind and matter is indispensable to the existence of the former. This would follow, (little as Berkeley was aware of it,) if his principle, that a thing must be held to be impossible, when it has been proved so in every sense which we can conceive, were valid: for it is past doubt, that, never having been conscious of any existence which did not imply a relation betwixt the Ego and the Non-ego, we can form no conception of the existence of an Ego *per se*. But the principle is a bad one. Possible existence must not be limited to what we are capable of conceiving. In like manner, though we have no evidence to shew that matter ever exists out of relation to mind (Berkeley was right so far) it does not follow that its existence out of relation to mind is an impossibility. This was Berkeley's great fallacy. True; we can form no conception of matter *per se:* but possible existence must not be limited to what we can conceive.

As I have followed Professor Ferrier in using as interchangeable the expressions, *absolute*, and *independent* existence; it is nccessary to remark that, in the above reasonings, it is not implied that the finite existence which manifests itself in sensitive perception, is independent, so as to have the principle of its being in itself: the idea naturally suggested, and indeed intended to be conveyed, by Spinoza's definition, "per substantiam intelligo id quod in se est, &c." All that has been shewn, is, that there is no evidence for the existence of the Ego independently of, or out of relation to, the Non-ego; and that there is no evidence for the existence of the Non-ego independently of or out of relation to. the Ego. Even therefore if, in Professor Ferrier's phraseology, this should be stated by saying that what exists is a synthesis of the Ego and the Non-ego, it would be gratuitous and, I have no hesitation in adding, false, to affirm that the synthesis thus recognised as existing, has the principle of its Being in itself, or, in other words, *is*, independently of a continued exercise of sustaining power on the part of the infinite Creator. There is nothing in phil-

osophy opposed to, but on the contrary all its conclusions are in beautiful harmony with, what revelation teaches, that God "is not far from every one of us, for in him we live and move and have our being." The universe was not created once for all, and then left in some inconceivable condition of independent and abiding existence; but it is at every instant upheld by God; it is a continued product of the continued exercise of his power. It has often been remarked that to sustain the worlds which have been made requires an exercise of power not less than was implied in their original formation: but indeed it may be questioned whether there is really any essential difference between creating and sustaining. Creation is a putting forth of divine energy, in virtue of which something is, where otherwise nothing would have been; and is not the Divine Being, in sustaining the universe, constantly exerting an energy, wanting which the universe would not be?

It may perhaps be thought that the course of remark by which it has been shewn that the object of perception, the existence immediately manifested in the perceptive act, always is (in the sense explained) a synthesis of the Ego and of the Non-ego, would suffice to prove that every object known by any intelligence, or any where existing, is a similar synthesis. For, knowledge (it may be said) of whatever description, being a relation between subject and object, a relation to which both terms are necessary, and whose character is due partly to the one, and partly to the other, neither the subject *per se* nor the object *per se*, can be said to be known; but the object known, which is only logically different from the knowledge realised, is a synthesis of the two. Hence also, unless there be some existence absolutely unknowable, whatever exists must be a synthesis of subject and object. Must then the conclusions of Professor Ferrier's Institutes be accepted without limitation? *If all knowledge be a relation*, they undoubtedly must. Here, however, the question meets us: *is* all knowledge a relation? To assume this, would be quite unwarrantable. I allow that I have no conception of any knowledge which is not a relation; that is, I can frame to myself no direct positive conception of any existence which is not, like my own as revealed in consciousness, a subject standing in relation to an object; and it might therefore seem that I am shut up to go the whole length of our author's system. But no. There may be more things existing than man is able to conceive. In particular, it is necessary to guard against supposing that the Divine existence involves relation in any such sense as that in which the term is employed when we speak of those successive relations between Self and Not-self, of which our

sensitive consciousness is made up. There must always, indeed, be a relation between the Creator and his creatures, of this kind—that the universe of each moment is dependent on the Divine power exerted in that moment. The frame of nature is sustained by—in other words, *it constantly results from—the Fiat, the unceasingly repeated* LET-THERE-BE, of Him "whose word leaps forth to its effect": but instead of warranting the inference, which forms a part of Professor Ferrier's system, that, in the existence of the Infinite Being, the two factors of subject and object can be discriminated, as in our consciousness,* this would seem to imply the reverse; for the relations betwixt subject and object which constitute the several existences manifesting themselves in nature, are at each instant due to an essentially creative act; they cannot, therefore, be met with in one of whom it is a distinctive peculiarity, to be uncreated—to have life in himself.

In bringing my examination of Professor Ferrier's metaphysical system to a close, I would observe that, though I have been obliged to dissent, and that seriously, both from his reasoning and his conclusions, the work under review must have the praise bestowed upon *it of being one of unusual and refreshing originality. It is written* with great clearness, in a flowing and expressive manner; and the only fault to be found with it, in respect of style, is, that it bristles too much with the forms of demonstration. The Institutes are enriched with several incidental discussions of great value; of which, however, it is impossible to take any special notice at present. There is one service which our author could render to philosophy, probably as well as any man living; and, if he could be persuaded to undertake the task, he would deserve, and receive, the thanks of all who feel an interest in the history or progress of speculation. What I refer to, has been already pressed upon his attention.

"We hope, also," says a writer in Blackwood's Magazine, (Feb., 1855,) "at no distant day, from the fair promise of the present "volume, to see Professor Ferrier engaged in a work affording a "larger field for the concrete philosophy, than the subtle discussion "of the present volume presents. We have already said that he "wields the pen gracefully, and that he is anything but a dry, blood-"less speculator; a mere metaphysician; which, like a mere mathe-"matician, a mere lawyer, a mere theologian, a mere scholar, or a "mere anything else, is a monster, always, with a most religious

*Of course, it is not meant that Professor Ferrier ascribes to the Divine Being our sensitive modes of apprehension. He disclaims such an idea. But his doctrine is that the one Absolute Existence which is strictly necessary "is a supreme and infinite and everlasting mind in synthesis with all things."

"instinct, to be shunned. Would Professor Ferrier, who evidently "reads Greek—not at all a necessary accomplishment in a Scotch "Professor of Moral Philosophy—perhaps be so kind as *work out* "*for us an elegant exposition of the philosophy of Plato in its princi-* "*ples and its applications?*" Such a work as that suggested in the part of the quotation italicised, is still a desideratum; to undertake it, would be a task not unworthy of the most brilliant genius; and we do not need to look beyond the "Institutes" for proof that Professor Ferrier possesses in a high degree the principal qualifications requisite for executing it successfully.

ON THE HYDRATE OF HYDROSULPHURIC ACID.

BY HENRY CROFT, D.C.L.,

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Read before the Canadian Institute, Dec. 1st, 1855.

Very little is known with regard to the combination of water with sulphuretted hydrogen, although its existence has been pointed out by Wöhler. Its excessive instability at the ordinary temperature and pressure, renders it impossible to ascertain its formula, which is of considerable interest, inasmuch as crystalline hydrates of the hydracids are almost, if not entirely, unknown.

Wöhler obtained the compound in t· › ways, firstly from liquid hydrosulphuric acid, which had been formed in the usual manner by the spontaneous decomposition of the bisulphide of hydrogen in a closed tube. Among the crystals of sulphur he observed small colorless crystals, which could scarcely be any thing but the hydrate. The tube exploded on being brought into a warm room, the crystals rapidly disappearing with evolution of gas.

Secondly, by exposing a mixture of alcohol and water, of such strength as not to freeze at eighteen degrees below zero, to a freezing mixture capable of producing this degree of cold, having previously saturated it with well-washed sulphuretted hydrogen, an icy crystallization was produced, which vanished on the least rise of temperature, gas being rapidly evolved. The crystals could not be kept when enclosed in a tube, but reappeared as often as it was exposed to a temperature of 18°. The same results followed when hydrated acetic æther was employed.

Wöhler thought that he once detected octohedral crystals.*

* Annalen der Chemie und Pharmacie, B., 32.

In a second paper "On the Influence of Pressure on the Formation of Chemical Compounds"† Wöhler refers to the above observations, and adds, that in two tubes in which sulphur, but no liquid hydrosulphuric acid, had separated, the crystals were found in large quantity, they did not, however, make their appearance in a third tube in which the bisulphide was enclosed together with some hydrochloric acid. Hence the author concludes that the crystalline compound, which is no doubt a hydrate of hydrosulphuric acid, must be produced when a small quantity of water is enclosed with the gas free from any other acid, the water then combines with it under the pressure of the condensing gas (17 atmospheres). Under this pressure it is permanent at ordinary temperatures. If the tube be heated to 86° Fahrenheit, the compound rapidly becomes fluid, returning to the solid state again on being cooled to the ordinary temperature.

Several years since I had occasion to prepare the liquid sulphides of phosphorus described by Berzelius; they were preserved under water in stoppered bottles, in one of which the stopper soon became immovably fastened, by the deposition of what appeared to be sulphur.

About eighteen months afterwards, during an intensely cold winter, I observed a quantity of crystals floating on the surface of the liquid in this bottle, and the sulphide had entirely changed its appearance having become opaque and perfectly solid. The crystals were precisely similar to the feathery forms of sal ammoniac, so much so that they might readily have been mistaken for that substance, and undoubtedly belonged to the regular system.

On breaking off the stopper, the crystals began to disappear very rapidly, but a small quantity of the substance was introduced into a tube over mercury, where it was speedily converted into a gas which exhibited all the properties of pure sulphuretted hydrogen. Owing to the rapidity of decomposition it was impossible either to weigh or to dry the crystals for a quantitative analysis, although the temperature of the room was several degrees below zero.

There can be little doubt that this was the same compound as observed by Wöhler, but its formation in this case was not prevented by the presence of an acid. Pelletier and Serullas have shewn that the sulphide of phosphorus is decomposed under water with evolution of gaseous sulphuretted hydrogen, and formation of phosphoric or phosphorous acid.

† Annalen der Chemie und Pharmacie, B. 85.

NOTES OF A SOJOURN AMONG THE HALF-BREEDS, HUDSON BAY COMPANY'S TERRITORY, RED RIVER.

BY PAUL KANE, TORONTO.

Read before the Canadian Institute, Nov. 13th, 1855.

I have already had an opportunity of submitting to the members of the Canadian Institute some incidents of travel among the Indians of the far West, and especially of those occupying the north west coast, in the vicinity of Vancouver's Island.* I shall now confine myself to a tribe altogether peculiar, not only lying considerably nearer the eastern seats of Anglo-Saxon civilization on this continent, but deriving some of their most remarkable characteristics as the result of the intercourse between the Anglo-Saxon and the Indian occupants of the region referred to. In the month of June, 1846, I reached the Red River settlement of the Hudson's Bay Company, situated on the river of that name which empties itself into the Winipeg Lake. This settlement is the chief provision depôt of the Hudson's Bay Company, and it is also here that large quantities of Pimmi-kon are procured from the Half-breeds, a race, who, keeping themselves distinct from both Indians and whites, form a tribe of themselves; and although they have adopted some of the customs and manners of the French voyageurs, are much more attached to the wild and savage manners of the Red man. Fort Garry, one of the most important establishments of the Company, is erected on the forks of the Red River and the Assiniboine, in long. 97° w., and in lat. 50° 6′ 20″ N. On the opposite side of the river is situated the Roman Catholic Church, and two or three miles further down there is a Protestant Church. The settlement is formed along the banks of the river for about fifty miles, and extends back from the water, according to the original grant from the Indians, as far as a person can distinguish a man from a horse on a clear day. Lord Selkirk first attempted to form a settlement in 1811, but it was speedily abandoned. A few years afterwards several Scotch families, including some from the Orkney Islands, emigrated under the auspices of the Hudson's Bay Company, and now number about 2,000, who live as farmers in great plenty, so far as mere food and clothing are concerned. As for the luxuries of life they are almost unattainable as they have no market nearer than St. Paul's, on the Mississippi River, a distance of nearly 700 miles over a trackless prairy. The Half-breeds are more numerous than the whites, and now amount to about 4,000. These are the descendants of the

* Vide *Canadian Journal*, old series, vol. iii, p. 273.

white men in the Hudson's Bay Company's employment and the native Indian women. They all speak the Cree language and the Lower Canadian patois; they are governed by a chief named Grant, much after the manner of the Indian tribes. He has presided over them now for a long period, and was implicated in the disturbances which occurred between the Hudson Bay and North West Companies. He was brought to Canada charged with the murder of Governor Semple, but no sufficient evidence could be produced against him.

The Half-breeds are a very hardy race of men, capable of enduring the greatest hardships and fatigues; their Indian propensities predominate, and, consequently, they make poor farmers, neglecting their land for the more exciting pleasures of the chase. Their buffalo hunts are conducted by the whole tribe and take place twice a year—about the middle of June and October, at which periods notice is sent round to all the families to meet at a certain day on the White Horse plain, about twenty miles from Fort Garry. Here the tribe is divided into three bands, each taking a separate route for the purpose of falling in with the herds of buffaloes. These bands are each accompanied by about five hundred carts, drawn by either an ox or a horse. Their cart is a curious looking vehicle, made by themselves with their axes, and fastened together with wooden pins and leather strings—nails not being procurable. The tire of the wheel is made of buffalo hide and put on wet. When it becomes dry it shrinks and is so tight that it never falls off, and lasts as long as the cart holds together.

I arrived at Fort Garry about three days after the Half-breeds had departed, but as I was very anxious to witness buffalo hunting, I procured a guide, a cart for my tent, &c., and a saddle-horse for myself and started after one of the bands. We travelled that day about thirty miles and encamped in the evening on a beautiful plain covered with innumerable small roses. The next day was anything but pleasant, as our route lay through a marshy tract of country, in which we were obliged to strain all the water we drank through a piece of cloth on account of the numerous insects, some of which were accounted highly dangerous, and are said to have the power of eating through the coats of the stomach and causing death even to horses. The next day I arrived at the Pambinaw River and found the band cutting poles which they are obliged to carry with them to dry the meat on, as after leaving this no more timbered land is met with until the three bands meet together again at the Turtle mountain, where the meat they have taken and dried on the route is made into *pimmikon*. This process is conducted in the following manner: The

thin slices of dried meat are pounded between two stones until the fibres separate. About fifty pounds of this is put into a bag of buffalo skin with about forty pounds of melted fat and mixed together while hot, and sewed up, forming a hard compact mass;* each cart brings home ten of these bags, and all that the Half-breeds do not require for themselves, is eagerly bought by the Company for the purpose of sending to the more distant posts where food is scarce. One pound of this is considered equal to four pounds of ordinary meat, and the *pimmikon* keeps for years perfectly good, exposed to any weather. I was received by the band with the greatest cordiality: they numbered about two hundred hunters, besides women and children. They live during these hunting excursions in lodges formed of dressed buffalo skins; they are always accompanied by an immense number of dogs, who follow them from the settlements for the purpose of feeding on the offal and remains of the slain buffaloes. These dogs are very like wolves both in appearance and disposition, and, no doubt, are a cross breed between the wolf and dog. A great many of them acknowledge no particular master, and are sometimes dangerous in times of scarcity. I have myself known them to attack the horses and eat them. Our camp broke up on the following morning and proceeded on their route to the open plains. The carts containing the women and children, and each decorated with some flag or other conspicuous emblem on a pole, so that the hunters might recognize their own from a distance, wound off in one continuous line extending for miles, accompanied by the hunters on horseback. During the forenoon, whilst the line of mounted hunters and carts was winding round the margin of a small lake, I took the opportunity of making a sketch of the singular cavalcade.

The following day we passed the Dry-dance Mountain, where the Indians, before going on a war party, have a custom of dancing and fasting for three days and nights. This practice is always observed by young warriors going to battle for the first time, to accustom them to the privations and fatigues which they must expect to undergo, and to prove their strength and endurance. Should any sink under the fatigue and fasting of this ceremony, they are invariably sent back to the camp with the women and children. After leaving this mountain we proceeded on our route, without meeting any buffalo, although we saw plenty of indications of their having been in the neighborhood a short time previous. On the evening of the second day, we were visited by twelve Sioux chiefs

* Hence its name in the Cree language; *pimmi* signifying meat, and *kon* fat.

with whom the Half-breeds had been at war for several years; they came for the purpose of negociating a permanent peace. But whilst smoking the pipe of peace in the council lodge, the dead body of a Half-breed, who had gone to a short distance from the camp, was brought in newly scalped, and his death was at once attributed to the Sioux, the Half-breeds not being at war with any other nation. A general feeling of rage at once influenced the young men, and they would have taken instant vengeance for the supposed act of treachery upon the twelve chiefs in their power, but for the interference of the old and more temperate of the body; who, deprecating so flagrant a breach of the laws of hospitality, escorted them out of danger, but at the same time told them that no peace could be concluded until satisfaction was had for the murder of their friend. Exposed as the Half-breeds thus are to all the vicissitudes of wild Indian life, their camps while on the move are always preceded by scouts, for the purpose of reconnoitering either for enemies or buffaloes. If they see the latter, they give signal of such being the case by throwing up handfuls of dust, and if the former, by running their horses rapidly to and fro. Three days after the departure of the Sioux chiefs, our scouts were observed by their companions to make the signal of enemies being in sight. Immediately a hundred of the best mounted hastened to the spot, and, concealing themselves behind the shelter of the bank of a small stream, sent out two as decoys who exposed themselves to the view of the Sioux. The latter supposing them to be alone rushed upon them, whereupon the concealed Half-breeds sprang up and poured in a volley amongst them, which brought down eight; the others escaped, although several must have been wounded, as much blood was afterwards discovered on their tracks. Though differing in very few respects from the pure Indians, they do not adopt the practice of scalping, and in this case, being satisfied with their revenge, they abandoned the dead bodies to the malice of a small party of Saulteaux who accompanied them.

The Saulteaux are a band of the great Ojibewah nation, both words signifying "the jumpers," and derive the name from their expertness in leaping their canoes over the numerous rapids which occur in the rivers of their vicinity.* The Saulteaux, although numerous, are not a warlike tribe, and the Sioux, who are noted for their daring

*I took a sketch of one of them, Peccootiss (the man with a lump on his navel.) He appeared delighted with it at first, but the others laughed so much at the likeness and made so many jokes about it, that he became quite irritated, and insisted that I should destroy it, or at least not show it so long as I remained with the tribe.

and courage, have long waged a savage war on them, in consequence of which the Saulteaux do not venture to hunt in the plains, except in company with the Half-breeds. Immediately on their getting possession of the bodies, they commenced a scalp-dance, during which they mutilated the bodies in a most horrible manner. One old woman, who had lost several relations by the Sioux, rendered herself particularly conspicuous by digging out their eyes and otherwise dismembering them. In this ceremony the Half-breeds took no part, for though a warlike people they do not practice the scalp-dance, nor do they wear scalps as ornaments.

The following afternoon we arrived at the margin of a small lake, where we encamped rather earlier than usual for the sake of the water. On the following day I was gratified with the sight of a band of about forty buffalo cows in the distance, and our hunters in full chase; they were the first I had seen, but were too far off for me to join in the sport. They succeeded in killing twenty-five, which were distributed through the camp and proved most welcome to all of us, as our provisions were getting rather short, and I was abundantly tired of pemmikon and dried meat. The fires being lighted with the wood we had brought with us in the carts, the whole party commenced feasting with a voracity which appeared perfectly astonishing to me, until I tried myself and found by experience how much hunting in the plains stimulated the appetite.

The upper part of the hunch of the buffalo, weighing about four or five pounds, is called by the Indians the little hunch. This is of a harder and more compact nature than the rest, though very tender, and is usually put aside for keeping. The lower and larger part is streaked with rich fat, and is very juicy and delicious. These, with the tongues, are considered the delicacies of the buffalo. After the party had gorged themselves with as much as they could devour, they passed the rest of the evening in roasting the marrow bones and regaling themselves with their contents. For the next two or three days we fell in with only a few single buffalo or small herds of them, but as we proceeded they became more frequent. At last our scouts brought in word of an immense herd of buffalo bulls about two miles in advance of us. They are known in the distance from the cows by their feeding singly and being scattered wider over the plain, whereas the cows keep together for the protection of the calves, which are always kept in the centre of the herd. A Half-breed of the name of Hallett who was exceedingly attentive to me, woke me in the morning to accompany him in advance of the party, that I might have the opportunity of examining the buffalo, whilst feeding, before the commence-

ment of the hunt. Six hours' hard riding brought us within a quarter of a mile of the nearest of the herd. The main body stretched over the plains far as the eye could reach. Fortunately the wind blew in our faces; had it blown towards the buffaloes, they would have scented us miles off. I wished to have attacked them at once, but my companion would not allow me until the rest of the party came up, as it was contrary to the law of the tribe. We therefore sheltered ourselves from the observation of the herd behind a mound, relieving our horses of their saddles to cool them. In about an hour the hunters came up to us, numbering about one hundred and thirty, and immediate preparations were made for the chase. Every man loaded his gun, looked to his priming, and examined the efficiency of his saddle-girths.

The elder men strongly cautioned the less experienced not to shoot each other, a caution by no means unnecessary, as such accidents frequently occur. Each hunter then filled his mouth with balls which he drops into the gun without wadding; by this means loading much quicker, and being enabled to do so whilst his horse is at full speed. It is true that the gun is more liable to burst, but that they do not seem to mind. Nor does the gun carry so far, or so true, but that is of less consequence as they always fire quite close to the animal. Every thing being adjusted, we all walked our horses towards the herd. By the time we had gone about two hundred yards, the herd perceived us and started off in the opposite direction at the top of their speed. We now put our horses to the full gallop, and in twenty minutes were in their midst. There could not have been less than four or five thousand in our immediate vicinity, all bulls, not a single cow amongst them. The scene now became one of intense excitement: the huge bulls thundering over the plains in headlong confusion, whilst the fearless hunters rode recklessly in their midst, keeping up an incessant fire at but a few yards distance from their victims. Upon the fall of each buffalo the successful hunter merely threw some article of his apparel—often carried by him solely for that purpose—to denote his own prey, and then rushed on to another. These marks are scarcely ever disputed, but should a doubt arise as to the ownership, the carcase is equally divided between the claimants.

The chase continued only about one hour, and extended over an area of from five to six square miles, over which might be seen the dead and dying buffaloes, to the number of five hundred. In the mean time my horse, which had started at a good run, was suddenly confronted by a large bull, that made his appearance from behind a knoll within a few yards of him, and, being thus taken by surprise, he

sprung to one side and getting his foot into one of the innumerable badger holes with which the plains abound, he fell at once, and I was thrown over his head with such violence that I was completely stunned, but I soon recovered my recollection. Some of the men caught my horse, and I was speedily remounted, and soon saw reason to congratulate myself on my good fortune, for I found a man, who had been thrown in a similar way, lying a short distance from me quite senseless, in which state he was carried back to the camp. I again joined in the pursuit and, coming up with a large bull, I had the satisfaction of bringing him down at the first fire. Excited by my success I threw down my cap, and, galloping on, soon put a bullet through another enormous animal. He did not however fall, but stopped and faced me, pawing the earth, bellowing and glaring savagely at me. The blood was streaming profusely from his mouth, and I thought he would soon drop. The position in which he stood was so fine, that I could not resist the desire of making a sketch. I accordingly dismounted, and had just commenced, when he suddenly made a dash at me. I had hardly time to spring on my horse, and get away from him, leaving my gun and everything else behind. When he came up to where I had been standing, he turned over the articles I had dropped, pawing fiercely as he tossed them about, and then retreated towards the herd. I immediately recovered my gun, and, having reloaded, again pursued him and soon planted another shot in him; and this time he remained on his legs long enough for me to make a sketch. This done, I returned with it to the camp, carrying the tongues of the animals I had killed, according to custom, as trophies of my success as a hunter. I have often witnessed an Indian buffalo hunt since, but never one on so large a scale. In returning to the camp I fell in with one of the hunters coolly driving a wounded buffalo before him. In reply to my enquiry why he did not shoot him, he said he would not do so until he got him close to the lodges, as it would save the trouble of bringing a cart for the meat. He had already driven him seven miles, and afterwards killed him within two hundred yards of the tents. That evening, while the hunters were still absent, a buffalo, bewildered by the hunt, got amongst the tents, and at last got into one, after having terrified all the women and children, who precipitately took to flight; when the men returned they found him there still, and being unable to dislodge him, they shot him down from the opening in the top.

Our camp was now moved to the field of slaughter for the greater convenience of collecting the meat. However lightly I wished to think of my fall, I found myself the next day suffering considerably

from the effects of it and the fatigue I had undergone. The man, whom I had brought with me as a guide, was also suffering much from an attack of the measles. Next day our hunters sighted and chased another large band of bulls, with good success. At night we were annoyed by the incessant howling and fighting of innumerable dogs and wolves that had followed us to the hunt, seemingly as well aware of the feast that was preparing for them as we could be ourselves. The plain now resembled one vast shambles; the women, whose business it is, being all busily employed in cutting the flesh into slices and hanging them in the sun, on racks made of poles tied together. In reference to the immense number of buffaloes killed, I may mention that it is calculated that the Half-breeds alone destroy thirty thousand annually.

Having satisfied myself with buffalo hunting amongst the Half-breeds, I was anxious to return to the settlement, in order to prosecute my journey, and as this closed my intercourse with the singular race of Half-breeds, I should perhaps draw my narrative at once to a close. The incidents, however, which marked my course back to the Red River settlement, are not without their interest as illustrations of the character of the country and the habits of its wild occupants. On proposing to set out I found my guide so unwell that I feared he would not be able to travel. I tried to procure one of the hunters to take his place and return with me, but none of them would consent to travel alone over so large a tract of country from fear of the Sioux, in whose territory we then were, and whom they dreaded, from the late occurrence, would be watching to cut off any stragglers. Being unable to procure a fresh man I was about to start alone, when my guide, who thought himself better, proposed to accompany me on condition that he would ride in the cart, and not be expected to attend to the horses or cooking. This I readily agreed to, as his services as guide were of the utmost importance.

We started next morning for the settlement, a distance which I supposed to be somewhat over two hundred miles. A party of twenty of the hunters escorted us for eight or ten miles, to see that there were no Sioux in the immediate vicinity. We then parted, after taking the customary smoke on separating from friends. I could not avoid a strong feeling of regret at leaving them, having experienced many acts of kindness at their hands, hardly to be expected from so wild and uncultivated a people. We found a great scarcity of water on our return, most of the swamps that had supplied us on our way out being now dried up by the heat of the season.

We fell in with a great many stray dogs and wolves, which ap-

peared to be led on by the scent of the dead carcasses. After hobbling the horses, putting up my tent and cooking the supper, I made a sketch of our encampment, and then turned in for the night, not without some apprehensions of a hostile visit from the Sioux, as we were still on their hunting grounds and in the territory of the United States, being still a few miles south of the boundary line. During the night my guide, who was very ill and feverish, cried out that the Sioux were upon us. I started up with my gun in my hand, for I slept with it by my side, and, rushing out in the dark, was near shooting my own horse who, by stumbling over one of the tent posts, had alarmed my companion. We travelled on next day with the greatest rapidity that the ill health of my guide would permit, and on the evening of the 30th of June we encamped on the bank of the Pambinaw. I lost considerable time next morning in catching the horses, as they are able, from habit, to run a considerable distance and pretty fast, in spite of their hobbles. In the afternoon we arrived at the Swampy Lake, about fourteen miles across. A little before sunset we reached about the middle of it, but my guide complained so much that I could not proceed further. I succeeded in finding a small dry spot above water, large enough for me to sit on, but not affording room for my legs which had to remain in the water, there being no more room in the small cart than was necessary for the sick man. Having no means for cooking I was compelled to eat my dried meat raw. I tried to compose myself to sleep, but found it impossible from the myriads of mosquitoes which appeared determined to extract the last drop of blood from my body. After battling with them until four o'clock next morning, my eyes almost blinded by their stings, I went in search of the horses which had strayed away to some distance into deeper water, tempted by some sort of flags growing there. I had to wade up to my middle in pursuit of them, and it was not until nine o'clock that we were able to proceed. After leaving this dismal swamp we were within a day's march of the settlement, and my guide, believing himself to be much better, insisted upon my leaving him to drive the cart, whilst I proceeded at a more rapid rate on horseback. This, however, I would not do until I had seen him safe across Stinking River, which the horses had almost to swim in crossing. Having got him over safely, I left him, and proceeded onward in the direction of the fort. But I had not gone far before I encountered one of the numerous swampy lakes that abound in this region and render the travelling extremely difficult. I had no doubt got upon a wrong track, for, on endeavouring to cross, my horse quickly sank up to his neck in mud and water. Finding that

I could neither advance nor recede, I dismounted and found myself in the same predicament, scarcely able to keep my head above the surface. I managed, however, to reach the dry land, and with the lasso, or long line, which every voyageur in these parts invariably has attached to his horse's neck, succeeded in getting the animal out. I remounted and endeavoured to cross in another direction, but with no better success. I now found myself surrounded on all sides, as far as I could see, with nothing but swamp. My horse refused to be ridden any further. I had therefore to dismount and drag him along as I best could, wading up to my very middle in mud and water abounding with reptiles. That I had lost my way was now certain, and, as it was raining hard, I could not see the sun, nor had I a compass. I, however, determined to fix upon one certain course and to keep that at all hazards, in hopes that I might reach the Assineboine River, by following which I could not fail to reach the settlement. After travelling in uncertainty for ten or twelve miles I had at length the satisfaction of reaching the river, and in two hours afterwards I arrived safe at Fort Garry. The next morning I learned that my guide had been brought in by two men who were looking for some stray horses. The poor fellow had got rapidly worse after my leaving, and had only proceeded a short distance when he was compelled to stop. He only survived two days after his arrival. Fort Garry is one of the best built forts in the Hudson's Bay territory. It has a stone wall with bastions mounted with cannon, inclosing large storehouses and handsome residences for the gentlemen of the establishment. Its strength is such that it has nothing to fear from the surrounding Half-breeds or Indians. The gentleman in charge was Mr. Christie, whose many acts of kindness and attention I must ever remember with feelings of grateful respect.

The office of Governor of the Red River Settlement is one of great responsibility and trouble, as the happiness and comfort of the whole settlement depend to a great extent upon the manner in which he carries out his instructions. The Half-breeds are much inclined to grumbling, and, although the Company treat them with great liberality, they still ask almost for impossibilities; indeed as far as the Company is concerned, I cannot conceive a more just and strict course than that which they pursue in the conduct of the whole of their immense traffic. In times of scarcity they help all around them; in sickness they furnish them with medicines, and even try to act as mediators between hostile bands of Indians. No drunkenness or debauchery is seen around their posts, and so strict is their prohibi-

tion of liquor, that even their own officers can only procure a small allowance, given as part of their annual outfit on voyages.

Without entering into the general question of the policy of giving a monopoly of the Fur trade to one company, I cannot but record as the firm conviction which I formed from a comparison between the Indians in the Hudson's Bay Company territories and those in the United States, that opening up the trade with the Indians to all who wish indiscriminately to engage in it must lead to their annihilation. For while it is the interest of such a body as the Hudson's Bay Company to improve the Indians and encourage them to industry according to their own native habits, in hunting and the chase, even with a view to their own profits; it is as obviously the interest of small companies and private adventurers to draw as much wealth as they possibly can from the country in the shortest possible time, although in doing so the very source from which the wealth springs should be destroyed. The unfortunate craving for intoxicating drinks, which characterises all the tribes of Indians, and the terrible effects thereby produced upon them, render such a deadly instrument in the hands of designing men. It is well known that, although the laws of the United States strictly prohibit the sale of liquor to the Indians, it is impossible to enforce them, and whilst many traders are making rapid fortunes in their territories, the Indians are fast declining in character, wealth, and numbers, whilst those in contact with the Hudson Bay Company maintain their numbers, retain their native characteristics unimpaired, and in some degree share in the advantages which civilization places within their reach.

A METHOD OF DETERMINING THE INDEX ERRORS OF THERMOMETER SCALES.

BY W. D. C. CAMPBELL, QUEBEC.

Read before the Canadian Institute, January 26th, 1856.

The following simple method is proposed for determining the errors below 32° Ft. of Mercurial Thermometers, which have been compared and corrected above the freezing point.

If air has been carefully excluded from the tube, (as is the case in most Mercurial Thermometers,) on turning it upside down, the mercury will run from the bulb to the end of the tube, leaving a small vacuum in the bulb; by turning the thermometer quickly

upright, and giving it a slight jerk, the vacuum will be brought to the aperture of the fine tube, and when the position of the thermometer is again reversed, the column of mercury in the tube will separate from that in the bulb, leaving a vacuum in the tube.

The bulb is then to be gently heated until the remainder of the mercury in it rises to the lowest point of the scale to be proved, and by again holding the tube in an upright position, the columns run together. A gentle shake will insure their joining, which is essential.

Let the bulb be now immersed in snow, or ice and water, until the mercury has nearly reached 32°, and it will be found that on again reversing the position of the tube, the mercury will separate at the same point of the scale, at which it had joined.

The thermometer being placed in a horizontal or slightly inclined position, with the bulb surrounded with wet snow, the separated column of mercury can be made to move upwards, (this is best effected by gentle *taps* at the end of the tube,) as required, while the observer reads the lower and upper extremities at such intervals as he may find necessary. The readings may be written down as follows:—

From	— 30	to	33.2
	— 29	to	34.2
	— 28	to	35.1
	— 29	to	36.1
	— 26	to	37.0
	32°	to	95.0

By applying the corrections previously known at 32° and 95°, we find the true length of the column of mercury in degrees of the scale, and the true reading at each of the lower points of the scale may be obtained by deducting the number of degrees in the column from the upper reading (corrected) thus:

Correction at 95°		+'5—	true reading,	95°	5
Do.	32	— 0—	Do.	32.	0
			Column of mercury.....	63°	5

Upper reading, 32°
Col. 63 5

Correct reading for — 30° is — 31.5, — error at — 30 = — 1.5.

It is scarcely necessary to mention that, in applying the above method, the greatest care must be taken that the length of the column of mercury is not affected by change of temperature.

REVIEWS.

The Agriculture of the French Exhibition. By John Wilson, F.R.S. E., F.G.S., &c., Professor of Agriculture in the University of Edinburgh. Edinburgh: Adam & Charles Black. 1856.

The grand conception, which originated, we believe, with Prince Albert, of inviting all the civilized nations of the world to bring to one centre their various characteristic productions from the wide domains of nature and art, has already been productive of extensive and beneficial results. The great Exhibitions of London and Paris have now become matters of history, and although their brief existence belongs to the past, the mighty impetus which they imparted to the genius and industry of nations will continue to be felt to distant periods of the mysterious yet hopeful future. These Exhibitions are characteristic of an age of rapid progress in the useful and ornamental arts, and constitute a marked epoch in the advancement of a higher civilization, in which those great national, moral and social relations of the race, occupy a prominent position. It may be that some of these effects will not become speedily apparent; even, perhaps, when they are the most latent, they may become the silent but effectual means of accomplishing ultimately the most valuable and enduring improvements. The harmonising influences which such Expositions exert on the different races of mankind, the prejudices they dissipate, the catholicity of spirit they inspire, and the expansion of thought, improvement of taste, and general elevation of the whole mind in many of the best elements of progression and Christian civilization, which they tend to produce, form an invaluable and much needed discipline of both mind and heart, and cannot fail in the end of securing in the highest sense, "the greatest happiness of the greatest number."

The work which stands at the head of this article was prepared in the form of a lecture, and delivered by the author to his Agricultural class in the University of Edinburgh. Professor Wilson is favorably known on this side of the Atlantic. He was appointed one of the British Commissioners to the New York Industrial Exhibition in 1853, when he attended the Provincial Shows of both sections of this Province. Canada is under great obligations to him for the interest he took in our department of the London Exhibition, in 1851, and the favourable disposition he has subsequently shown towards Canadian productions, both in the Paris Exhibition, and with reference to their introduction to the Crystal Palace at Sydenham. The British department of Agriculture in the Paris Exposition was entrusted to his

care, and he was also appointed a Juror in the general examination and adjudication of awards. We need scarcely say, therefore, that Professor Wilson must be highly qualified, from previous acquirements and professional duties, to speak and write on the Agriculture of the French Exhibition. We proceed to lay before our readers a few facts and statements relating to this department, gleaned principally from his lecture.

The Agriculture of France continues as yet very defective in reference to two of its most important departments, *draining*, and the use of *special manures*. The former, Professor Wilson says, is daily becoming more appreciated, and some few plans of drainage were exhibited, with a comparative statement of results. A French writer on agriculture, who has already established a European reputation, LEONCE DE LAVERGNE, observes in a recent number of the *Revue des Deux Mondes*: "That with badly worked and badly manured fields as is still the case with three-fourths of France, drainage can produce but little good effect. Great progress has to be made in most districts before that. The adoption of a good rotation costs less, and may prove as productive. Then comes the employment of some improved implements, as a good plough, a good harrow, threshing by machinery, and the use of improvers for the soil."

Guano till quite recently has been but very sparingly used in France. During the first six months of 1854, out of 225,000 tons exported from the Chincha Islands, 113,000 went to England, 98,000 to the United States, and only 5688 to France. In 1855, however, France imported 100,000 tons of this valuable fertiliser. Considerable attention seems lately to have been given in that country to the manufacture of artificial manures, several of which were exhibited. "Of these," the Professor remarks "one, the Fish Guano—

"Particularly claimed attention, inasmuch as the practicability of the manufacture was lately the subject of much discussion in scientific as well as in commercial circles. It was manufactured, I was informed, upon a considerable scale, the process differing somewhat from that suggested in this country. The fish, either the refuse of the market or otherwise, is cut into pieces, and submitted to the action of high-pressure steam (four or five atmospheres) in suitable vessels, for about an hour. It is by that time sufficiently cooked, and is then ready for the presses, which expel a great proportion of the water, and leave the residue in the form of a cake. This cake is, by means of a coarse rasp or grating machine, broken up into a sort of pulp, which is spread out in thin layers on canvass, and dried by means of warm currents of air. It is sold either in this state or more minutely divided by means of the ordinary grinding processes. It is stated in this condition to correspond to 22 per cent. of the crude weight of the fish, and to contain from 10 to 12 per cent. of nitrogen, and from 16 to 22 per cent. of phosphate. The price was

20 francs per 100 kilogrammes (about £8 per ton), and the demand regularly increasing. Probably there are few places where this manufacture could be carried out more advantageously than along the north-east coast of this country, where both the raw materials,—fish and fuel,—are so abundantly provided; and I certainly think the simple process of the "*Engrais Poisson*" is more economical than and preferable to the processes hitherto recommended."

In the agricultural implement department there was an extensive display, but nothing particularly novel or superior to what had been previously exhibited elsewhere. There were no less than 350 exhibitors, whose productions as might be expected indicated very different orders of merit."

"The practical trials of the implements were of a somewhat irregular and protracted character. Those coming immediately under the adjudication of the Agricultural Jury were carried out satisfactorily, considering the difficulties attendant upon the operations of such a large number of machines and implements, most differing from, and many of them entirely new to the agriculture of the land. The trials occasioned considerable excitement,—each time the country sent its representatives from far and near. Ministers of State and Imperial Commissioners, with their President, the Prince Napoleon, Arab chiefs, and foreigners from all parts of the globe, came to see the experiments; while the presence of a battalion and a brigade, with their martial accompaniments, conferred a *novelty*, if not a charm, upon the field. After all, these warlike accompaniments formed a striking background for such a living picture of the peaceful arts. The results of all these comparative trials will be officially made known by the Jury. The character of the English implements was well sustained, in none perhaps more than in the *ploughing* trials, when the dynamometer showed, that while it required only a force equal to 17·01, to turn over a *certain quantity* of earth in a *certain time*, with the best English plough, it required a force of more than 27 to do the same work with the *best* French one, and 32·3 with the best Belgian plough. Many other ploughs were tested, some requiring a force of 60, 80, and indeed nearly 100, so that practically one horse with the English plough would be as efficient as *four* or *five* horses attached to some of the other ploughs. In the trials of *Reaping Machines*, the Americans were each time victorious; the work was admirably done. An English and a Canadian machine, on *Bell's* principle, were forced to withdraw from some derangement of the working gear. These machines, from their economy of labor, and rapidity and excellence of work, appeared to produce a great effect upon the crowds who witnessed their operations. I fear, however, that the agriculture of France is not yet sufficiently advanced for their successful introduction. What Palladius said of old, is equally true now,—that they are only to be used when the fields are large, and the surface level,—and these are certainly not the present conditions of France."

"Of all implements," says M. de Lavergne, "the most necessary is the most difficult to perfect; there is not such a thing as a *perfect* plough, and it is very doubtful if it be possible to find one which shall satisfy every condition. All the ploughs were tried by the jury; those which did apparently the best work with the least draught were, the English *Howard*, the American [Canadian]

Bingham, the Belgian *Odeurs*, and the French *Frignon*. As the experiment shewed no very marked superiority in any, it is probable that each nation will keep to its own. That which is defective and imperfect in the work of the plough has to be supplied by other implements; as scarifiers, diggers, harrows and rollers. For these the superiority of the English is incontestable. Nothing can match Garrett's *cinease*, Colman's weeder, and the Norwegian harrow and clod crusher of Crosskill. These superior implements are now copied in France, as far as the high price of iron and the means of our cultivators admit."

In the trial of implements we understand that *Morse's plough*, manufactured at Milton in Upper Canada, stood next to Howard's in lightness of draught and quality of work, then came Bingham's, an iron plough, the irons of which were not polished like Morse's—a circumstance that will, to some extent at least, account for the small difference of draught on a first trial. These two ploughs were purchased with many other articles by the Canadian Government, and transmitted to the French Exhibition. It is no small honor for the daughter to be but slightly excelled by the mother, in that most ancient, important and characteristic implement, the plough.

In the fourth section, relating to the produce of cultivated crops, the first and foremost place is assigned to the French Colony of Algeria, which, after being for many years dependent for a considerable portion of its food and a drag on the mother country, has been changed by the adoption of an improved system of tillage, into a large exporter of the necessaries and of some of the luxuries of life. But Algeria is not without her rivals. Professor Wilson remarks:

"Rivalling the fine samples of hard wheats from Algeria, were the *white wheats* of Australia, Tasmania, the Cape, Canada, and Sweden. France, Spain and Belgium also exhibited beautiful wheats, both white and red; while the *red* wheats of Portugal were very highly commended. Austria and Baden both funished very comprehensive and well arranged collections of agricultural produce, and the *quality* of the wheat exhibited by Turkey shewed the richness of her soil, while the dirty unmarketable condition testified to the want of care of its inhabitants. Denmark, Sweden, Canada, and Hungary exhibited the finest samples of *barleys*; and Tasmania sent a sample of *oats* equal to any in the building. The specimens of *maize* were very numerous and of admirable quality; the finest perhaps were from Algeria, Canada, Australia, Portugal, Hungary, and Styria. *Rye* and *buckwheat*, two crops hardly known as bread corn in this country, were contributed by France, Bohemia, Denmark, Sweden, and Canada, in which countries they are very largely consumed. Samples of *rice* were contributed by South Carolina, of remarkable size and color; Algiers, Portugal, Tuscany, and the Pontfical States also exhibited their produce. Bavaria, Bohemia, and Belgium sent fine collections of *hops* of superior quality. Canada also exhibited samples showing a marked

improvement in quality since 1851. The advanced state of the *flax* cultivation in France, Holland, Belgium, and Austria, was well represented; from each country an extensive series of samples of various qualities, and in the different stages of preparation, was sent. The *tobacco* specimens, I was informed, were of extraordinary quality, in many cases, I am sorry to say, superior to the samples of grain of the exhibiting country. Those most commended were contributed by Algeria, France, Austria, Baden, Spain, and Portugal. From Greece a small collection of grain was sent, as also a pot of honey from Mount Hymettus, which the umpires, still faithful to the traditions of the poets, pronounced to be the best in the Exhibition."

British agricultural produce was confined to one collection, exhibited by the British Government, and entrusted to the care of Professor Wilson, who manifested no ordinary amount of taste and skill in procuring and arranging the several articles, which excited much praise and admiration, both from the visitors and the press. The official Hand-book has the following remarks:

"Vegetable productions occupied a large space in the contributions from the English Colonies. Their prodigious variety, their relations with manufacturing industry, and with the *alimentation* of the country, assigned to them naturally a prominent position in the Exposition of 1855. But we were not prepared to see the agricultural produce of England represented with such éclat. Whilst the contributions from the Indies struck us by their variety, which, so to say, prevented all methodical classification; those from England were arranged in admirable order, and thus enabled us to appreciate at a single glance the results of that high cultivation which the necessity for a large production has forced upon this great nation. The cereals, leguminous and forage plants, and the indigenous timber woods, were represented by specimens in their natural state; the roots and cultivated fruits were represented by wax models; the domesticated animals by carefully painted portraits. This collection, in its ensemble, does the greatest honor to those who made it; our only regret is that the place assigned to it in the Annexe was somewhat removed from the great lines of circulation."

The cereals of Canada occupied a high position, and our wheat was among the best produced by any country. The native woods of this country, which were sent over in large sections, in like manner attracted much notice, inasmuch as most of them possess a high economic value. On this subject the Professor remarks:

"Thus far I have only touched upon the produce of cultivated crops, and these have for the most part been the food substances of Europe. Of these even some fine specimens were sent from our own Colonies, but their strength and importance were displayed in the admirable collection of the produce of *special crops*, or of those obtained without any cultivation at all. First and foremost of these, in number and beauty of specimens, if not in actual importance, must be classed the *woods* used for construction and for ornamental purposes. In these the English colonies of Canada, Guiana, Jamaica, and Australia, were without any rivals. The gigantic dimensions of the soft timber of Canada were only equalled by the strength of fibre and beauty of grain of the hard woods of lower latitudes. Each specimen in these large collections was correctly named, and formed an object of *study* for the

economic botanist, no less than an object of commercial interest to the merchants and artificers of Europe. Such a large collection of specimens offered an excellent opportunity for testing their comparative value for different purposes of construction; and a series of experiments were carried out, the results of which, I have no doubt, will materially add to our knowledge of the relative strength of materials. The importance of these experiments would probably be more readily seen in reference to shipbuilding than to any other ordinary purpose for which wood in large quantities is required. In shipbuilding about 40 cubic feet (using round numbers) are required per ton,—say 32 cubic feet for the hull, and 8 cubic feet for fittings,—this would give for a ship of 1000 tons 32,000 + 8000 cubic feet. The two important elements for the consideration of the builder are strength and specific gravity,—both separately and in relation to each other. The value of the former is not so generally determined as that of the latter; indeed this formed the principal object of the experiment alluded to; let us see, then, how far the latter element of the physical character of timber influences the ship. The *first-class* woods entered at Lloyd's are eight in number—English oak, American oak, African oak, Morung Saul, East India teak, Greenheart, Mora, Iron bark; these mostly differ considerably in specific gravity. A cubic foot of English oak weighs 40 lbs.; of American oak, 46 lbs.; of African oak, 50 lbs.; of Malabar teak, 39 lbs.; of Mora excelsa, 62 lbs.; of Iron bark, 65 lbs. Besides these, other woods are largely used, as Honduras mahogany, which weighs 31 lbs. per cubic foot; Eucalyptus, 50 lbs.; Canada pine, 22 lbs.; and cedar, 25 lbs.

"Now, taking these specific gravities into calculation, the hull of a 1000-ton ship would require of English oak, 572 tons; of American oak, 657 tons; of African oak, 714 tons; of teak, 537 tons; of Mora, 885 tons; of Eucalyptus, 714 tons, and of Iron bark no less than 930 tons; while it would only require of Mahogany, 443 tons; of Canada pine, 316 tons; or of Cedar, 362 tons. Taking the two extremes, Iron bark and Canada pine, a difference is shown of 614 tons—nearly 200 per cent.—in the displacement tonnage of the vessel, and consequent increased capacity for freight.

"These collections contained also many woods valuable for furniture and ornamental purposes,—the black walnut of Canada, for instance, of which a suite of drawing room furniture was shown; the *Dacrydium Franklinii*, or Huon pine of Tasmania, whose fragrant odour and brilliant golden color attracted much notice. In the Algerian collection were some fine timber woods, and also some beautiful specimens of the *Thuja articulata*, whose richly marked, deep tinted knots found a ready sale in Paris at the rate of 2s. per lb. weight. The specimens of Amboyna wood in the Dutch collection were remarkably beautiful. One piece was valued at 1200 francs."

The spirit of the author's concluding observations will find a ready response among the true hearted of our race, not only in Canada, but in every civilised nation of the earth:

"This brief sketch which I have given you has touched but the surface—the salient points of interest which naturally present themselves to the ordinary observer. But a man cannot long remain an *ordinary* observer whose duties lead him, day by day, and week by week, to the examination of these great and varied evidences of Divine beneficence. He cannot compare unmoved the productive ratio of skilled and Christian Europe with that of the dark, unevangelized nations

of the East. He cannot but trace the hand of Providence in adapting the wants and produce of a country to each other,—whether he seeks for it in the contributions from the ice-bound shores of Scandinavia or the sunny lands of southern latitudes. He feels, after all, how poor are man's efforts, and how small is his success, when—with all the powers of advanced civilization, the matured intellect, and the developed skill—he cannot rival the beauty and the richness of those productions which Nature has bestowed on lands over which her sway is still undisturbed. His intellect may originate,—his skill may apply,—science and art may lend means for the adaptation of Nature's gifts to his daily need, but his own *finiteness* must ever come home to his mind with the great truth that—though as *Paul* he may plant, and as *Apollos* may water,—it is *God* that giveth the increase."

We too, in Canada, have many great and wise lessons to learn from the part we have played in these palaces of Industry reared successively in the two chief capitals of Europe and of the world. We have much to be justly proud of in the appearance we have made; but our experience will have been to little purpose, if we do not also learn from it how much we have yet to accomplish in every way, to place us on an intellectual as well as an industrial equality with these, the foremost among the nations of the world.

G. B.

Researches on Colour-blindness, with a Supplement on the Danger attending the present system of Railway and Marine Coloured Signals. By George Wilson, M. D., F.R.S.E., Regius Professor of Technology in the University of Edinburgh, and Director of the Industrial Museum of Scotland. Edinburgh: Sutherland and Knox. 1855.

There are few persons, we imagine, who would not be startled if their friend standing by them, looking at the same object, and endowed with eyes to all appearance as acute of vision as their own, were to declare that the rainbow was only a white circle, that the varied hues of a sunset were but increasing shades of darkness, or that the gorgeous coloring of a picture by Titian was undistinguishable from the *chiaro obscuro* of a mezzotint; yet, reflection may convince us that such an incident is quite within the limits of possibility, since the impression of colour conveyed to the mind by some function of the apparatus of vision must depend on the organization of that apparatus, which will vary in different individuals; and this variation may in some cases be exalted into so wide a difference from the normal type as to involve the confusion of colours which are distinct to ordinary eyes, or even, as in the case suggested, the obliteration of all. Though this extreme case is very rare, we have abun-

dant proof of its existence; and that, between the eye thus absolutely destitute of perception of colour and the normal eye, which is only insensible to the distinction between faint shades of contiguous colours, there exists a great variety of sensibility to colour in different persons, commencing with those rare cases which confound all colours indiscriminately, passing on to others, still rare, which confuse one of the primaries with another and with all composites, or which are sometimes insensible to the primary red; then to more frequent cases of confusion of one or more composites, and thus terminating, though by no marked definition, in the normal eye. To designate these various grades of defect the appropriate term *colour-blindness* has been adopted, superseding (we hope) the name of *Daltonism*, which that illustrious chemist had unenviably suggested to Continental *savans* by being one of the first to call attention to the subject through a description of his own case. The term, however, must be understood as restricted to cases where the deficiency is decidedly marked (since we are *all* more or less *colour-blind*), and does not properly include such cases as consist merely in a defective memory of colours, in which the inability to *name* any particular colour presented does not result from inability to distinguish between it and another when simultaneously contrasted to the eye.

Previous to the publication of the work which is the subject of this article, information on this interesting subject was not readily accessible, and was sufficiently scanty: a couple of admirable memoirs by Wartmann; descriptions of particular instances scattered through the Transactions of scientific societies; the investigations of Seebeck, and the digests of Brewster, Herschel, and Moigno, comprised nearly all that was then known. Fortunately the subject attracted the attention of Dr. George Wilson, the gentleman whose recent appointment to the chair of Technology in the University of Edinburgh, and the Directorship of the National Industrial Museum, has been hailed with pleasure by the scientific world; and to his exertions we owe not only a vast accession of original facts and cases, but the clear and full exposition of the whole subject contained in the work before us. Dr. Wilson appears personally to to have examined above seventy marked cases (besides numerous others communicated to him from all parts of the country) occurring in all conditions of life, and sometimes presented in a manner which conveys to the normal-eyed a sense of the ludicrous. Thus, to select a few instances almost at random, Mr. N. (who thinks his blindness an advantage to him as an amateur artist) says, "I have sometimes attempted a coloured landscape, relying upon a friend to select the

appropriate crayons in regard to tint, whilst I exercised my own judgment in regard to tone; if, as has often been done for experiment, what others call a *red* crayon is given to me, whilst executing the foliage of a tree, provided it suited my ideas of depth, I have never distinguished the difference, and have now some drawings with, I am told, bright red intermixed in the foliage; and in one instance a sea piece has *light pink* crests to the waves. I selected these myself, the assorted crayons having become intermixed. * * * I remember the late Lord V—— joking his wife for wearing a *scarlet* dress; she assured him it was bright *green;* and on comparing notes with him, I found that our defect of vision was precisely the same, although he had been scarcely aware of it until that time.—My brother, when a child, once picked up a red-hot coal, asking 'what that funny green thing was?'"

Strange as it seems, Dr. Wilson gives us several instances of artists suffering from this defect. The brother of Admiral ——— once painted a *red* tree in a landscape without being aware that he had done so: Dr. S. says he has done the same: one artist-pupil copied a *brown* horse in *bluish-green*, painted the sky *rose-colour*, and roses *blue:* another painted a head with a face *muddy-green*, and insisted on a packet of *emerald-green* being *vermilion*.

Rather awkward it must have been for Admiral ——— when he 'chose a pair of *green* trowsers once, thinking they were *brown:*' and still more for those members of the Society of Friends of whom we read 'one provided himself with a *bottle-green* coat, intending to purchase a *brown* one; and selected for his wife, who desired a dark gown, a *scarlet* merino. Another, who is an upholsterer, purchased *scarlet* for *drab*, and had to rely upon his wife and daughters to select for him the fabrics needed in his profession!' Most of all should we sympathise with that unhappy Minister in the same sober community, who selected *scarlet* cloth as material for a new coat. In little better case was that officer of the navy who purchased 'a *blue* uniform coat and waistcoat with *red* breeches *to match*,' or the undertaker's apprentice, who 'on being sent for black cloth to cover a coffin, brought scarlet;' or those journeymen tailors who 'matched the scarlet back of a livery waistcoat with *green* strings; put a ruddy *brown* side by side with a dark *green;* informed a purchaser that a red and blue stripe on a piece of trowser-cloth was *all* blue, and put a *crimson* patch on the elbows of a *dark-blue* coat.'

It is certainly curious that colour-blindness should thus be found in professions where we should least expect it: thus, says Dr. Wilson, 'dyers, painters, weavers, clothiers, and the members of other

'callings much conversant with colour, are not unfrequently colour-'blind. I, myself, have very recently been offered "any reasonable 'fee" if I would cure a worthy working tailor of almost total inabil-'ity to distinguish colours. I know of cases among haberdashers 'and silk-mercers; and on enquiring at one of the latter, who had 'served under a colour-blind master, and thereby had his attention 'directed to the matter, what became of those haberdashers who 'could not distinguish colours, he made the unexpected reply, "that 'they generally ended in mourning-warehouses."'

We find also instances of chemical students unable to tell the colours of their precipitates, and even a chemical professor who hardly dare speak to his students about the colours of bodies; office-clerks using red and black ink without knowing the difference, and obliged to ask a friend which is the red and which the black sealing-wax. Dalton himself compared red sealing-wax to one side of a laurel leaf, and a red wafer to the other, and his doctor's scarlet gown to the leaves of trees; and lastly, a house-painter, who could not distinguish any colours but black and white, and who 'trusted to his wife in selecting and mixing colours,' on one occasion painted some square yards of the wall of a public building *blue*, under the impression that he was producing a *stone-tint*.

Our limits do not allow us to follow Dr. Wilson through the many varieties of colour-blindness that he has recorded, but we quote the following as illustrations:

(*Case of Dr. Y., described by himself.*)

"The colours I see in the rainbow are blue and yellow. Crystals examined by polarised light present to my eye the same appearance as to yours—most likely; that is to say, I see the yellow and blue, the red and green, and on turning the prism round I see them changing, but I cannot retain in my eye the red and green, and could not tell them on a piece of cloth the next minute.

"The colours which I distinguish best on natural objects such as cloths, glass, etc., I think are yellow and blue, the worst are red and green. Yet when I try to answer your two questions, which I must run together, 'What colours are confounded with each other, or supposed identical or undistinguishable?' and 'What mistakes have been made in reference to colours?' I feel that I may be said not to recognise any colour. In the first place, I never could recognise corn whether it was yellow or green, the green appearing only as a darker shade of yellow. Green and red I cannot distinguish from each other. Red I never saw in the fire, gas, candles, etc., only yellow and blue. Red cabbage growing, pickled, or in infusion, are all the most beautiful blues I can conceive, and it was by not observing any change by acids in the infusions of red cabbage, when attending Professor Hope's chemistry class where I used to stare for the whole hour expecting to see the change, that I first became fully convinced of my great defect. Red, again, in the lips, cheeks, nose, roses (red), gooseberries, inflammations, and the like, looks blue to me!—(I never saw a

red rose in my life) and yet on recently taking up an oil-paint, to illustrate to another my conception of the colour of the lips, you will be astonished to hear that I took up a green (*terre verte*). On another occasion I was very much annoyed at a little boy who could tell a blue line of water-colour, drawn across my finger, from blood; I could see no difference. Strawberries, cherries, etc., I can recognise without the slightest difficulty, but I don't trouble myself about their colour; I see only a difference as regards what I call *shade*. Pinks, lilacs, purples, and blues, are all the same colour, only differing in intensity. Browns, russets, maroons, olives, citrines, and a host of others, are just anything that I can guess at, but I never get further than red, brown, or green. The names of the other colours I don't think I ever uttered. Indeed I never speak of colours unless I cannot avoid it, and the only practical mistake I ever made in regard to them was purchasing a purple neckloth under the impression that it was black. That was the only mistake; for a good reason, I never bought a coloured piece of dress, *alone*, either before or since. I may mention that the same colour, when presented to my eye on different objects, especially with unlike surfaces, often, I may say generally, appears quite different on each.

"I have now given you the best account I can of my case. It appears to myself on reading it over, very absurd, and would lead one to ask, 'What can he see?' Yet I have the firm idea and *feeling* in my own mind, that I *see* colours the same, and as distinctly as you do, but they produce no lasting effect on the eye at all, and I cannot recognise them again."

(*Case of Dr. K., a medical man, described by himself.*)

"To endeavour to familiarize my eye to the primary and prismatic colors, I keep in my writing desk, and look almost daily at, a chart of the primary and prismatic colours. These, I think, I know on the card, but I make sad blunders when I leave the card and look at silks, cloths, powders, fluids, or flowers. Indeed, *I dare not name any colour*, and endeavour at all times to describe objects by other characters than those of colour.

When a boy at school, my attention was directed to my want of knowledge of colour by finding I could not see what my father called the *bright red* berries of the holly. When other children easily found out the trees which were loaded with ripe cherries, I never could till I came so near as to detect the form of the fruit. The discovery of this defect in vision distressed my father exceedingly, and he endeavoured to cultivate in me a knowledge of colour by giving me lessons in painting, making coloured charts for me of the prismatic and other colours, wishing to believe that the defect resulted from want of education in colour, not from a visual defect. I destroyed many a painting of flowers, etc, by putting on wrong colours, as blues for purples, green for some kinds of red, and yellow for others. I still remember the surprise he exhibited when he found I could not detect a red cloak spread over a hedge, across a narrow field—hedge and cloak appeared to me the same exact hue, and they do so to this day.

"Blue and yellow are to me the brightest of all colours. Red (that is scarlet) is to me a pleasing sober colour, which refreshes my eye as much as green; indeed I cannot tell any difference in colour between certain shades of these. Red sealing wax and grass, for instance, are absolutely the same exact colour. Some shades of brown, green and red, I cannot detect to be different. Prussian blue and rouge have the same hue. A rose, the lips, a ruddy complexion, and the face of a man dis-

coloured by nitrate of silver, are to my eyes absolutely the same. Yet my eye can appreciate most delicately the various shades of all these colours, but they are all to me but shades of *one* colour, and that colour varieties of what I can see in the pure deep sky or in Prussian blue—in fact, blue in various dilutions. Red hot coals and gamboge yellow are to me identical in colour. Infusion of red cabbage deepened by alkalies, or reddened by acids, to me exhibits *no change of colour*, but only a greater intensity or depth of colour in the acid jar—the actual colour remains absolutely the same. I cannot detect cherries, strawberries, or the red fruits from the leaves but by their form.

"In purchases I have consequently made many mistakes. For instance, I bought a red dress thinking it a green one. I have, on more than one occasion, bought red and green trousers thinking they were brown, and had to get them dyed afterwards to get them worn. In Paris I bought a red cap to wear instead of a hat, thinking it a green one; in fact, I could give very many instances of similar mistakes.

Dr. Wilson adds to this the remark:

In the preceding explicit account, Dr K. has, in addition to direct statement, supplied an incidental proof of his colour-blindness. He refers to infusion of red cabbage as being deepened in colour by alkalies; but this infusion, which is originally purple, is not rendered darker by alkalies, but is changed into a bright green. An equally striking, and withal amusing, evidence of inability to distinguish colours is afforded by the chart of prismatic colours to which Dr. K. alludes. He was adventurous enough to prepare it himself, and the result may be anticipated; a youthful member of his family soon informed him that one of the spaces was wrongly coloured; and on asking sight of the chart I found that what was called the violet band was a full crimson, so that both extremities of the prismatic spectrum were represented as red.

Almost all the cases referred to in this work present nothing of melancholy in the subjects thereof: never having known the beauty and charm of colour, they do not suffer from the deprivation, and their mistakes are to themselves rather a source of amusement than annoyance; but one case is mentioned of a gentleman in full possession of his colour-faculty, receiving, by a fall from his horse, a concussion of the brain, which terminated in the permanent loss to him of this power.

It is painful to read that—

Whilst formerly a student in Edinburgh, he was known as an excellent anatomist; now he cannot distinguish an artery from a vein by its tint. He was previously fond of sketching in colours, but since his accident he has laid it aside as a hopeless and unpleasant task. Flowers have lost more than half their beauty for him, and he still recalls the shock which he experienced on first entering his garden after his recovery, at finding that a favourite damask rose, had become in all its parts, petals, leaves, and stem, of one uniform dull colour; and that variegated flowers, such as carnations, had lost their characteristic tints.

Alone of all the cases which I have recorded, he knows what he loses by his colour-blindness, and is even worse off in some respects than the totally blind; for if they have never witnessed colours, they will not think of these as things they can-

not recall; and if they have known them, they can, as the seeing do in dreams, recall them, it may be dimly, but yet on the whole as they are. But for Mr. B., the colours which he saw, are not only effaced, but are replaced by tints the most unlike those which they once bore.

It is only due to Dr. Wilson that we should distinctly state some of the important facts and laws of which he may claim in this work to be the discoverer. These are—

1. *That the colour* RED *produces to some eyes the sensation of positive blackness;* a most valuable fact which goes a long way to explain some of the difficulties of this subject.
2. That the colour-blind have a perception of *intensity* more acute and also discordant with that of ordinary vision.
3. That the sensitiveness to *colour* of a colour-blind eye, suffers sooner from the withdrawal of light, (or by deepening of shades) than that of a normal eye, and at the same time that the perception of *form* and *outline* is more persistent to the abnormal.
4. That there is a 'chromic myopia,' or short-sightedness to *colour*, not accompanied by a corresponding short-sightedness to *form* or *outline*, so that, whereas to the ordinary short-sighted eye, *form* disappears before *colour*; in *this* myopia the colour becomes undistinguishable while the outline still remains distinct.

We cannot readily present in a separate form other valuable facts or suggestions for which Science owes much to our author, but we would particularly refer to the observations on the effect of artificial light in influencing the perceptions of the colour-blind; to those made with the colours of the spectrum, and to the practical method of relieving to some degree this natural defect by artificial means. What we have specified above will undoubtedly throw fresh lustre on an already brilliant reputation, and the more so when we consider the difficulties which meet us on the threshold of such an investigation as this. Our nomenclature of colour is altogether vague and indefinite; the term 'red' for instance includes an infinite variety of tints differing from each other both in hue and intensity, and there are (or at least there *were)* no ready means of identifying any precise tint offered: again most of the experiments must be made by means of pigments or coloured skeins of worsted or silk, and these are evidently inferior to, and indeed may give totally different results from those made with the corresponding homogeneous tints of the solar spectrum; so also, the nature of the light by which coloured objects are seen powerfully affects the impression of tint conveyed to the eye: but most of all, the difficulty lies in the want of a common language be-

tween the experimenter and the colour-blind subject. We cannot do better than give Dr. Wilson's own words on this point.

"All cases of colour-blindness agree in this; that to the extent of its occurrence in any one, it implies a condition of vision, in reference to which there is not a common experience, and therefore cannot be a common language between those conscious of colour and those unconscious of it. The information, accordingly, which they can convey to each other is almost solely of a negative kind. We cannot, for example, give to one who never saw green a positive conception of what we understand by it; we can at best make him aware that it is none of the colours he does see. And he, on his part, cannot make us understand what *positive* impression green makes upon his eye, although he may satisfy us that it is something different from that which blue or yellow makes."

Such considerations as these require not only the utmost skill and care in the investigator, but render a classification of the observed phenomena extremely difficult, if not, in the present state of our knowledge, impossible. Accordingly we find in the present treatise even the small attempts at classification made by preceding writers overthrown, and the classification with which Dr. Wilson himself sets out is abandoned before the close; there really seems no other statement at present to be made than that the varieties of colour-blindness are infinite in number and insensible in gradation.

With regard to the statistics of this defect, Dr. Wilson's researches present us with the startling result that *nearly one in eighteen of the whole population is more or less colour-blind*, a conclusion drawn from an examination of 1154 cases taken indiscriminately and comprising a corps of soldiers, of the Edinburgh police, and the students of the University. There is also no doubt that the defect is hereditary, and runs in families; and that, though generally coexistent with infancy, it may be temporarily induced by certain diseases, and even permanently by cerebral injury. A strange exemption is exhibited in the case of females, among whom Dr. Wilson has been able to furnish only two or three instances of colour-blindness. "Its occurrence," says our author, with small show of gallantry, "probably appears more rare than it is, and chiefly because the value set by women upon a nice appreciation of colours, makes them reluctant to confess that they are not quick or accurate in judging of them." Long ago Gall announced that the phrenological organ of *colour* was more developed among females than males, a fact deemed to be contrary to experience since no woman has ever been a great painter, and their perception of harmony of colour has always been considered weak,

however glaring may be their merely sensuous appreciation of it; the implication contained in the above passage of our Edinburgh philosopher would seem equally to run counter to the general opinion which assigns to woman a small organ of *secretiveness*.

Whether one class of the population is more liable to colour-blindness than another, or whether such a peculiarity may not extend to even a national distinction, there are not sufficient data to determine, but the following extract is an acute and happy generalisation.

"It is worth a moment's consideration how far this peculiarity of vision characterises one race of men more than another. It is, doubtless, more common among the civilised nations, large numbers of whom are doomed, by that division of labour, which is a great source of their strength, to occupations which dwarf one or more of the external senses, than it is among the uncivilised races, each member of whom cares only to do what is "right in his own eyes," and cultivates the powers of those eyes to the fullest.

"Among both the civilised and uncivilised nations, however, there are doubtless great differences in original endowment, so far as the sense of colour is concerned; and, as may be reasonably surmised, there are corresponding differences in the extent to which colour-blindness prevails among them. Thus, those eastern and southern nations, who live under bright skies, among plants and animals of vivid and brilliant colours, exhibit—partly as a prerogative of race, partly and largely as an effect of such colours daily impressing them—a delight and skill in arranging, matching, and harmonising tints, such as are incompatible with colour-blindness, and imply its rare occurrence in those whose love of colour and command over it are so great.

"The Chinese, the Japanese, many of the tribes of Hindostan, the Venetians, the Italians, the Spaniards, the Flemings, the inhabitants of Southern France, and some of the northern Teutonic and Celtic tribes have, as florists, painters, dyers, weavers, glass and porcelain makers and stainers, excelled for centuries sister-nations in the management of colours. Among untutored races, the Indians of the American continent, the African tribes, the uncivilised races of Central and Southern Asia, and the inhabitants of the islands in the Pacific Ocean, have shown by their war-paint, their crowns of brilliant flowers, and still more brilliant birds' feathers, their brightly stained skins and parti-coloured dresses, their dedication of the most splendid coloured objects to their gods and their chiefs, besides much else; that however different their canons of taste may be, they are as passionate and exclusive lovers of colour, as the overcivilised ancient nations who allowed none but princes to wear robes dipped in the Tyrian dye, or to write with purple ink.

"On the other hand, the civilised nations of temperate climes, where the summers are short and the winters long and gloomy, living under sombre skies, amidst a Fauna and Flora of pallid and inconspicuous, or dark and subdued tints, and surrounded by masses of green which satisfy, but do not excite the eye, care little for brilliant colours in their dress or household adornments, compared with the inhabitants of more sunny regions; and probably are more liable to colour blindness than they.

"A similar observation may probably be made, with the deductions requisite in contrasting the conditions of the external senses in civilised and uncivilised nations, in reference to such races as the Esquimaux and Fuegians, and specially

to the former, who live in regions bereft of vegetation during the greater portion of the year, and presenting to the eye little but the dazzling monotony of ice and snow. The sense of colour must, to a great extent, lie dormant in those so circumstanced, and become dulled through want of exercise. The tribes in question and others in similar latitudes seem very indifferent to colour, as an addition to their dress or ornaments.

What are the physical causes which give rise to this strange peculiarity? Some philosophers have sought to ascribe it to a malformation of the eye, or to some coloration of one or more of the membranes, the choroid or the retina. Dalton attributed his own colour-blindness to a *blue* tint in the *vitreous humour*, on which supposition he successfully explained most of the facts in his own case; an examination however after death shewed that this humour was *not* blue. Other theories of this kind may be set aside simply by the fact that Albinoes are normal as regards colour. Nevertheless it can hardly be doubted that variations in the prevailing tinges of the humours and membranes of the eye must produce chromatic peculiarities of vision; which would fall, however, under a different class than those now considered. Dr. Wilson discusses these points in detail with much acuteness and ingenuity, and closes his review with the following remarks:—

"I am not disposed to assert that colour-blindness, of the kind Dalton and his fellows exhibited, can be occasioned by such modifications in the colour of the membranes of the eye as I have drawn attention to. But an extreme chromatic equation, not always distinguishable in its practical manifestation from veritable colour-blindness, may certainly be occasioned by the varying condition of the membranes referred to, and on this account I have, in the introduction to this discussion, spoken of such manifestations as deserving to be ranked under a special chromatic theory of colour-blindness.

"I close this section with the expression of the hope, that the colour of the membranes within the eye-ball will now be an object of more frequent and minute examination by physiologists, than it has hitherto been. My friend, Dr. Beddoe, has indirectly supplied much interesting information on this subject, in his little work recently published,* containing the results of an examination during life, of the colour of the eyes and hair of some 5000 of the Scottish people, representing nearly all the districts of their country. According to the observations of John Hunter, already quoted, in which physiologists generally concur, a dark choroid and dark hair go together, and *vice versa*. In the future enumeration, accordingly, of cases of colour-blindness, it is desirable that the colour of the hair should be recorded, as it cannot be expected or desired that the majority of the colour blind should speedily become the subjects of pathological investigation. The colour of the iris generally, but not invariably, resembles in shade that of the hair, and a hazel or pale golden iris has been thought to be an index of colour-blindness. Of the truth of this particular conclusion no proof has been given; but it is certain that the amount of dark pigment on the back of the iris (*uvea*), increases or dim-

* A Contribution to Scottish Ethnology. By John Beddoe, B.A., M.D., 1853.

inishes in proportion to the general abundance of colouring matter tinting the choroid; and it would be highly interesting to know whether the fair-eyed and the dark-eyed—apart from colour blindness—attach a different chromatic value to the same colour. The proverbial difference between the tints preferred for dress by blondes and brunettes, and the great fondness of the negro races for white and the primary colours, are probably *in part*, at least, related to differences in the colour of the choriod, to which that of the hair and of the iris is a clue. The hair is probably the more important external index of the chromatic condition of the choroid, especially where the hair differs in shade from the iris; but this is not certain; and even if it were, it will often be impossible, in the living human subject, to look at both, so that in all cases each should be examined, and the result recorded."

There remains no other hypothesis to fall back upon but that adopted by Herschel, Wartmann, Kelland, and others; namely, that colour-blindness consists in an inability of the sensorium to distinguish between the vibrations produced by certain rays having different wave-lengths. This, translated out of the language of the Undulatory theory, merely asserts that the eye of the colour-blind is incapable of distinguishing between certain colours, and whatever may be thought of its value as an explanation, it certainly possesses the merit that it cannot be objected to.

In fact, the whole subject of colour is to this day the grand stumbling-block in the Science of Optics. We have on the one hand, the objective phenomena of natural coloration; on the other, the subjective requirements of the Undulatory theory, meeting in the prismatic spectrum as common ground. The facts of the former are still unmeasured and unclassified; the analysis of the latter, even in the hands of Fresnel and Cauchy, fails to give satisfactory account of Dispersion. The Experimentalist has to tell us how to measure the intensity and hue of a given colour, and in what way a compound of colours may produce to the eye the same impression as a single homogeneous one; the analyst has to tell us what is the law which connects the wave-length of a ray with its velocity of transmission in different media. Till both are told, Theory and Experience will be like the Youth and the fair Lily in Goethe's Tale, vainly striving to come together.

Perhaps one of the most important steps taken in this direction for a long period is the invention by Mr. Maxwell of the instrument which he calls a *colour-top*; the account of this beautiful contrivance, far superior to the methods of Newton and Young, to the diagram of Professor Forbes, and the pretty *Chromascope* of M. Soleil, we extract from this work, where it was published for the first time.

"Mr. Maxwell employs a disc of pasteboard, or metal, provided with a spindle, so as to admit of it being spun as a top or teetotum. The spindle is in two pieces,

and can be unscrewed so as to allow discs of coloured paper, perforated in the centre to receive the spindle, and with a slit corresponding to a radius of the disc, to be placed on the upper surface of the top, the rim or circumference of which is divided into 100 equal parts. The paper discs admit of being placed above each other, and any portion of one disc may be made to appear above another, by passing one edge of its slit through the slit in the other.

"Thus, let a disc of red and a disc of white paper be placed together on the top, the white being the lower of the two; we may then, if we choose, cover the white entirely by the red, so that the latter only shall appear; or at will, bring the white through the slit in the red so as to let one-tenth, one-twentieth, one-twelfth, or the like quantity of the surface of the white cover that amount of the surface of the red. When the top is made to spin, one of the tints (dilutions with white) of red will be obtained, and the quantity of red and white in it may be measured by the graduation on the circumference of the circle.

"In the same way a circle of red and a circle of black will give the shades (deepenings with black) of red; and the delicacy of an eye in distinguishing the nicer gradations of colour, may be quantitatively determined."

"Again, small discs (half the diameter of the larger ones) of green, and of white or black paper, may be placed on the colour-top above the larger red and white or black discs, so that when the top is spinning, a green circle, surrounded by a red ring, will be visible to a normal eye, and these may be compared throughout their tints and shades."

We cannot help thinking that this beautiful instrument will be to the theory of colour what the thermometer has been to the theory of sensible heat, but before touching on the hypothesis of Mr. Maxwell, we must beg leave to take strong exception to the manner in which Dr. Wilson speaks of the view taken by Sir David Brewster of the constitution of the Solar Spectrum. We can willingly excuse our Author for using (as indeed he was compelled to do for want of better,) the ordinary, vague and indefinite names of colours, such as red, blue, and the like, and also for adopting, as a convenient classification the distinction of colours into primary or secondary, (a distinction in part certainly arbitrary, probably wholly so,) but when we find him speaking with favour of an hypothesis which asserts, as Sir David's does, that there exist in white light only three homogeneous tints, and that a superposition of three equal lengths of these is the real constitution of the Solar Spectrum as revealed to us by the prism, we would remind him that the experiments on which the illustrious philosopher of St. Andrew's grounds his opinion, have been persistently rejected by names of no small authority; that the conclusions drawn from them have been repudiated by a still larger class of *savans*; that the hypothesis has found no favour among continental philosophers; and that the repetition of these experiments by Helmholtz and Bernard has not led to their confirmation; and further, that some of the facts of colour-blindness brought out in this

very volume, stand in direct contradiction to this view. The "beauty" of the hypothesis is a matter of opinion, (and we certainly differ from Dr. Wilson in this point,) but of the *unreality* of it, we think there is small doubt; and hold confidently to the belief that the simple and elegant explanation of our great Newton stands unimpeached in its integrity.

In an altogether different category stands the hypothesis first suggested by Newton and adopted with modification by others, such as Young, Mayer, Lambert, Herschel, and lastly by Mr. Maxwell; namely, that all possible tints can be produced by proper combination of *three* standard tints, (which may be designated as principal or primary,) and that *any* three tints may thus be assumed, provided they are capable in certain proportions of producing white, an extension due to Sir John Herschel, which Dr. Wilson erroneously attributes to Mr. Maxwell. We regret that we have not yet seen the investigations of this latter gentleman *in extenso*, the volume of the R. S. E. Transactions, in which they are published, not having yet reached this country; and we hesitate at pronouncing an opinion derived only from the letter of Mr. Maxwell, in the volume before us, giving an outline of his system neither over full nor sharply defined. Mr. Maxwell assumes three tints (or as he calls them, three pure sensations of colour,) as his primaries; he supposes these to be placed in the corners of a triangle, and then by a simple geometrical construction, namely, finding the centre of gravity of three weights placed at these points proportional to the respective intensities of the tints used in forming any required tint,—he assigns to every possible colour its position relative to them, and also the numerical measure of its intensity. Undoubtedly this construction is extremely beautiful, and the numerical expression of it is in effect little different from that of Mayer, as extended by Herschel. The only question is whether Mr. Maxwell's formula will express all the colours that exist in nature, a question that can only be answered by observation; Mr. Maxwell indeed has drawn some conclusions regarding colour-blindness, which would furnish an *experimentum crucis* of his hypothesis, but we do not find that Dr. Wilson has yet submitted it to this test. Meanwhile we cannot help suspecting that the formula may break down, at the same point as that of Mayer, in assigning the position of the browns, and indeed of all colours in which, in our opinion, black enters as a positive element, and not as a mere negation. Be this as it may, we must protest against any hypothesis of this kind, indispensable though it must be as a means of measurement and classification of colours, being designated as a *theory* of colour; nor can we assent to the conclusion drawn both by Mr. Maxwell and our author,

that colour-blindness consists essentially in an absolute insensibility to one of the three tints assumed for primaries, or as Mr. Maxwell expresses it, "in the absence of a determinate sensation, depending perhaps upon some undiscovered structure or organic arrangement, which forms one-third of the apparatus by which we receive sensation of colour," a conclusion from which a subsequent remark of Dr. Wilson abstracts all the force, for he says; "It is only in fully-developed colour-blindness that vision is decidedly dichromic, and even then it is not absolutely so, at least so far as my experience goes." In other words, out of the infinite variety of colour-blindness there is one particular and limited class which may be described as *dichromic*. Such an explanation of the phenomena in general is moreover inconsistent with the fact of *chromic myopia* pointed out by Dr. Wilson, which expresses that the colour-blind can appreciate colours, when close, of which they lose the distinction at a certain distance; and still more with the fact that even the normal eye becomes colour-blind to the shades of certain colours by sufficient diminution of intensity; in short this explanation exalts into a difference of *kind*, what our author himself more than once strongly represents as being only a difference of *degree*.

With that felicity of practical application which has always distinguished Dr. Wilson, he has devoted a considerable portion towards the close of this work to a consideration of the dangers involved in the possible employment of colour-blind persons on Railways or Vessels, and of the liabilities of mistake to which the present system of signalling by coloured lights and flags is open; we regret that our space will not permit us to follow him through those interesting and useful chapters, and shall content ourselves with observing that, on the whole, Dr. Wilson recommends calling in the aid of *form* to that of *colour*, both by flags or signal-vanes of different shapes for day, and by using differently-arranged combinations of several lamps for night instead of a single one; also that of all coloured lights, the best practically would be, *white* for safety; *red* for caution; and for danger by day, *sky-blue*; by night, *yellow*. This subject strongly claims the attention of our Railway authorities, although on this side the Atlantic, accidents are sufficiently numerous from other causes, to render this particular one of comparatively small moment.

We lay down the volume with hearty thanks to Dr. Wilson both for his own experiments and researches in this obscure subject, and for having embodied all that is yet known about it in a clear and concise *resumè* which will serve as a standard of reference hereafter to the scientific investigator.

J. B. C.

Letters from the United States, Cuba, and Canada; by the Hon. Amelia M. Murray. New York: G. P. Putnam & Co., 1856.

Towards the end of July, 1854, the Hon. Miss Murray, one of the Ladies in Waiting at the Court of Queen Victoria, crossed the Atlantic, to see with her own eyes this new world and all its varied institutions. Looking about her accordingly with intelligent and observant eyes, she witnessed much that was novel, both in nature and society. The Botany of another hemisphere had its attractions for one already educated to understand its scientific novelties; the Geology had its popular aspects of interest also; while of its Zoology the *Genus Homo*, Red, Yellow, White, Black, and Brown, naturally claimed a prominent share of her attention. On all these themes accordingly, she wrote and journalized, and now prints a pleasant, superficial, *olla podrida* of observations, opinions, surmises, and deductions, which would have been read, smiled at and forgotten, but for the chance—fortunate or unfortunate as it may be,—that she deemed her flying visit to the Southern States qualified her to set, not only her friends, but the world at large right on the vexed question of American Slavery. Her new opinions, it seems, before being issued from the press were communicated to the Queen, who replied to her Lady in Waiting—according to an explanation which the *Athenæum* gives of her retirement from Court, in correction of less guarded statements,—by some very wise and womanly counsels. "Unhappily the royal letter missed its object; and before Miss Murray had the advantage of reading her august friend's advice she had pledged herself *not* to observe that discreet silence on a most intricate and vexed problem which is necessary in persons holding public situations. Miss Murray has the courage of her opinions; but as she chose to take a part in a discussion that every day threatens to rend the Union, her retirement from the Queen's household followed naturally. These are the simple facts. There was no intention to dedicate the book to her Majesty. Her Majesty never saw the proof sheets. We cannot suppose that the Queen meant to rebuke Miss Murray—as the paragraph makes her—for forming an honest opinion. Miss Murray's retirement from the Court must be assigned to a political—not a personal—motive."

A book for which its author has been made a martyr; which has occasioned her deposition by "perfidious Albion," and her banishment from Court,—which rumour persists in affirming, spite of all contradictions, that British Majesty refused the dedication of, solely because its authoress had the magnanimity to look at Jonathan's

peculiar institutions through a special pair of his own rose-colored spectacles; must needs become the rage; and so here we have it presented to us, as prepared for the American palate, with, it is to be feared, a most ungrateful disrespect for the fair champion's rights of authorship.

The book is just such a lively, heterogeneous melange of news, and gossip, and hasty illogical deductions, as any intelligent lady-traveller might be expected to communicate to her friends at home; but it was certainly not worth the sacrifice which its author has incurred by extending its perusal beyond the partial and admiring circle for whom it was originally written. It does not even pretend to any preparation for the press, but abounds with such epistolary addenda as: "Lord Elgin tells me this is the day for letters to go, so I must conclude hastily;" or again, "I have not any time to read over what I have written, therefore repetitions are probable, &c." We shall not therefore seek to break the flimsy gossamer-wings of this ephemeron on the critical wheel, but content ourselves with a chance extract or two to show the character of its mottled plumage.

Some of our Authoress's themes lie a little beyond our legitimate editorial province; for she discusses Canadian and American politics with both freedom and picquancy; depicts our late Governor, Lord Elgin, as the patient, placable and good tempered dry-nurse of that awkward, and alarmingly vivacious baby: Young Canada; and draws pen and ink sketches of its public characters in this free fashion,—not omitting names, which we shall take leave to do: "* * is a singularly wild-looking little man, with red hair, waspish and fractious in manner—one of that kind of people who would not sit down content under the Government of an Angel. He has evidently talent and energy, but he seems intent only upon picking holes in other men's coats!" With like easy nonchalance she nocks off a portrait gallery of the Court and Parliament at Quebec in September, 1854, sufficiently amusing, and not without its value, as showing what her opinions may be worth on other matters requiring a little deeper insight.

It is obvious that Miss Murray by no means approves of hastily formed opinions—at least in others,—the pleasant way in which she sets the authoress of of "Uncle Tom" right on the "*peculiar Institution*" is truly edifying. "Had Mrs. Stowe"—says this patient and pains-taking observer, in one of her chance leisure moments,—"lived for some months among the institutions and the people which, in *Uncle Tom*, she thoughtlessly, perhaps not intentionally vilified, she would have used, not misused her undoubted talents!" and she thus,

after an approving quotation, of an exceeding fresh and novel character, from the old sage of Bolt Court, triumphantly proves that two blacks do, after all, make a white!

"I have now taken leave of the Southern States. Louisville and Cincinnati are places in which I believe Mrs. Stowe once resided; and I quote an opinion she advances in her last work which proves her entire ignorance of negro constitution and habits. She asserts that Canada is the best locality 'to develope the energies of the black race.' Before saying this it would have been well if she had studied the conditions of the free negroes in Canada. The very climate itself is utterly unsuited for them. Mrs. Stowe quotes as mistaken and absurd the sensible remarks in Boswell's life of Johnson respecting negro slavery, which I must requote as wise and true: 'To abolish a status which in all ages God has sanctioned and man has continued would not only be robbing a numerous class of our fellow-subjects, but it would be extreme cruelty to the African savage, a portion of whom it saves from more bondage in their own country, and introduces into a much happier state of life, especially when their passage to the West Indies and their treatment there is humanely regulated. To abolish the trade would be "'to shut the gates of mercy on mankind.'" And I must add this: the opinions I have heard from intelligent slaves coincide with those here quoted. Because some slave manacles were seen by Clarkson in a Liverpool shop, he decided at once upon the inhumanity of slavery,—so says Mrs. Stowe. Tyrannical men and women in Great Britain have actually starved apprentices to death. Is apprenticeship therefore, murder? I trust no English woman can be found willing to bring such an accusation against her people. Let us imagine two brothers in this country engaged in trade: one buys a plantation with two hundred negroes to raise cotton in the Mississippi, the other sets up a mill to spin cotton at Cincinnati. Trade is bad with the elder, he must raise or buy corn and clothes to feed and clothe his labourers. Trade is tight with the other,—he dismisses his work-people, who may starve or perish, and there is no law which can make him responsible for their sufferings. I will conclude this subject with one more anecdote, for the truth of which I can vouch.

"A Southern lady and gentleman brought a mulatto slave to Cincinnati, who there fell in with some abolitionists and was imbued with a feeling of discontent. Her master and mistress observing this, proceeded to New York, where they told the girl that they did not wish to retain a servant against her will, and giving her twenty dollars, they added: take this money and your freedom. The girl took it, and went out. She entered a theatre, and was told she must go to the entrance for colored people. In Church she is ordered to sit with the blacks. Trying for a place in an omnibus, the driver says it is no place for her. She hurried back to her mistress to return the money, and entreated she might be taken or sent back to that South where black people are free!"

There are omnibuses, theatres, and churches too, it would seem, nearer home, whose directors would be of the same opinion in reference to the Cincinnati mullato: that there was no place for her. So, at least we imagine may be inferred from another little bit of portraiture from the fair pencil we have already exhibited touching off our Canadian notables, and which may serve as a counterpart to

the former sketch. At Louisville the Honourable Miss Murray finds her porcelain of human clay in actual contact with two of those pipkins of the commonest black earthenware called "negro women," and no northern lady "to the manor born," could conduct herself with a more becoming dignity: "Such a frightful specimen of black nature as one of these slave women was!—her mouth just like a cat-fish, and then so sulky and unaccommodating;—she took her own share of the room and added to it as much as she could possibly steal from her neighbours. Talk of white freedom! Why I never saw women of the white classes in England as independent and assuming in manner as some of these darkies. I can imagine what they must be in the West Indies, since we have given them free scope there!" What indeed! What business have low, vulgar people, with ugly faces, to independence or free scope? We should have liked to have started the knotty ethnological problem of "the Unity of the Human Race?" in that Louisville stage-coach, and asked our authoress just to take a quiet philosophical look at it, with her practical view of things. Miss Murray would have made short work of it, or we are greatly mistaken.

It must not be supposed, however, though our authoress in general sticks to the rose-colored spectacles, that everything is perfect even on the White side of the question. The following shews that even white nature will sometimes forget itself:—

"I have heard much of Democracy and Equality since I came to the United States, and I have seen more evidences of Aristocracy and Despotism than it has before been my fortune to meet with. The 'Know-Nothings,' and the 'Abolitionists,' and the 'Mormonists,' are, in my opinion, consequent upon the mammonite, extravagant pretensions and habits which are really fashionable among Pseudo-Republicans. Two hundred thousand starving Irish have come to this country, and in their ignorance they assume the airs of that equality which they have been induced to believe is really belonging to American society. They endeavour to reduce to practice the sentiment so popular here,—but no—that will never do. Ladies don't like their helps to say they 'choose to sit in the parlour, or they won't help them at all, for equality is the rule here!' Mrs. So-and so of the 'Codfish' Aristocracy, doesn't like to have Lady Anything to take precedence of her; but Betty choosing to play at equality is quite another thing."

Our notice might be greatly enlarged by similar piquant selections, which diversify the more commonplace narrative of an American traveller's notes; but we shall content ourselves with one or two brief reminisences within our own Canadian frontier. Toronto is dismissed in less than a couple of pages. It "wants a little polish, but will be a noble city." Montreal scarcely receives a definite notice; but the capital of the Lower Province is drawn in a paragraph of which we

dare not reproduce more than this fag-end: "In Quebec there are more churches and more beggars than in any other place I have yet seen on this side the Atlantic!" But we must select for our final extract one which exhibits Canada in a more agreeable aspect; and here surely is a comfortable prospect for the vidual portion of forlorn humanity, such as we may safely defy any other corner of the universe, out of Utopia, to surpass:—

"Colonel Tulloch, the Government Commissioner for settling and looking after the military pensioners who have had grants of lands in Canada, dined here. He has been very successful in improving their condition, and land is not—as it used to be—a misfortune rather than a blessing to the pensioned soldier. This improvement is partly owing to Colonel Tulloch's plan of making the grants consist of three or four acres instead of one hundred, as was formerly the case; when the occupant, unfit to clear and bring into cultivation so large a portion, was ruined by it. Now the smaller allotments are cultivated garden fashion: and one individual made fifty pounds last year by his three acres, principally by growing vegetables for the Toronto market.

"In case of the death of an occupant, his widow is left in possession on condition that she remarries with no one but a soldier; and no widow has ever yet (Colonel Tulloch declares) remained two months without a husband. Such is the anxiety for a housewife, that men of fifty marry widows fifteen years older than themselves rather than remain bachelors. What a chance for antiquated spinsters wishing to change their state!"

It would, of course, be ungallant to suppose that the favour for widows of such a ripe maturity, implied any idea in the minds of their chivalrous suitors of their being incumbrances on the military allotments! It will be seen from the brief passages we have quoted, that these "Letters from the United States," &c., are not without such attractions as may serve pleasantly enough to beguile a leisure half-hour. That they are at all likely to influence the convictions of the British public on the controversial questions they undertake to throw a fresh light upon, we scarcely think many Canadians will admit.

D. W.

The Canadian Naturalist and Geologist: By E. Billings, Barrister at Law. (No. 1, February 1856.) "Ottawa Citizen," Ottawa, Canada West.

A periodical especially devoted to the Natural History and Geology of Canada, has long been a desideratum. In the Journal of the Canadian Institute, it is true, papers of undoubted merit on subjects of natural history, essentially Canadian, have appeared from time to time; but the character of this Journal—a record in chief part of the proceedings of a mixed literary and scientific Society—is clearly of

too general a scope to fulfil completely the end in question. The field moreover is so wide, the resources so abundant, that with all the efforts now making to give some literary and scientific value to the Canadian Journal, and the anxious solicitude of its editors to illustrate to the full the natural history and resources of the province, ample space is left in this important department for the cooperation of fellow-laborers. The success of a scientific periodical, like that now offered to the Canadian public by the enterprise of MR. BILLINGS, will obviously depend in a great measure on the judicious blending of elementary principles with information of a new and purely scientific character. In the number before us, the true object of the publication seems to have been well sustained. The general reader, anxious for information, yet ignorant of the technicalities of science, will find in its pages much to instruct, much to interest, and nothing to rebut. As an example, a description of a new encrinite from the Trenton limestone, is preceeded by a brief but clear exposition, aided by illustrative woodcuts, of the structural characters and organization of the crinoids generally; and this is again preceded by a sketch of the Trenton limestone itself, together with a popular account of the various rock formations throughout the province. Other articles comprise a view of the classification of the animal kingdom according to the system of AGASSIZ, with explanatory remarks; detailed descriptions, with woodcuts and a lithographed plate, of many of the more common of our Canadian fossils; and some exceedingly interesting papers on the natural history and habits of the Moose Deer, the Barren-ground, and the Woodland Carribou.

The new crinoid, referred to above, belongs to the genus *Glyptocrinus*, and is named *G. ramulosus* by the author.* It was obtained from Brigham's Lake, Township of Hull, County Ottawa. The following is MR. BILLING'S description—accompanied, however, in the original by several engravings:—

"*Glyptocrinus ramulosus*;—The body or cup of this species is covered with smooth plates, and broadly rounded or obscurely pentagonal at the bottom. The height is about equal to the diameter at the free rays. Five strong rounded ridges or keels proceed from the base up the sides, following the centre of the rays. Upon the third plate from the centre of each ray, the ridge divides into two branches, which proceed up the secondary rays to the base of the free arms.

*Mr. Billings points out in another place the resemblance of this species to Prof. Hall's *Schizocrinus nodosus*. The two have certainly much in common. The cross ridges on the plates, that salient character in *Glyptocrinus*, are here wanting.

There are four plates in each of the secondary rays. The pelvic plates are small and barely visible, being in part concealed beneath the basal plates of the rays. They have a projection at their bases which forms a ring all round under the base of the cup. In some of the specimens this ring is sharp, and overhangs, as it were, the top of the column. In other specimens it is thicker and rounded.

The free rays or arms are, at first, twenty; two springing from the top of each secondary ray. At the height of about three-fourths of an inch, they again divide, a few of them, however, (the precise number not ascertained) continuing single to their extremities. They are fringed on their inside with two rows of tentacula from two-eighths to five-eighths of an inch in length. The arms are composed of two series of ossicula which interlock with each other. [A drawing is given, shewing the wedge-shaped form of the ossicula and their mode of interlocking, much as in *Dimerocrinus*, *Eucalyptocrinus*, &c., only to a greater depth.] On the back of one of the arms, at its base, eight joints were counted in the length of one-eighth of an inch, but higher up they are more numerous. It has not yet been ascertained with certainty whether the tentacula were jointed or not. Each appears to have four or five joints.

The column is round and annulated, the projecting rings being very close to each other, and most of them thin and sharp at the base of the cup and for a short distance below. They are further apart and their edges are thicker and rounded, or slightly notched, in the remainder of the column. Between the annulations, the column is composed of thin plates with crenulated edges, the angles fitting into each other. There are from five to ten of these thin plates between each two of the projecting rings. When the number is thus large, one of them in the centre increases in thickness, and forms a new annulation. The edges of the rings are bent very slightly downwards, and each alternate one (in all the specimens examined) in the lower part of the column is notched on the inner side. [Figures are given of these various peculiarities.] The columns are much larger at the top than at the bottom. One specimen tapers from one-fourth of an inch at the base of the cup, to one-eighth at the distance of fifteen inches below. Others become more rapidly small, while some of them are more gradual in their decrease.

The form of the alimentary canal varies a great deal in different parts of the same column, being in general more or less star-shaped with five rays, but sometimes circular. The separate thicker joints are usually seen in the shape of a flattened ring with the outside

margin thick and rounded, but thinned down to a sharp edge around the perforation in the centre.

We think this species grew to a great size, there are columns in the Trenton Limestone on the Ottawa river more than half an inch in diameter at the upper or larger extremity, and which when perfect appear to have been six feet in length. Their form is the same as in this species, except that the annulations are not notched at the edges. The plates of the cup are smooth—the rays are keeled—there are four plates in each of the secondary rays—the arms are branched, and composed of very numerous thin and flat joints. We think these are full grown specimens of *G. ramulosus*."

The January number of the Canadian Journal contained a list of some Lower Silurian fossils obtained from the strata laid bare by the esplanade works in Toronto. The reader will find several of these forms (*Modiolopsis modiolaris, Ambonychia radiata, Murchisonia gracilis, &c.,*) figured and described in full in the publication now under review.

The following remarks explanatory of the general character of the work, are quoted from the introductory address :—

"The Magazine proposed to be established will be devoted exclusively to the Geology and Zoology of the British Provinces of North America; and in conducting it I shall endeavor to make it as useful as possible to all who may feel interested in the subjects to which it will be confined. I shall collect and compile all the information concerning the fossils and animals of the country, within my reach, commencing with the larger quadrupeds and more characteristic and common organic remains, and thence gradually proceeding to those more rare or hitherto undescribed. The works consulted will be the best European and American authorities. In the present number, some of the matter in two of the articles, as will be observed, has been taken from the Reports of the Geological Survey of Canada; but as I understand that these invaluable documents are about to be republished for general circulation, I shall confine myself to other sources and such discoveries as I have made myself. In fact this Journal will consist more of Natural History than of Geology in the restricted acceptation of the term. It is intended principally to be of assistance to the youth of Canada, but as it will contain many new species, and even several new and very remarkable genera of extinct animals, I hope that scientific men will also regard it as favorably as they can. In conclusion, I would respectfully solicit the public men of the Province, and others who can do so without inconvenience to themselves, if they think the work worthy of encouragement, to aid it by subscribing for it, and also by using their influence in its favor."

Altogether we recommend this new periodical most strongly to the attention of our members, and to all, indeed, who look with interest on the progress of Canadian Science.

E. J. C.

"*On the course of Collegiate Education, adapted to the circumstances of British America. The Inaugural Discourse of the Principal of McGill College, Montreal.*" By J. W. Dawson, F. G. S. Montreal: H. Ramsay. 1855.

"*The Progress of Educational Development: a discourse delivered before the Literary Societies of the University of Michigan.*" By Henry P. Tappan, D. D., LL. D., Chancellor of the University. Ann Arbor: E. B. Pond. 1855.

"*On the advancement of learning in Scotland: a letter to the Patrons of the University of Edinburgh.*" By John Stuart Blackie, M. A., Professor of Greek Literature, Edinburgh University. Edinburgh: Sutherland & Knox. 1855.

No subject merits, or perhaps receives at this present moment, a more widely extended and anxious consideration in Canada than the great question of Education. In many forms and under divers aspects it meets us on all hands. The Separate Schools difficulties, the Medical Schools difficulties, the denominational and general Colleges difficulties, and the University Reform difficulties of every sort, abundantly suffice to prove that the subject is being weighed, and measured, and discussed in all its bearings. For we are a free people claiming and exercising the right of private judgment in this British Canada of ours, and have no paternal Frederick William of Prussia to drill us into an educational uniformity and save us the trouble of thinking. In this respect we are only following the example of the Mother Country. University Reform, a National system of Education, Industrial and Ragged Schools, with Schools of design, people's Colleges, and Museums of Economic Art and Science, engage scarcely less attention at home, even than the engrossing theme of Eastern War.

The learned discourse of the Chancellor of Michigan University, the title of which we have copied above, traces the rise and progress of the European Collegiate system from its first germs. Indeed, with that comprehensive cast of thought which American orators are prone to favour, he goes back a little farther, and begins his investigation with that primitive Collegiate Institution: "The Garden of Eden!" This which he classes in the first of the "three stages of learned association: The primal or ancient," was followed by the "middle, or ecclesiastical and scholastic," with which we have a little more to do. The one essential element of difference between that medieval, and our modern era, in relation to our educational Institutions, may indeed be embodied in that word "ecclesiastical."

"The arts," says Dr. Tappan, "comprised the Trivium and Quadrivium, which included together seven branches—Grammar, Logic, Rhetoric, Music, Arithmetic, Geometry, and Astronomy. Philosophy was divided into three branches, and thence called the three philosophies, namely, Theology, Law, and Medicine. A particular university, however, cultivated frequently in an especial degree, only one of these philosophies.

According to the statutes of Oxford, ratified by Archbishop Laud, there were four faculties in which the University furnished education and granted degrees —Arts, Theology, Civil Law, and Medicine.

Four years attendance on the lectures of the first faculty was required to qualify for the degree of Bachelor of Arts; and seven years for the degree of Master of Arts.

To commence the course in the faculty of Theology, a mastership in Arts was a pre-requisite. Seven years attendance on the lectures qualified for the degree of Bachelor of Divinity, and four more years for the degree of Doctor. In the faculty of Civil Law, a mastership in Arts was not a pre-requisite; but the Master obtained the Bachelor's degree in Law in three years, and the Doctor's in seven; while the simple student was required to attend five years for the first, and ten for the second.

In Medicine, a mastership in Arts was a pre-requisite; and three years attendance on the lectures qualified for a Bachelor's degree in Medicine, and seven for a Doctor's.

Degrees were also granted in particular branches, as in Logic and Rhetoric. In Music, a separate degree is given even at the present day.

The branches embraced by the Arts were multiplied as knowledge advanced. Hence, in the time of Laud, Greek, Natural Philosophy, Metaphysics, Moral Philosophy, History, and Hebrew, are specified, in addition to the seven arts before mentioned."

We have further to bear in remembrance, however, that in all times anterior to the reformation, Arts, Civil Law, and Medicine, were practically as ecclesiastical as theology. Roger Bacon wrote his *Opus Majus* under a Franciscan's cowl, and when Sir Thomas More, received from Wolsey the great seal which constituted him Lord Chancellor, he was the first layman who had filled that highest legal office for upwards of a century and a half. Learning, therefore, in medieval times, however profound it might be in certain special aspects, as in the metaphysics and dialectics of the Schoolmen, was extremely simple in the compass of its themes, and readily adapted itself to the wants of the special and well-defined class, who alone courted its honors and advantages. But the great religious revolution which closed that medieval era put an end to this convenient classification, which had rendered the term *clericus* equivalent alike to its modern form of clerk, or ecclesiastic, and that of Scholar,—by no means necessarily the modern equivalent of the other. Our modern lawyer, if he be not a proctor, confining himself to wills, divorces, or clerical scandals and heresies, is as little of a monk as our modern

doctor of medicine: who when he meddles with heresies, does so rather in the *san-benito*, than in the Cowl of the Franciscan. And as for our modern Philosophers, Chemists, Civil Engineers, Geologists, Astronomers, Naturalists, and Litterateurs of all sorts: the old *Trivium* and *Qadrivium* of medieval Universities would have shut them out altogether from the mystic perfections which their seven arts symbolised. Hence, without condemning ancient university systems we can have no difficulty in arriving at the conclusion that a very different system is demanded for these modern days of ours. On this subject the new principal of McGill College remarks:

"It is a great and common error to suppose that collegiate education has reached a point where it may safely remain stationary,—that its course has been unalterably fixed by authority and precedent. It is an equally serious and prevalent error, to take it for granted that it has attained its full extent of development when its benefits are confined to a few professional men, or persons of wealth and leisure. Such views cannot in the present state of the world lead to the highest prosperity of collegiate institutions, nor cause their humanising and elevating influences to be extensively felt on the mass of society. Happily in our day wider views are becoming prevalent, and no subject has been more extensively agitated in educational circles than University Reform. This reforming spirit has not only stamped its impress on all the newer colleges, but has made a powerful impression on the oldest universities on both sides of the Atlantic: and its tendency is to make the carefully elaborated learning of all the great academic centres become more fully than it has yet been, the principal moving power in the progress of practical science, of useful art, and of popular education. As illustrations I need only refer to the reforms now in progress in the great English Universities, to the recent establishment of a Technological Chair at Edinburgh, to the Scientific Schools of Harvard and Yale, to the special courses of practical science in the new London Colleges, and in the Queen's Colleges of Ireland, and to the similar improvements in Brown University, in Amherst College, and in the University of Toronto."

On this subject, however, there can be no need to generalise or enlarge. We are not sure that the danger does not, in part at least, lie rather in this reforming direction. The Chancellor of Michigan, and most other American university reformers, are abundant in their denunciation of English Universities, not always aparently with the very best knowledge of what they are holding up to condemnation. Witness, for example, the following comparison by Dr. Tappan between the English University system and the German or Prussian one,—which is greatly more the subject of American praise than of imitation:

"Compare now the state of popular education in England with that in Germany. In England the university system has not reached a proper development. Here the teachers are only the fellows—an elect and exclusive class, while the graduates at large instead of feeling the obligation of becoming

teachers in time, and finding a field open for the exercise of their vocation, go out into the world as men who are possessed of a privilege which belongs to rank and fortune. And hence, no system of popular education has, as yet, made its appearance here.

In Germany on the contrary, where the gymnasium is open to the poor as freely as to the rich, where all who honorably pass through the gymnasium cannot fail of finding access to the university, and where every educated man becoming a member of the great educational system, incurs the obligation as well as meets the demand to contribute by his labours as a teacher to its sustentation—there we find a most perfect system of popular education. As everything in education depends upon a proper supply of teachers, so there the primary or common school is provided for in a distinct institution—the Seminary or Normal School; while this again is supplied with instructors from the university and gymnasium."

It would be difficult, we think, to point out a more egregious misstatement of all that pertains, for good or evil, to the English Universities than is here set forth. If there is one thing for which the English Universities are more remarkable than all else, it is in the strong inducements they hold out to the most distinguished and worthy of their graduates to become teachers; and what is the difference between the "elect and exclusive class" of fellows, and the graduates at large, but solely this, that the former have proved their preeminence in the examinations by which the Scholarship of all has been tested, and have achieved a *rank* dependent, not on fortune, but on learning. With more justice, because with better knowledge, another American writer, Charles Astor Bristed, thus writes, in reference to Cambridge, where he studied, and graduated.

"The private tutor at an English University corresponds in many respects with the *Professor* at a German. The German Professor is not necessarily attached to any specific chair; he receives no fixed stipend, and has not public lecture rooms; he teaches at his own house, and the number of his pupils depends on his reputation. The Cambridge private tutor is also a graduate who takes pupils at his rooms in numbers proportionate to his reputation and ability. And although, while the German professor is regularly licensed as such by his University, and the existence of the private tutor *as such* is not even officially recognised by his, still this difference is more apparent than real; for the English University has *virtually* licensed the tutor to instruct in a particular branch by the standing she has given him in the examinations." We are apt indeed to deceive ourselves with names instead of things.* The German *Bursch*

* The confusion in the minds of those unfamiliar with the English University system, arises from the fact that the term Professor is there reserved exclusively for the special class of lecturers, not attached to any of the Colleges, but on

has a tutor whom he terms his *privat docent*, while his Professor often closely corresponds to the Scottish "Extra-academical lecturer." The Cambridge man, calling to his aid a private tutor terms him a *coach*, whilst the Edinburgh student styles his equivalent a *grinder:* both sufficiently expressive tropical terms. The one takes up his laggard pupil and *coaches* him on to the most advanced rank attainable by him ; The other *grinds* the dull novice up to the requisite degree of sharpness and polish, while the real amount of coaching or grinding demanded for the entrant, be it remembered, depends alike at Berlin, Cambridge, Edinburgh, or Toronto, on the standard which each University fixes as the indispensable requisite for its honors and rewards.*

As to the English Universities, their one radical defect as national institutions notoriously lies in this, that the change of opinion in a large portion of the community has degraded them from universal, and national, to merely denominational Schools of learning, a subject no longer overlooked in the reforms now in progress. But no institutions in the world turn out a greater number of highly qualified teachers on the subjects specially cultivated by them. Apart from the tutors, public and private, numbering hundreds, within the circuit of the two Universities, Oxford and Cambridge provide professors and teachers, in their own special departments of classics and mathematics, to the great majority of the public schools of England and the Colonies. The colleges of London, Manchester, Birmingham, and Durham, all the great public schools, and even mathematical and classical

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the University foundation. The majority of these professorships are honorary appointments; the emoluments are trifling; and when, as in the case of Dr. Arnold, when filling the Oxford Chair of modern History, the duties are fulfilled, they consist of a brief course, in his case of only eight lectures, or in that of Sir James Stephen, the Cambridge modern history professor, of twelve lectures, on subjects quite apart from the regular course of studies taught by the College Professors or Tutors. The discrepancies between the two American writers quoted above are amusingly significant even in trifles. "Instead of the old names of Freshman and Sophomore, *borrowed from the English Colleges*, we will take" &c., writes Dr. Tappan, (p.40) while Mr. Bristed at the commencement of his Cambridge experience, notes that "there are no such beings as *Sophomores* at an English University,' (p.18.) and at a later date, when familiar with Germany as well as England, he speaks of "the barbarous term of *Sophomore*, a name to which it is hardly necessary to say there is nothing answering in the Colleges of any other country, [but America.]" (p.437.)

* Bristed, thus writes of his Cambridge Tutor: "Travis certainly put more into me in seven months than I could have acquired by my own unassisted labors in two years."

chairs of the Scottish Universities, are supplied from the ancient seats of learning on the Cam and the Isis. The English college tutor again is precisely what we term in Canadian or American Institutions a professor; his functions in no degree differ, and the more our Canadian professor imitates the thoroughness of the English college tutor in his mode of instruction, the better will it be for the future scholarship of the province.

We have heard much talk in America of the "Prussian system" and read much more in "Commencement Day" and other college orations, of its adaptability to American Institutions, and the great advantages already flowing from its adoption. Yet what is the fact? Amid all their differences, the University systems of England and Germany, agree in the thoroughness and substantiality of their training in so far as the subjects taught are common to both. The difference in the result lies in the character of the national mind. Germany has produced her Niebuhr, Boeckh, and Muller, but has not England also her Arnold, Thirwall, and Grote, whose synthetical cast of intellect is no less the admiration of Germany than of England. As to America's Colleges and Universities, the number in all, according to the last American Almanac, is one hundred and twenty-two; and the greatest immediate blessing that could possibly befal them, would be the adoption, not in name but in reality, of the Prussian system, or any other system with a uniformity of plan and centralising control. As it is, an American College degree may mean anything, every thing, or nothing. A student may graduate as M. A. at one College, with acquirements that would not enable him to matriculate at another. And yet this is not because of any extravagant exceptional standard at the latter. Mr. Bristed, to whom we have already referred, thus describes his first American experiences as a student: "I was fifteen years old when I went to New Haven to enter the Freshman class, at Yale College. In the School where I prepared, one of the masters was an Englishman, and the instruction given partly on the English model. I had been fitted for Columbia College, *the standard for the Freshman class in which institution was then nearly equal to that for the Sophomore at Yale.* The start which I had thus obtained confirmed me in the habits of idleness to which a boy just emancipated from school is prone, when he has nothing immediately before him to excite his ambition. During the first year I did little but read novels and attend debating societies; and the comparison of my experience with that of others leads me to conclude that this is the case with most boys who enter well prepared at a New England College; they go backwards rather than forwards the

first year."* At Yale Mr. Bristed carried off three out of the four classical prizes of his four years' course; graduated; devoted still another year at New Haven to College study; and then, dissatisfied with his acquirements, and wishing "to make himself a scholar," he resolved to spend some time at a European University. By chance Cambridge, in old England, became his foreign Alma Mater, and there the Yale graduate found he had the whole process to go over again; won, only with hard labor, and with a corresponding pride, a foundation Scholarship in Trinity College; and at length after five years of study there, learned to look with a philosophic sense of justice on his own coming out in the Tripos, only "second in the second class." On this subject he concludes by saying that "to take, at Cambridge, even a good Second in Classics, one must, as a general rule, have read a large quantity, and be able to display a considerable knowledge of the Ancient languages. No one knows how hard a first class is to obtain, unless he has either just got it, or just missed it."†. And this native American, returning to his own country, and writing for behalf of his countrymen, says: "were I to be questioned by an educated foreigner, an Englishman or Frenchman, German, Hollander, or Dane, upon the standard of Scholarship in our Colleges and Univerisities, I should be obliged to answer, not having the fear of King Public before my eyes, that it was exceedingly low, and that not merely according to his idea, but according to the idea of a boy fitted at a good school in New York. When I went up to Yale College in 1835, the very first thing that struck me was the classical deficiency of the greater part of the Students and some of the instructors. Yale is the largest College in our country, and one of the two most distinguished. The result of my inquiries has not led me to believe that Harvard is any better off. That the other Colleges throughout the country, many of which derive their instructors from these two New England Colleges, are if anything in at worse state, may be easily inferred."‡

Columbia College, N. Y., as we have already seen, is excepted, to some extent from this sweeping censure; and indeed the State of New York is the only one which has had the courage to attempt centralization. All its Colleges are now embraced by a central organization, consisting of a Board of Regents,§ or Senate, presided over by a

* Five years in an English University, p. 6.

† Ibid., p. 283.

‡ Ibid., p. p. 374, 377.

§ The term is by no means an American novelty, but pertains to the nomenclature of the ancient European Universities, and we should be glad to see it adopted

Chancellor, and constituting the University of the State of New York. Dr. Tappan remarks of it: "The control which this board exercises, is very slight, and the several Colleges appear to enjoy equal independence with the Colleges of other States." It is an organisation, nevertheless, capable of effecting the greatest benefit, and only requires to extend its control a little further, to make a high and uniform standard of Scholarship supersede, throughout that important State, the reckless and lawless system of diplomaed mediocrity, which has sufficed to bring the degrees of American Colleges into merited contempt.

Such a system of comprehensive and efficient centralization the Chancellor of Michigan University proposes and boldly advocates for his State, adding to his scheme the indispensable element of effective union under one system of all educational machinery, from the humblest common School to the central University, the fountain of scientific and literary rank. "A University" says Dr. Tappan, "can have no branches, unless we so designate its faculties. A University is a compact association of learned men, incorporated and existing in one place. To distribute it into branches planted in different places would prove as incompatible with its offices as to scatter abroad a Legislative Assembly, and would in fact destroy it." In this perfectly true remark, however, the Chancellor we suspect says more than he means, confounding the functions of College and University. He next refers to the attempt to create an efficient system of Grammar Schools, or "Gymnasia essential to a well ordered system of education, and without which Universities cannot reach their full proportions and efficiency." Following up this idea he thus proceeds:

"It was unfortunate that the plan could not have been properly digested and carried out. To place them [the schools] upon the university fund was suicidal of the whole undertaking; for they only diminished a nutriment which can never be sufficient for both, without deriving an adequate supply for their own existence.

The Union schools which have since arisen are at another expression of the same idea—the idea of taking pupils who have received the first rudiments of learning at the primary school, and inducting them into a system of regular training, based on the constitution of the human mind, and the natural order of the growth and unfolding of its faculties; and on the nature of different studies as ministering to this growth, and forming a philosophical discipline of the faculties graduated to this order; so that, from childhood to adolescence, and from adolescence to budding manhood, the mind shall be led along genially and cheerfully, to any point of education less than the full course, or by completing the course, to a preparation for the university. This is the true gymnastic course

in Canada, in the hope that it might help to some understanding of the difference between a University and a College, which at present would seem to be nearly unattainable.

—the course which Michigan has been aiming at in her intermediate schools, and which it may be her high destiny finally to mature and bring into full operation. Whatever these schools may cost, the State has no higher interest than their perfect constitution and development. They will afford the possibility of education as widely and freely as the common schools, but it will be the possibility of a higher education, consistently and harmoniously ordered. Now, a vast amount of time is lost in childhood and youth for the want of early opportunities of educational training; and young men who propose to enter the higher institutions of learning, have either to suffer the loss of knowledge which ought to have been acquired long before, or are compelled by spasmodic efforts, often ruinous to the health, and injurious to the mind itself, to make up, and that in an imperfect manner, the deficiencies of early life. Conceive of a gymnasium open to you from childhood. At twelve years of age you have acquired French, have overcome the difficulties of the Latin, and begin to feel the charms of its literature, and are grounded in arithmetic, geography, drawing, and music. At fifteen you are reading Greek and German with pleasure, and have acquired the elements of mathematics, and a general knowledge of history: And at eighteen or nineteen—instead of beginning to prepare for college, as many now do, tortured by the Latin and Greek grammars, and in the haste inspired by the consciousness that you are almost men—you find yourselves in the easy and almost natural command of languages and the principles of science, with the habits of a scholar thoroughly matured, and the art of study mastered, and ready to step into the university as an inviting field of knowledge, where everything is prepared to your hand, and where you feel prepared to put your hand to every thing, with the skill of one who, having thoroughly learned his trade, is never embarrassed in handling his tools.

Ye who know by hard experience the want of all this, sympathize with those who are to come after you, and in the true spirit of literary association, determine unitedly to labour for the elevation and perfection of the institutions of your country!

The proper constitution of these schools, by whatever name they are designated, will require great wisdom, great care, great energy, and a supply of teachers who know how to do their work.

Where shall we find these teachers? The Normal schools cannot supply them, for they are designed to supply teachers for the primary schools—a great and important work, embracing what we have called the logical basis of the whole system of public instruction. Or they can supply them only to a limited extent, and in the more juvenile classes. The University alone can supply teachers for the gymnastic schools. In Germany you will find university educated men giving instruction in arithmetic and geography; masters of their subjects, they instruct without text-books, and fill their class-rooms with the vivacity and charm of oral communication, and keep the interest of their pupils alive by the necessity of prompt answers to unexpected questions.

And here rises up to view, again, the great principle I have expounded and illustrated throughout this discourse, that in the historical order of development the highest institutions come first. *Without a perfected University, we can never have a perfected system of public education, even in the lowest degrees;* and as it has been, so must it ever be, that popular education must flow out of the higher institutions, as the showers that water the valleys and plains fall from clouds which were gathered on the mountains.

The university, the gymnasium, the Normal schools, the primary schools, once started into existence, must move on together. Each is necessary to the whole, and the prosperity of each contributes to the prosperity of the whole. Nothing but sheer sciolism or utter ignorance can conceive of any opposition between them; and none but an empiric in education, or a traitor to its cause, can aim to aid one by the sacrifice of any of the others."

This organization of the entire scheme of education for the Province, from its lowest primary or infant school, to its finishing Colleges and University, into one coherent and mutually dependent system, is not only what we want, but what seems indispensable for Canada. Nor are we without our own ideas as to how it might and should be accomplished; but we dread the intrusion of polemics into the pages of the *Canadian Journal*, the organ of an Institute which, we trust, will ever offer an arena wherein educated men of every opinion and party can meet on common ground. But this accomplished, by whatever means; and that other scarcely less important requisite: a uniform standard of University degrees, having been secured throughout the Province; the next step must be to render it an indispensable qualification for the mastership of every Grammar School, that its holder has taken his B.A. degree. By and by,—and the sooner the better,—this demand must be extended to the Common School Teachers also; and this done, and their salaries proportionably raised, so as to render the appointments worth a man of education looking forward to as objects of professional ambition, then we shall be ready to borrow a most important principle from Prussia, viz:—to make the appointments to the mastership of the Provincial Grammar and Common Schools the prizes of the most successful candidates for University honors. This is the new principle recently introduced with the very best results into various departments of public life,—not in the United States, but at home—and especially into the civil appointments of the East India Company's service; thereby substituting for the unwholesome and mischievous influences of political patronage and personal favor, the impartial test of intellectual attainments. Thus the Common Schools would be made to depend on the Grammar Schools, the Grammar Schools on the Colleges, and the Colleges on the University. We have said nothing about the Normal School, but it is not because we undervalue the influence of that admirable Institution. The function of the Normal School is to teach men *to teach*; and such a coherent system must doubtless raise its standa . also; but we should just as certainly demand of the B. A., candidate for a Common School teachership the production of his first class certificate from the Council of Public

Instruction, as we should require of him his diploma of M. D., if he were candidate for a medical appointment.

And here, we touch on one of the great errors lying at the foundation of all the schemes of root and branch University reform, set forth by educational theorists. We affirm unhesitatingly that it is not the primary function of a College to provide a professional education; and this is especially true of the Faculty of Arts. American Educationists acting on a different theory are devising new courses, titles and degrees; Masters (and Mistresses too) of Science;—preceded, no doubt by Bachelor, and Spinster of Science*;—Masters of the Science of Engineering; of the Science of Agriculture; nay even of the Science of Penmanship, and the Science of Accounts! accompanied with *graduation* in Commercial Computations, Business' Customs, Ornamental Penmanship, and Commercial Ethics!! Our idea is that the College course for a B. A., degree must comprehend these, in so far as they do not purely relate to special professional details, just as much as it has always been our idea that Commercial Ethics is necessarily comprehended in the Christian Ethics which are, or should be, taught every Sunday from the pulpit.

A Chair of Civil Engineering was proposed in the scheme originally shaped out for the changes effected on Toronto University; and surely in this country few Chairs could have been more useful. But men could not realize the conception of such a professorship apart from the professional routine of the Architect's an[3] Engineer's office, and the comfortable pupils' fees; and hence we believe it was still-born. How the Chair of Agriculture escaped the same fate may well be wondered. But so long as this practical chair stands alone its position must be precarious. To complete its efficiency, a Veterinary

* "We are multiplying our Bachelors and Masters on all sides..The fond idolators of old deified beauty and wisdom under different forms; but we will deify all our beauty under the form of wisdom, and we will place our new Goddess in our new Parthenon under the august title of *Mistress* of Arts!" Dr. Tappan's Discourse, p. 49. On the same subject a correspondent of the New York *Tribune*, writing from Ann Arbor, the seat of Michigan University, last April observes:—"The last term of the University for the year 1854-5, commences to-day. The Regents have been notified that application will be made either at this or the following term, by several females for admission into the University, and a full and equal participation in all its privileges. You will not fail to observe and to be interested in the debate on this very point in the State Teachers' Association and the position taken by Prof. Haven, and indeed all the other prominent educators in the State. The thing is a fixed fact. Females are to have, as they ought, equal advantages in this respect with men. The only question left is: Shall they have a separate institution, or go to the University? The Teachers all say the *latter*."

Chair seems indispensable, and when the Agriculturists are ready to avail themselves of it, the Professors both of Chemistry and Natural History, and perhaps also of Mineralogy and Geology, could supplement their studies with much that is useful, without at all interfering with the strictly professional education, to be learned in the field; just as the medical student must acquire his practical knowledge, not in the lecture room, but in the hospital wards and the dispensary practice. The following discriminating distinctions of the shrewd Scottish Professor of Greek, John Stuart Blackie, whose letter "on the advancement of learning in Scotland," we have named above, are well worth noticing here:

"What do we understand by learning? The word is vague; and some irrelevant criticisms and pert objections may be anticipated by defining the term distinctly in the outset. A farmer who tills his ground skilfully, and, by the blessing of God and favour of the elements, stores a large crop of life sustaining fruit in his garners, is not a learned man: he is a man of skill, industry, and experience. The same farmer, if, in addition to the careful and skilful cultivation of the soil, according to the received customs of the agricultural profession, he occupies himself with experimenting in various ways so as to produce important agricultural results by the application of new chemical or other scientific principles, may be called a scientific farmer; or, if you please, an intellectual or a speculative farmer; but no man would think of calling him a learned farmer. Let him, however, in addition to the scientific accomplishments which we have just supposed, be found at his leisure hours, with the help of dictionary and commentary, spelling his way through the Georgics of Virgil, the authors *De Re Rustica* of the Romans, and the geoponic writers of the Greeks, we should then have no hesitation in saluting him as a *geoponus eruditissimus*, a learned agriculturist and a wonder of the country-side. In the same way, any man who can make a neat incision into your blood-vessels without mistaking an artery for a vein, may be called a skilful phlebotomist, and if he does so in difficult cases, and in the most approved way, he may be called a scientific phlebotomist. But the man who not only can finger a lancet, but will explain to you the whole theory and history of blood-letting, from the precepts of earliest Egyptian drugmen in pre-Homeric times, to the diaetetic protests of Erasistratus of Ceos in the third century before Christ, and the heroic practice of a stout Broussais and Gregory, of the most recent memory; such a man who, to great practical skill and dexterity, adds extensive knowledge of the past, well arranged and digested by the organic power of ideas, you would call both a learned and a philosophic phlebotomist; you would be justified in making such a man a professor of phlebotomy."

And this might tempt us into the vexed question of Canadian Medical Education, of which it is sufficient to say that every single member of the community is so *vitally* interested in the subject that it may surely be left to the common sense of the public at large to put an end to the present state of things, which no man we ever met with pretends to defend. Medicine is the one professional educa-

tion in which every member of the community has an interest, and if it be desirable that the degree of M. A., should have a definite and uniform meaning throughout the Province, it is surely no less indispensable that that of M. D. should be held by no one but a thoroughly educated and trained practitioner of the healing art. But is it reasonable to expect that any required number of such learned and philosophical phlebotomists as the Scottish Professor pictures above, should turn up by chance, and at a moment's notice, among the medical practitioners of a new country like Canada, to say nothing of a city of some forty thousand inhabitants. Edinburgh, with a population of four times the number, has filled up two Chairs in her University recently. She might have been supposed to have choice enough among her own world-famous staff. Yet the one was given to Dr. Laycock, of York, the other to Dr. Allman, of Trinity College, Dublin; and it is by getting the ablest men, irrespective alike of local interests and professional jealousies, that she has become what she is. When, however, she shall get as far ahead as our Metropolitan Toronto has done, and shall find herself with not one, but three Universities competing with each other for the granting of medical diplomas, then—it may be presumed she will make our medical schools her models in all other respects.

We have spoken of the thoroughness of the education at Cambridge, in the subjects taught and encouraged at that University. That a too limited and exclusive devotion to one or two objects of study has been engrossingly fostered at the English Universities we readily admit; but even in this respect the evil is more apparent than real, and a little, well and thoroughly learned, is worth all the popular, superficial doses of crude science and learning which figure so grandly under every variety of superlative nomenclature in the prospectuses of American Educational Institutions. Mr. Bristed, after having taken his B. A., degree with honors, at Cambridge, remarks: "I had more opportunities of observing what had often struck me before, —the development which takes place in an Englishman's mind after the age of twenty-two, when he recovers in two or three years all the ground which he *appeared* to have lost as compared with an American, Scotch, or Continental student, and gains a great deal more. The Cambridge student acquires manly habits of thinking and reading. He becomes fond of hard mental work, and has a healthy taste in his mental relaxations. The trash of the circulating library he despises as he would sugar candy. No works of fiction but the very best, and those rarely, are to be found in his room. Such a taste is indeed late in forming; but the habit of mind once started, he goes

on drawing in knowledge from all quarters at a vast rate, and whatever he does take into his well prepared mind assimilates itself with matter already there, and fertilizes the whole, and fructifies; nothing of what he reads is thrown away." To such a man of ripe mind and studious habits, the acquisition of a modern language such as the French or Italian is a mere pastime, and the German only a pleasant task. What would he say to the substitution of them by our University reformers as equivalents for the Greek and Latin,—the sole keys to all the treasuries of Theology, Philosophy, and Science!

Having thus discussed, however cursorily, the direct aim and purpose of Universities and Colleges as means for the encouragement of LEARNING, we are now free to admit of a secondary purpose which they may answer, especially in a new country like Canada. Professor Blackie denounces, with not less vigorous eloquence than truth, the neglect of classical learning in Scotland; nevertheless, Scotland owes not a little of the energy and intellectual vigour of her people to the very looseness of her University system, which threw open the halls of her Colleges to hundreds who sought for knowledge, without dreaming of *learning*. With a like object in view, the scheme of the Toronto University College, provides for its unmatriculated students and encourages them to emulation and study by special and entirely distinct honors and rewards. The new Principal of McGill College thus announces the proposed popular department of that Institution:

"During the present winter it is intended to deliver a popular course, which will embrace the subjects of Natural History, Chemistry, Natural Philosophy, and Civil Engineering, a combination of interesting and important subjects which should attract large audiences.

These provisions, however, by no means exhaust the field of usefulness in this direction; and it is in contemplation, in the Session of next winter, to institute in connection with the Faculty of Arts certain special courses, bearing on some of the principal lines of industrial occupation, in the hope that in this way we may induce many young men who would otherwise receive none of the benefits of collegiate education to attend to certain selected classes. We propose then, to attempt the establishment of the following Special Courses, each to extend over two years, and to entitle the student, on examination, to a certificate or diploma

1. A course of Civil Engineering. This will embrace English Literature, Mathematics, Natural Philosophy, Chemistry, Geology and Mineralogy, Surveying, and Civil Engineering, including the construction of machinery. Such a course will be exceedingly serviceable, not only to all young men about to enter on the profession of Civil Engineering, but to many others more or less closely connected with the public works or manufactures of the Province.

2. We also hope to commence a course of Commercial Education, including English Literature, History and Physical Geography, Mathematics, Chemistry, Natural Philosophy, Natural History, Modern Languages, Commercial Law, and, if suitable arrangements can be made, Lectures on Political Economy.

3. A farther extension of our Courses of Study may be effected in the direction of Agriculture. Throughout the Colonies attention is now being directed to those scientific principles of farming which have effected such wonders in Great Britain, and the introduction of which is imperatively demanded in all the older and more worn out districts of this country. I have no doubt that there are within reach of Montreal a number of enquiring and intelligent young farmers, who would gladly avail themselves of such a course during the winter months. It would include the following subjects:—English Literature, Natural History, Natural Philosophy, Surveying, Agriculture, Chemistry, Practical Agriculture and Management of Farm Animals.

These special courses will, I believe, rather build up than detract from our general under-graduate course, while they will certainly extend our usefulness, and give us increased claims on the support of the community; and thus tend ultimately to increase the demand for collegiate instruction, while in the meantime they will give an important impulse to practical science and the arts of industry."

Much of this is unquestionably suited to the present wants of Canada, if it be really teaching that is intended, and not mere attendance on popular lectures. We attach more importance, however, to the scheme of "Options" now partially introduced into the system of Toronto University. By this, in the first half of the under-graduate course, the study of Classics and other branches essential to the educated man, whatever his future professional education may be, is rendered imperative; but in the remaining half of his course he is free to select according to his own intellectual predilictions or the special objects he has in view. The principle is admirable. The details of it want revision. The divorcement of Classics and Modern Languages specially strikes us as equally inconsistent in itself and arbitrarily opposed to the likely choice of a youth of a philological cast of mind. But the other divorcements are scarcely less arbitrary. The clause in the University programme thus refers to under-graduates of two years standing: "Students presenting themselves at this Examination are not required to take the *Greek and Latin Languages* and the *Modern Languages*, but either at their option. Neither are they required to take *Mathematics* and the *Natural Sciences*, but either at their option." The following we venture to suggest as at once a more natural and a more useful classification of options:—

I. Classics, Modern Languages, and History; *or:*—

II. Mathematics, the Natural Sciences, and English Literature; *or:*—

III. Metaphysics and Ethics, Logic and Rhetoric, English Literature, Civil Polity, and History.

Such a choice, following on the substantial ground-work of the first two years' acquirements would admit of the student adapting

his further studies to his future career in life, and taking his degree at the University with honors, while the knowledge of which it is the guarantee, is available for all the objects of his further aim and aspirations. It might be a question, indeed, whether a fourth class of options, including the Natural Sciences alone,* without Mathematics, but with correspondingly high requirements in the narrower field of study, might not be wise, with a special view to induce the student of Medicine to graduate in Arts, and thus lay a foundation calculated to fit his mind for appreciating the philosophy of the Science of Medicine, which, in the hands of so many of its half-educated practitioners degenerates into mere empiricism.

After all, however, be it remembered that a complete, efficient, and practical University system, accompanied by well organised Colleges and crowded lecture rooms, cannot be created in a new country like Canada in a day. The unfortunate University of Toronto, with all its wealthy endowments, has hitherto been treated as the Tahitians treated the first crop of wheat the Missionaries introduced among them. They *constantly pulled it up by the roots to see how it was thriving!* Somehow we are rather too prone to despond, and have inherited so much of John Bull's propensity to grumble that we are very difficult to inoculate with those sanguine anticipations of ripening triumph and glory, in which our neighbors indulge with such magnificent amplitude. The new President of McGill College concludes his Inaugural Discourse with the expression of a modest "hope that the utmost possible success and permanence may attend their united efforts in behalf of good learning." But the Inaugural Discourse of the Michigan Chancellor† winds up in a very different vein; which, considering that he is speaking of a *great State* not so old as some of Mr. Dawson's present under-graduates, may well put the Montreal President and the rest of us to the blush:

"Let me remind you that it is not in accordance with the spirit of our country to let improvements grow slowly. This great State is the growth of a quarter of a century. In our Industrial arts and improvements we are not willing to fall behind Europe according to the ratio of our respective ages. We aim not merely to equal, but even to surpass the old nations of the world, in our manu-

* Say: Chemistry, Botany, Natural History, and a choice of some such additional studies as Natural Philosophy in some of its branches most useful to the medical man, Geology and Mineralogy, with Palæontolgy and comparative Anatomy. The latter of these might be further encouraged as the special subjects for an honor degree in Medicine.

† A discourse delivered by Henry P. Tappan, D. D., at Ann Arbor, Mich., on the occasion of his inauguration as Chancellor of the University of Michigan, December 21st, 1852. PP. 51, 52.

factures, our steamboats, and our railroads. We level the forest in a day, lay down our tracks and startle the old world with the sound of our engines. Our steamers outspeed theirs across the ocean. Our yachts win the royal prize over the ancient ship builders in the sight of the Majesty of England. The Autocrat of Russia employs our engineers to make his railroads; and his steamers are built on our shores.

"Shall we be behind then only in the great matter of Education? Can we not build up Universities too? Shall we apply to the cultivation of Mind a principle of slow progression which we scorn to apply to anything else? Let it not be my countrymen—let it not be. Arouse thy energies young State of Michigan! Giant of the West! holding the great lakes in the hollow of thine hands; bearing on thy bosom, deep engraven, the memorial of thy glorious deeds; looking with eyes of light upon all thy brothers around thee, and inspiring them with thy majesty and beauty; speak out with thy strong and melodious voice the decree that here a new Athens shall arise with its schools of Philosophy and Art, and its Acropolis crowned with another Parthenon, more glorious that that of old, because illumined with the true light from heaven!"

The Parthenon of our Canadian Acropolis will not, we are satisfied, manifest any of this new-world speed. The work is all before us, and must be done, slowly, patiently, above all, thoroughly. It is easy for a time, to throw dust in the people's eyes with the help of grand names, magnificent talk of Prussian systems,—meant only to end in talk,—grandiloquent novelties of graduation titles; and the substitution of an *ad captandum* scientific nomenclature to such good old-fashioned school-boy acquisitions as writing and arithmetic: "*Sciences* of *Accounts* and *Commercial Computations!*" the "*semi-angular system of Penmanship*, both practical and ornamental!" &c., and—which is quite of a piece with this,—lists of Members of faculties eked out by the help of honorary lecturers and *Emeritus* Professors! Noah Webster bluntly explains to his countrymen that an Emeritus is one *honorably discharged from service.* We wonder what the Professor of Commercial Ethics would say to the retention of such on the list of Teachers! We would willingly hope that Canadians are not to be caught by such chaff. Nevertheless, the truth must not be disguised that Canada has yet to learn the just appreciation of a well organised system of education, extending beyond the ordinary requirements of common schooling. The very desire for learning, apart from its mere marketable value as the stepping stone to a profession, has to be created. And on this subject, the following just remarks of Professor Blackie, are not without their application to ourselves:

"To get rid of the uneasy sensation, and the shock to our self-esteem, caused by the honest presentation of these facts, I can easily imagine that some stout champion of things as they are, will come blurt out with the old question—*Well, if we are not a learned nation, what harm? If the Germans write moun-*

tains of erudite books, may we not ask, CUI BONO? Is not sense better than learning: and can a man not see what is worth seeing in the world without the spectacles of books? Now, lest any person should be moved by vain talk of this kind, which is not altogether without wisdom, though somewhat of a worldly kind, I hope I have sufficiently taken care, to avoid leaving the impression that I set much value on mere learning. A man may attain wisdom and virtue without books and Universities—God be praised! Still learning performs an important part in the intellectual culture of any educated people; and it may be difficult to name a single point in which the civilized life differs more radically from the savage than in the possession and in the use of books. It is easy to laugh at the remote and unpractical character of the subjects on which many German professors write books; men of a strongly practical turn will always have their joke at the expense of those who indulge in curious, recondite, and apparently useless research; but books are as much the natural expression of a highly-trained intellect in this age, as ballads were in the age of Homer;—"By their fruits ye shall know them;"—and it remains a fact that every educated man who pens a paragraph for a newspaper, and every possessor of a pulpit who sends forth a pastoral address to his people, makes use of some part of the grand floating capital of knowledge with reference to the past, which is only the results of learned research put into a popular shape. Without learning, therefore, as an educated people, we cannot live; the only question is, whether we shall be content to take this learning at second-hand from the Germans and other learned nations, or whether it would not be more creditable, more safe, and in the long run, perhaps a shorter plan, to create that learning for ourselves at home, by Universities properly organized, and by professors supplied with proper opportunities and endowments, to make the advancement of a first-class academical learning the great object and the sole ambition of their lives."

But indeed we have to begin our work at a much lower stage than that of University organization. Much has indeed been done, and well done under the persevering zeal of Dr. Ryerson. But assuredly the standard of our Common Schools has to be elevated. Our Grammar Schools have to be made—what now they certainly are not—efficient feeders to our Colleges; and the status of our Schoolmasters must be raised. At present the scale of remuneration, and the social rank, awarded to this important class of functionaries, to whom is entrusted the intellectual and moral training of the rising generation, reflects little credit on the province. Setting aside one or two exceptional cases, the average pay of a Grammar School teacher is £175; that of a first class Common School teacher ranges from £80 to a £100; a second class teacher from £60 to £80, and a third class teacher from £45 to £60! Can it be expected that such salaries will engage the talent of the country in the all important work of education, when the highest are not more than a clerk in a store would demand; while, failing such prizes, so far as regards the remainder, a robust man may hope to make more by chopping wood? It ought not to be a matter of indifference to the people of this wealthy pro-

vince that those to whom is committed the intellectual culture of their sons and daughters, are struggling with the sordid cares which pecuniary pressure involves, and degraded by a social humiliation which it is impossible to disguise; and until the Common Schools and Grammar Schools are doing their work effectively, and have been so doing for years, it is as vain to expect our Universities and Colleges to flourish, as for our farmers to look for their harvests before they have begun their clearing.

D. W.

SCIENTIFIC AND LITERARY NOTES.

GEOLOGY AND MINERALOGY.

THE GEOLOGICAL SURVEY OF CANADA.

The *London Gazette* of January 30th, dated from Buckingham Palace, announces the gratifying intelligence that Her Majesty has seen fit to confer the honor of Knighthood upon WILLIAM EDMOND LOGAN, ESQ., Director of the Geological Survey of Canada; a well earned and justly merited tribute of honor, which will be confirmed by universal acclamation throughout British North America.

PRESERVATION OF ORGANIC REMAINS.

The causes which mainly influence the preservation of organic bodies in the fossil state, are the following:—

1. The habitat of the plant or animal.
2. The conditions prevailing at the spot to which its remains may be brought, or at which it meets its death.
3. The inherent power of these remains to resist mechanical disintegration.
4. Their powers of resistance to chemical decomposition.
5. The nature of the rock-matters in which they may be enclosed; and the after conditions to which these matters may be subjected.

With regard to the first condition, it is abundantly evident, that aquatic types are far more favorably circumstanced for preservation, than purely terrestrial forms; and littoral species, again, more so than pelagic tribes. But, allowing the body of the dead fish or floating cephalopod to be cast, uninjured, by winds and currents, on the shore; or the drowned mammal swept down to the river estuary; the co-operation of various conditions is required to ensure its preservation. Briefly—there may be no sediments under process of distribution at the spot; or the sediments may not be thrown down with sufficient rapidity to arrest decomposition; or the shore may be rocky and exposed, and mechanical destruction follow. Finally, if entombed forthwith, its calcareous parts may be readily dissolved to constitute a cementing material for the surrounding mass; or subsequent metamorphic agencies may obliterate all traces of its form.

The more an organised substance approaches inorganic matter in its composition, the greater, of course, will be its capability of resisting the usual process of decay.

In this light, the following Table, drawn up chiefly from the researches of M. HUGARD, of the Geological Society of France, will be found to exhibit some interesting relations:

Approximate amounts of inorganic matter in animal bodies which occur more frequently in the fossil state:

Inorganic matter, 99 *or more per cent*:—Shells of Ostreæ and of some other acephalous mollusks.

Inorganic matter, 95 *to* 98 *per cent*:—Most corals; shells of most bivalves and gasteropods.

Inorganic matter, 90 *to* 95 *per cent*:—Shells of ordinary cephalopods.

Inorganic matter, 60 *to* 70 *per cent*:—Teeth of mammals, reptiles, and many fishes.

Inorganic matter, 50 *to* 66 *per cent*:—Bones of mammals, birds, and reptiles; scales of fishes; carapace, &c., of chelonians?; shells of crustaceans.

Inorganic matter, 40 *to* 50 *per cent*:—Elytra of certain insects (?).

Inorganic matter under 5 *or* 6 *per cent*:—Scales of reptiles; cartilage and hair of mammals; feathers of birds, &c.

A glance at this table will explain the cause, (as pointed out by M. D'ORBIGNY,*) of the rare occurrence of reptilian scales in the fossil state, whilst the scales of fishes are so abundant.—E. J. C.

PURPLE COPPER PYRITES.

Purple Copper Ore—the Buntkupfererz of the Germans; Erubescite: Dana—in pseudomorphs, after chalkopyrite, the common yellow pyrites, does not appear to have been hitherto recognised. Pseudomorphs of this kind occur, however, and seemingly in abundance, amongst the copper ores of Lake Huron. Their usual form is that of the ordinary dimetric tetrahedron, belonging to chalkopyrite. When broken across, a nucleus of this latter mineral is frequently seen within them. The purple ore may be readily distinguished from tarnished or variegated specimens of chalkopyrite. by its higher specific gravity. A portion of a crystal (G=4.77) contained 63.19 per cent. of copper; and two other specimens (in which, however, the copper was alone determined, and by a less satisfactory process,) shewed a still larger amount. In the first determination, the copper was separated from the iron by sulphuretted hydrogen, and weighed in the usual way as oxide. An analysis of 16.52 grs., thus furnished—sulphur, 3.97; copper, 10.44; iron, 1.96; or, in percentage values—sulphur, 24.03; copper, 63.19; iron, 11.86. The composition of purple copper is known to vary greatly, and its true formula is yet unsettled. Two formulæ have been proposed for it. The one adopted by Berzelius, $2Cu^2S+FeS$., requires S. 23.7, Cu. 62.5, Fe. 13 8. The other, assumed by Rammelsberg, $3Cu^2S+Fe^2S^3$., gives S. 28.1., Cu. 55.5., Fe. 16.4; but in the analyses hitherto published, the copper is always in excess of 55.5, and generally over 60.† At the same time, it is difficult not to admit that a higher degree of sulphurization than R S must be present in the mineral. Rammelsberg attributes the excess in question to an admixture with copper glance, Cu^2S: a compound which also occurs amongst the Lake Huron ores, and which is known furthermore to occur occasionally n other localities as a product of alteration from copper pyrites.—E. J. CHAPMAN.

* "Cours de Paléontologie et de Géologie Stratigraphiques."

† See the results of nineteen separate analyses in the 4th edition of Dana's "Mineralogy," II., 38.

PHYSIOLOGY AND NATURAL HISTORY.

To the Editor of the CANADIAN JOURNAL:

PERTH, 19th February, 1856.

SIR,—There is a variety of deer frequently killed in this vicinity, which I have never been able to find described, and should like to know if any of the members of the Institute can give any information respecting it. It is popularly known as the "Spike Horn Buck," and I adjoin the following short description.

The Spike Horn Buck has much shorter legs than the ordinary deer, but is also heavier bodied. The forehead is wider, and the horns, which are set very high on the head, are almost six inches in length, smooth and straight without any disposition to branch. As this animal is killed of all ages I think it is evidently a distinct variety from the common deer. I have had a head preserved which I shall send to the museum of the Institute as soon as an opportunity offers.

Yours, &c., W. T. MORRIS.

RANIDÆ.

In the proceedings of the Academy of Sciences of Philadelphia, for December 25th, Dr. LeConte has published a descriptive catalogue of the Ranidæ of the United States.

He remarks upon the difficulty of accurately describing those animals, and the confusion which has arisen in the synonymy, principally arising from the circumstance of the colors and markings being so extremely variable. Descriptions to be accurate must be made from living specimens, and from a number of individuals.

Dr. LeConte has had an opportunity of examining the following:

Rana Catesbiana,..... Shaw.
" nigrescens,..... Agassiz.
" fontinalis,..... LeConte.
" pipiens,..... Gmelin.
" palustris,..... LeConte.
" clamator,..... Daudin.
" conspersa,..... LeConte.
" capito,..... "
Telmatobius lentiginosus,..... Shaw.
Acris gryllus,..... LeConte.
" crepitans,..... Baird.
Chorophilus nigrita,..... LeConte,
" ornatus,..... Holbrook.
Hyla versicolor,..... LeConte, Tree frog of Pennant.
" lateralis,..... Pennant, Cinereous of "
" femoralis,..... Daudin,
" squirella..... "
" delitescens,..... LeConte.
" Pickeringii,..... Holbrook.
" ocularis,..... Daudin.
Scaphiopus solitarius,..... Holbrook.
Bufo musicus,..... Daudin.
" Americanus,..... LeConte,
" erythronotus,..... Holbrook,
" quercicus,..... "
Engystoma Carolinense,..... Wagler.

BATS.

Dr. LeConte has also published in the same number some observations on the North American species of bats, of which he enumerates and describes the following:

Vespertilio Noveboracensis,.....Linn.
" cinereus,.....Palesot de Beauvais,
" crepuscularis,.....LeConte,
" fuscus,.....Palesot de Beauvois,
" Carolinensis,.....Geoff. Se Hilaire.
" currsinus,.....Leunnenck.
" phaiops,..... "
" Caroli,..... "
" pulverulentus,..... "
" subulatus,.....Say,
" lucifugus,.....LeConte,
" Georgianus,.....Cuvier,
" macrotis,.....LeConte.
" pallidus,..... "
Rhinopoma Carolinense,.....St. Hilaire.

Dr. LeConte remarks that all the Bats he has seen, have an uncertain number of transverse wrinkles or plaits on the outer portion of the ear, and have the toes furnished with rather long and fine hairs, as it were fimbriated, hence these two marks are omitted as furnishing no good specific characters. All of the American bats except the Molossus (Rhinopoma,) belong to the same genus, the trifling difference in the number of the teeth does not afford a sufficient reason for considering them as different.

NEW HESPEROMYS.

Dr. LeConte has described two new species of Hesperomys, the H. cognatus and H. gracilis; these two appear to have been confounded with the Northern H. gossypinus. They are found in Georgia and Michigan.

TAPE WORMS.

Dr. Leidy has published, in the Proceedings of the Academy of Sciences, a list of all the tape worms which have come under his notice, both in man and in various animals. It is curious that he has never yet met with the Dibothrium latum (Bothriocephalus latus.)

MOSSES.

A valuable addition to the flora of the United States, has been given (l.c.) by Mr. Thomas P. James, being a list of those mosses not described in Gray's Manual, some of them being new species, amounting in number to forty-seven.

H. C.

ETHNOLOGY AND ARCHÆOLOGY.

ARTIFICIALLY COMPRESSED CRANIA.

The singular custom practised by the Flat Head Indians of the North West, of artificially compressing their skulls, is one of the most curious of all the barbarous customs, adopted by savage tribes. This unnatural operation, our artistic Canadian traveller Mr. Paul Kane remarks: not only does not appear to injure the

health of the children subjected to the deforming process, but it does not injure their intellect, as is proved by their enslaving the surrounding tribes, who retain the head in its normal shape.

This barbarous practice, however, is neither of modern origin, nor peculiar to the New World. Captain Jesse, in his "Notes of a Half-Pay Officer," describes in his travels in Circassia and the Crimea, an ancient example of an artificially compressed cranium, which he saw in the Museum at Kertch. This was said to have been found in the neighborhood of the Don; and he remarks in reference to it: "According to the opinions of Hippocrates, Pomponius Mela, Pliny, and others, the Macrocephali appear to have inhabited that part of the shores of the Euxine between the Phasis and Trapesus —the modern Trebizonde."

This highly interesting specimen of the artificially elongated skull, from whence this race is assumed to have derived its name, it can scarcely be doubted must have since perished in the destruction of the Kertch Museum, when that town fell into the hands of the victorious Allies. It is scarcely to be supposed that such a prize as the ancient cranium would be found among the spoils carried off by our soldiers from the Crimean city.

AMERICA PEOPLED FROM ASIA.

The following paragraph occurs in the editorial correspondence of the Toronto *Leader*, dated Rome, Nov. 5, 1855.

"At the *table d'hote* of the hotel de la Minerve, last night, I met a priest from Wisconsin. He stated some facts as conclusive proofs of the theory that America was originally populated from Asia; the principal one of which is that many of the Indians are found to have the religion of Egypt, which they had received by way of Asia Minor. On my remarking that the theory was not a novel one, but had not been hitherto sustained by conclusive proofs, he said, 'We have no doubt whatever of its correctness.' He has been long among the Indians of the West, and speaks their languages. He has taught them not only to renounce their paganism, but also to read, to plough, and follow other industrial occupations of civilized life. He has therefore, I take it, been an eminently useful missionary; and a self-denying one, too, it would seem, for he states that for four whole years he lived almost exclusively upon fish, seldom tasting the luxury of bread."

Such notices as this, preserving the deductions of intelligent observers, are deserving of record; though, like most others leading to similar conclusions, it is extremely vague and unsatisfactory. If by "the religion of Egypt" is meant, as we presume, the ancient ante-christian creed of the Nile Valley,—which even in the days of Herodotus was obscure, and already being overlaid, like the political institutions of Egypt, by foreign intrusions,—then something greatly more definite than the mere recognition of such elements as are more or less common to all pagan mythologies, must prove a connection which chronological evidence renders so improbable.

WORKING OF AFRICAN NATIVE IRON.

At a recent meeting of the Natural History Society of Boston, Dr. A. A. Hayes exhibited specimens of Native Iron from Liberia; and gave the historical and chemical evidence of its having been in use many years by the natives. By the simple process of hammering, this iron has been converted into rude instruments. It contains one and a half per cent. of crystals of quartz and magnetic oxide of iron, and, consequently has never been heated or wrought. There is no trace of

carbon, or manganese, or nickel, which, by their presence, would show it to be meteoric. This subject is interesting to the archæologist, as well as to the mineralogist, as furnishing another example of the working of metal—like the cold wrought copper of the ancient miners of Lake Superior—without smelting, or other than mechanical means.

VALUE OF NATURAL HISTORY TO THE ARCHÆOLOGIST.

In Indian grave mounds, and on sites of long-deserted Indian villages, numerous bones of wild animals are found, calculated to throw an interesting light on the old fauna of the clearings of this Continent. The following *resumé* of observations on this archæological department of Natural History in relation to England, abstracted from a communication by Mr. Joseph Clarke to the Historic Society of Lancashire and Cheshire, may suffice to shew of what essential service a knowledge of Natural History may prove to the Archæologist:—

Skeletons, in Saxon barrows, are sometimes surrounded with a row of flints, and next to them a row of small bones, and in one instance the body had been completely covered over with small bones, which were ascertained to be those of the water rat (*Arvicola amphibia*, Desm.), a species confined to banks of rivers and ponds, injuring the trees by gnawing off the bark for their store, and not visiting the habitations of man. The old English black rat (*Mus rattus*, Linn.) was not then known, having centuries since, been introduced from India. And that pest, now so common, the brown or Norway rat (*Mus decumanus*, Pall.), which has exterminated the other race, being a native of Persia, had not inflicted a visitation on this kingdom previous to 1730. It seems to be a law in nature that the weaker should disappear before the stronger; thus, our partridge (*Perdix cinerea*, Briss.) disappears before the red legged or French partridge (*Perdix rubra*, Briss.) wherever it is allowed to exist. And even man is not exempt: the Red Indian blotted out from existence the Aztec of America, to be in his turn extirpated from the earth by the intruding Anglo-Saxon. Immense numbers of the shells of one of the pests of our gardens—the common snail, (*Helix aspersa*, Mull.) have been found in some of the graves above-mentioned. Quantities of a species of *Nerita* have also been found in similar graves. Douglass figures shells of the genus *Cypriæ* in conjunction with burial places, and Mr. C. Roach Smith says, specimens of the genus *Nerita* and *Buccinum*, drilled as beads for necklaces, were discovered with remains at Settle, in Yorkshire; and at Sandwich, a gold coin and cowry-shel were found in an urn. The brown bear (*Ursus arctos*, Linn.) is one of our ancient indigenous animals, and infested some portions of this kingdom, almost as late as the sixteenth century. The beaver (*Castor Fiber*, Linn.) was noticed in Wales, by Giraldus de Barri, in 1138, and is known to have existed in great abundance at an early period on the banks of the river Hull, in Yorkshire, where the memory of its denizenship is still retained in the name of the town of Beverly—and Cambridgeshire has produced a skull of it in a fossil state. The wolf (*Canis Lupus*, Linn.) now happily exterminated, continued to prowl about our homestead and sheepfolds almost to the eighteenth century. The wild boar (*Sus scrofa*, Linn.) ranged the forests about London in the reign of Henry II. and its tusks are rather abundant in or near most Roman encampments. One found at Richborough had an ornamental piece of brass attached to it, and had probably been worn as a trophy or remembrance of some animal of extraordinary endurance in the chase, or ferocity in fight. Some legs of cocks (*Gallus domesticus*, Briss.) were found at Bartlow, which might have been preserved from the latter motive. The bones of the red deer (*Cervus*

elaphus, Linn.) and the roebuck (*Cervus capreolus*, Linn.) are found at various Roman stations, I once saw the greater part of a skeleton of the former which the peat had preserved, taken from the bottom of a ditch which emptied itself into the river at Colchester. From these facts, a fair inference may be drawn that they were once numerous in our woods and forests. The roebuck exists still in small numbers in Dorsetshire, but the red deer has been driven to take refuge in the Highlands of Scotland, which three hundred years ago were inhabited by a native buffalo (*Bos Taurus*, Linn.) since that time become extinct. It may be interesting to know that an antique Highland drinking horn, which was in the possession of the late Mr. Croker, was of the horn of this animal. In the sister kingdom of Ireland have been found, at various places, preserved in the peat bog of that Island, the skeletons of the Irish elk (*Megaceros Hibernicus*,) and in one instance the bones were discovered along with weapons of bronze, seeming to prove that this noble stag, now extinct for many centuries, was coeval with man, and came by its death by his machinations. In several instances it has been found in England, and one of the localities where it has been brought to light is in the forest of Hoylake. Amongst the osteological remains found in London, Colchester and Hartlip, are the skulls of an entirely extinct ox (*Bos longifrons*); and the same have been found in considerable numbers, along with Roman pottery at Newstead, Roxburgshire; others found at Chesterford, belong to a smaller species which may be referred to that which is now called Alderney. The bone skates of mediæval times, in the museum of Mr. C. Roach Smith, dug up in Moorfields,—probably lost when that locality was a moor, covered in winter with water, and frozen over,—are said to be the bones of horses; but some of the smaller ones are evidently the metatarsal and metacarpal bones of the red deer. A musical instrument, a sort of flute or whistle, was found with some urns, close to the Ermyn-street at Lincoln, in 1824. It is made of the tibia or thigh bone of a British bird, though now extinct, at least in Britain, the crane (*Grus cinerea*, Becks.), which in the time of Ray the naturalist, who wrote in 1611, was plentiful throughout England. Civilization has completely extirpated it, and the last straggling specimens upon record were taken in 1831.

D. W.

CHEMISTRY.

ALUMINUM.

Deville has prepared considerable quantities of this metal from *Kryolite*, a mineral from Greenland, consisting of fluoride of aluminum with fluoride of sodium. The mineral is tolerably pure, and can be readily reduced by placing it in fine powder in a porcelain crucible with layers of sodium, a bright red heat is sufficient to effect the reduction, which is accompanied by the evolution of an inflammable gas, resulting probably from the decomposition of the phosphoric acid, which can readily be proved to exist in *Kryolite*. The aluminum thus prepared is not quite pure, containing some silicium from the crucible; and Rose, who reduced it in the same way, but used an iron crucible, found it contaminated with the same metal.

Deville has succeeded in preparing a double fluoride of aluminum and sodium, which is decomposed as readily as the *Kryolite*.

Deville also remarks upon the property possessed by the alkalic fluorides of dissolving various substances, such as silica and titanic acid, the mixture becomes

perfectly fluid, and if subjected to the action of a galvanic current, oxygen is evolved at one pole and silicium or titanium at the other. Alumina, on the other hand, scarcely dissolves at all in the fluoride of ꝛ ium, and when acted on by the battery, fluorine is disengaged at one pole and sodium at the other.

Silicium may be prepared by bringing the vapor of sodium in contact with silica, or even with very pure pounded glass.

CADMIUM SALTS.

Von Hauer has continued his researches on the double chlorides of cadmium, and has described the following compounds:—The *chlorobicadmiate of barium* with four of water; the *chlorobicadmiate of strontium* and *calcium*, each with seven of water; the *chloro-hemicadmiates* (dicadmiates) of *calcium* and *magnesium*; the *chloro-bicadmiates* of *magnesium*, *manganese*, *iron*, *cobalt*, and *nickel*, with twelve, and the *chloro-monocadmiate* of *copper* with four of water.

BASICITY OF OXIDES.

H. Rose has lately shewn that all oxides may be divided into two classes according to their action on chloride of ammonium, (ante, January No. p. 80)—but if perchloride of mercury be used, then three divisions may be established. This method has the advantage that we may know immediately from the color of the precipitate, to which of the three divisions the base so tested belongs.

The first division includes the strong bases which when added in excess produce a yellow precipitate of pure peroxide of mercury, even at ordinary temperatures. These are potash, soda, lithia, baryta, strontia and lime, as well as solutions of alkalic silicates.

The second section contains the weaker bases, or strong bases whose basic properties are somewhat obscured by combination with a weak acid. These give with perchloride of mercury a precipitate of a reddish-brown color, the oxy-chloride, the chloride in which cannot be converted into the oxide at the ordinary temperature, even by an excess of base. To this category belong the neutral alkalic carbonates, the sesqui-carbonate of soda, the alkalic borates (neutral and biborates), the borates of the alkaline earths, magnesia, the basic carbonate of magnesia, and also the artificial neutral carbonate. Oxide and carbonate of silver seem also to belong to this class.

The third section includes the great number of bases which do not decompose perchloride of mercury. The alkalic bicarbonates and the carbonates of the alkaline earths also belong to it.

Hence it follows, that in the humid way carbonic acid is a stronger acid than boracic, the acid salts of which act in the same way as the neutral carbonates (on alkalies), while both of them are stronger than silicic acid, which does not at all obscure the basic property of the alkali with which it may be combined.

FORMIC ACID.

Alcohol may be represented as consisting of etherine plus water, and formic acid as carbonic oxide plus water, both are resolved into their respective bodies by the action of sulphuric acid. Berthelot has shewn that formic acid may be generated by heating carbonic oxide with caustic potassa in close vessels to a temperature of 212° Fahrenheit for seventy hours, water being present.

DATISCINE.

Stenhouse has examined this substance, originally found by Braconnot in the leaves of the *Datisca cannabina*. Stenhouse obtained it from the root by extrac

tion with wood spirit, and repeated crystallizations out of spirits of wine. He finds that it belongs to the family of the *glucosides*, and by weak acids can be resolved into *sugar* and *Datiscetine* which can be obtained in crystals.

By the action of dilute and strong nitric acid, nitrosalicylic and nitropicric acids are generated.

The Datisca is used by silk dyers as a dye stuff, and it appears that it would be advantageous to convert the datiscine into datiscetine, in the same way as Leeshing strengthens the coloring matters of weld and quercitron.

PYROXYLINE.

Béchamp has brought forward some further experiments to prove that pyroxyline is of the nature of a nitrate, and does not belong to the nitrobenzine class, inasmuch as the latter by alkalies and reducing agents is converted into an azotized body containing all the nitrogen, while nitric ether, the glycerine compounds, and pyroxyline, give nitric acid or different azotized compounds and the original body.

He proposes the following formulæ for pyroxyline and the other compounds obtained by him.

$C^{24} H^{17} O^{17}$, 5 N O^5, 2 H O — pentanitric cellulose, pyroxyline.
$C^{24} H^{6} O^{16}$, 4 N O^5, H O — tetranitric cellulose.
$C^{24} H^{17} O^{17}$, 3 N O^5, — trinitric cellulose.
$C^{24} H^{20} O^{20}$, — cellulose.

HORDEIC ACID.

A new acid belonging to the class of the fatty acids, $C^n H^n O^4$, has been obtained by Beekmann, by distilling barley with sulphuric acid: it possesses the usual characters of a fatty acid and has the formula $C^{24} H^{24} O^4$, and is therefore isomeric with laurostearic acid.

PIPITZAHOIC ACID.

Under this barbarous title, Mr. Weld has described an acid obtained from a purgative Mexican root, called Raiz del Pipitzahuac. Such a system of nomenclature cannot be sufficiently deprecated; names of substances obtained from plants or animals should be derived from their scientific denominations, or failing these, from some characteristic property of the bodies themselves. Chemical names are already sufficiently cacophonous without the introduction of the Mexican or the Aztec. We may probably shortly be treated to a description of the "Pipitzahoate of the oxide of Œthylmethylamylphenylammonium."

STIBŒTHYLE.

Merck has examined the action of iodide of stibœthyle upon stibœthyle. He has obtained and described the oxide, iodide, bromide, sulphate, carbonate, and acetate of *stibtriœthyle* (Sb $Œ^3$). The iodide crystallizes well, the rest are amorphous.

PHOSPHURETTED BASES.

Hofmann and Cahours have obtained some very interesting compounds by acting upon zincœthyle, zincmethyle, and zincamyle, with the terchloride of phosphorus, and also by treating the bodies so obtained with the iodides of œthyle, methyle, and amyle. The iodides of these radicals are readily decomposed by the oxide of silver, yielding the oxides which are possessed of strong basic properties. Many of their salts are crystallizable. Similar results were obtained by employing

the chlorides of bismuth and arsenic instead of the chloride of phosphorus. The following are the formulæ of the compounds as yet examined:

P $(C^2 H^3)^3$	P $(C^4 H^5)^3 (C_3 H^3)$, I
P $(C^4 H^5)^3$	P $(C^4 H^5)^4$, I
P $(C^{10} H^{11})^3$,	P $(C^4 H^5)^2$, $(C^{10}H^{11})$, I
P $(C_3 H^3)^3 (C^4 H^5)$, I	P $(C^{10} H^{11})^3 (C^2 H^3)$, I
P $(C^2 H^3)^3 (C^{10} H^{11})$, I	P $(C^{10} H^{11})^3 (C^4 H^5)$, I
	P $(C^{10} H^{11})^4$, I

SAPONIFICATION.

It was already known that fats and oils could be decomposed into glycerine and their respective acids, both by the action of a very small quantity of bases and by the influence of water or its vapour at a high temperature, and this plan has already been adopted in some large candle factories. Pelouze has shewn that the same can be effected by the action of soaps on fatty matters at a temperature corresponding to the pressure of five or six atmospheres. He supposes that the high temperature decomposes the neutral soap into a very basic one, which then acts on the fatty matters in the same manner as a free alkali.

TESTING ACETIC ACID.

Nicholson and Price have shewn that the method of determining the strength of acetic acid by means of carbonate of soda is open to objection, owing to the alkaline reaction of the resulting acetate. The methods with carbonate of lime or baryta, or the process of Fresenius and Will are to be preferred as giving accurate results. H. C.

MATHEMATICS AND NATURAL PHILOSOPHY.

PHOTOGRAPHY.

M. Taupenot's Process.—The following information with regard to this process is condensed from M. Taupenot's paper, which appeared originally in *La Lumière*, and a translation of which was given in the Journal of the Photographic Society for September last; and also from a translation in the October number of the latter Journal, of an article in the *Bulletin de la Société Française de la Photographie*. This new method of M. Taupenot is a combination of the collodion and albumen processes; and it promises to be very useful, because the plates may be used *dry*, and apparently some time after they have been excited, while their sensibility is nearly as great as that of ordinary collodion plates.

M. Taupenot's process is briefly as follows:—

I. Coat the glass plate with iodized collodion in the ordinary manner, place it as usual in the nitrate bath, and then wash the surface with distilled water.

II. Upon the plate thus coated with collodion pour a sufficient portion of iodized albumen, pour off the excess, and set the plate up against the wall to drain.

III. To sensitize the plate plunge it into a bath of aceto-nitrate of silver, consisting of 48 grains of nitrate of silver, and about 44 minims of glacial acetic acid to the ounce of distilled water.

IV. After exposure develope either with gallo-nitrate, (which seems, however, a very slow operation), or with pyro-gallic acid, with a heavy dose of acetic acid adding a small quantity of the aceto-nitrate.

We presume that the picture may be fixed either with hyposulphite of soda, or with cyanide of potassium.

These plates may be used the day after they have been finally sensitized. After the operations I. and II. have been performed the plate is apparently insensible to the action of light; one experiment mentioned in the *Bulletin* seems to contradict this, but we strongly suspect that the sentence must be wrongly printed. The following details of the operation may be also useful. It seems that the same aceto-nitrate bath mentioned in III. may be used for exciting the collodion film in I. The collodion itself must be *very thin*, or blisters are apt to be formed. The directions given in the *Bulletin* are rather vague; but we should imagine that a collodion containing from 1 to 1½ grains of gun-cotton per ounce would be suitable. The proper consistence of the collodion, however, seems to depend upon that of the albumen. M. Taupenot appears to use pure albumen, without adding water, but after fermentation. To the white of egg he adds about 10 per cent. of honey, and a small portion of yeast. The advantages of thus fermenting the albumen are, that beating is rendered unnecessary, and that the albumen will keep. He then adds 1½ per cent. of iodide of potassium. As a rough guide to the quantity thus indicated, we may notice that according to M. Negretti's estimate this will give about 7 grains of iodide of potassium to the white of a large egg. The following suggestion with regard to the development, from the pen of an experienced photographer (Mr. Sutton) is likely to be useful:—

"Take two glasses, into one pour the usual pyro-gallic solution, and into the other some diluted aceto-nitrate. Before developing moisten the plate with water, then pour on the pyro; no effect will be perceived at first; let it remain a minute or two, then pour off into the glass, and pour on the dilute aceto-nitrate. The development will now begin, and will advance rapidly. When the picture is nearly out pour off the aceto-nitrate, and pour on the pyro-gallic, and proceed in this way by changing the solutions (but never mixing them) until the end.

G. C. I.

VARIABLE STARS.

The following communications from Mr. J. R. Hind, which have recently appeared in the *London Times*, it will be seen are possessed of considerable interest to the scientific astronomer; they were both published in the form of letters, dated from Mr. Bishop's Observatory, Regent's Park, London, where Mr. Hind's observations are carried on; the first of these being dated on the 18th, and the second on the 21st of December last:—

NEW VARIABLE STAR OR SMALL PLANET.

About 9 o'clock on Saturday evening I remarked, near 84 Geminorum, an object shining as a star of the ninth magnitude, which I have not seen before during the five years that my attention has been directed to this part of the heavens. At 5 o'clock on the following morning it appeared to be in the same place, whence I conclude it must be a variable star of long period, recently come into view. It is, however, just possible that a small planet hereabouts might have been stationary, and the weather having continued cloudy since my last observation, I am induced to notify the circumstance, that the nature of this object may be ascertained as early as possible. Its mean place for January 1, 1856, is in right ascension 7h 46m. 33.65s., and north Polar distance 67° 37′ 17.1″. It exhibits the pale blue light which characterizes many of the telescopic planets, and nothing of the fiery appearance often presented by variable stars. Still I incline to place it in the latter class.

VARIABLE STARS.

The object to which my communication of the 18th had reference continues to occupy the same position in the heavens as on Saturday last, and is, therefore, in all probability, an addition to our list of telescopic variable stars.

While upon this subject let me point out one or two stars belonging to the same class, which are well worthy the attention of observers.

The bright star in Canis Minor, Procyon, has a small companion, the discovery of which, I believe, we owe to Admiral Smyth, who observed it in November, 1833. I have searched in vain for any previous mention of it, though Procyon has been on the list of standard stars, and consequently under constant observation in meridional instruments, for something over a century. The companion was missed by Professor Bond, of Cambridge, U. S., in 1848, but was again detected in March, 1850, by Mr. Fletcher, of Tarn Bank, Cumberland, who ascertained its position-angle with respect to Procyon. Since this date I am not aware that it has been perceived. I have repeatedly sought for it with Mr. Bishop's telescope of seven inches aperture, during the years 1853-4-5, and have always found its place perfectly blank. The appearance of the companion star, at certain distant intervals, is sufficiently established. This, however, is not the only point of interest about it. Procyon, like many other so-called "fixed" stars, possesses a considerable proper motion, whereby its actual position in the heavens is altered to the amount of 1½ second annually. When Admiral Smyth observed the small star in 1833, he estimated its position with regard to Procyon at 5° north of the parallel of declination on the eastern or following side, and its distance 145 seconds of arc. In 1850 the proper motion of Procyon would have changed the apparent angle of position of the companion (supposing it fixed) by rather more than 5°; but Mr. Fletcher's observation does not agree with this inference. He found by micrometrical measures that the small star was still about 5½° north of the parallel, as in 1833. His angle reduced to the date of Admiral Smyth's observation would bring the stars exactly on the same parallel of declination, in which position an error to the extent of 5°, even in an estimated angle, is very improbable. There is, consequently, strong reason for concluding that Procyon is carrying this small variable neighbor along with it. How far this circumstance may be supposed to account for the irregularities in the movement of the bright star, which led Professor Bessel to suggest the probable existence of a dark body in its vicinity, I will not attempt to discuss. Mr. Schmidt, of Olmütz, has lately drawn attention to the colored star on the confines of Lepus and Eridanus, which I remarked while comet-sweeping in October, 1845. At that time it was of the most intense crimson, resembling a blood-drop on the black ground of the sky. As regards depth of color, no other star visible in these latitudes could be compared to it. In brightness it was just beyond the unassisted vision of most persons, or between the 6th and 7th magnitudes, and as such I have always seen it between 1845 and 1854. Mr. Schmidt now states that its light is rapidly on the increase, while the intensity of color appears to be fading. Change of color in the variable stars as they go through their periodic fluctuations is a fact confirmed by our observations on some of these objects during the past few years, though I am not aware of any distinct reference to it in astronomical works. I will here adduce one or two instances:—

1. Near the star numbered 77, at the extremity of the South wing of Virgo, is

another which varies between the 6th and 11th magnitudes in somewhat less than a year. The following notes are extracted from our journals:—

"1853, February 19.—It is now brighter than 77 Virginis. Its color is decidedly deep yellow.

"March 14.—Less than 77 Virginis. It is now bluish white.

"March 29.—Little diminution of brightness, but a very decided difference in color and appearance between 77 and the variable. On bringing the former to the centre of the field of view it appears perfectly white. The variable star, on the contrary, has a dull aspect, and most undoubtedly very red flashes at times. I examined it attentively, and had not the least doubt of the red flashes in the variable; as certainly nothing of the kind was presented by 77 Virginis, which was always of a fine white.

"April 1.—Same appearance, but the color is of a more lurid red.

"1854, February 2.—Light vivid, with flashes of a deep red color.

"February 27.—Dull red.

"1855, March 8.—Fine yellow.

"April 7.—Of a dull amber color, or pale red.

2. A star near *lambda* Geminorum, which varies between the ninth magnitude and invisibility in about 10 months, affords similar phenomena.

"1848, March 4.—Ninth magnitude and ruddy.

"October 30.—Same brightness, but bluish.

"1852, January 17.—Bluish: no ruddiness about it.

"January 18 and 20.—The same.

"February 10.—Light more intense. It is now decidedly yellow, or deep orange. The color has certainly changed from bluish to yellow since January 18.

"February 25.—Reddish yellow.

"September 20.—Very slightly, if at all yellow.

"October 11 and 25.—There is now the yellowish tinge about its light.

"November 19.—Dull amber color.

"December 14.—Color livid: no yellowish tinge."

The same diversity of color was remarked in 1853 and 1854.

To generalize, I think I may add that when a variable star presents successively the colors blue, yellow, and red, the blue tinge is chiefly perceptible as its light increases; soon after the *maximum* is past the yellow becomes marked, while on its decrease the curious ruddy tinge and flashes of red light are noticed. Many of those stars which continue visible about their *minima* appear hazy and indistinct, as though some cloudy or nebulous medium intervened. These changes however, require closer observation, and as they can hardly fail to have an important bearing in connexion with the cause of variable light in stars, I venture to recommend them to the attention of the many amateur astronomers who possess instruments adapted for such observations.

At present the phenomena of variable stars mock all attempts at explanation.

METEOROLOGICAL PHENOMENON.

A very curious phenomenon was observed at Gateshead, at 6h. 15m. on Wednesday morning, Dec. 19th. A bright pillar of blue light appeared to stand up from the horizon at an altitude of about 30 degs. At that point it assumed a very bright appearance, resembling the bursting of a huge rocket. A stream of sparks and haze ascended to a height of about 10 degs. more. The light continued visible for about two seconds, illuminating the whole neighbourhood, and was

unaccompanied by any noise. The lower parts then disappeared, leaving the haze in the form of a bright oblong cloud, which gradually diminished in brilliancy for nearly ten minutes, when it had entirely disappeared. Its position was nearly due south.

COPLEY AND ROYAL MEDALS.

The Council of the Royal Society of London has awarded the Copley Medal for 1855 to M. Léon Foucault, for his various researches in Experimental Physics. One of the two Royal Medals for the year has been conferred on Mr. John Russell Hind, for his discovery of ten planetoids, the computation of their orbits, and various other astronomical discoveries. Mr. Westwood, the Entomologist has received the other Royal Medal.

PHOTOGRAPHIC MAGNETIC APPARATUS.

A Photographic Magnetic Apparatus, constructed by Mr. Brooke, similar to that in use in the Greenwich Observatory, has been placed by Dr. Whewell at the disposal of the Syndics of the Cambridge Observatory. The apparatus exhibits and records the changes of the direction, and the horizontal and vertical intensity of the magnetic force at the place of observation. The barometric and thermometric variations are also marked by a photographic self-register.—*London Literary Gazette.*

ENGINEERING AND ARCHITECTURE.

ENGINEERING CONTRIBUTIONS.

When the Canadian Institute was established in 1849 by a few individuals connected with the three professions—engineering, architecture and surveying—they were encouraged in their efforts by a strong hope that the advantages which such an Institute, by concentrating and comparing the experience gathered from the extensive public works progressing in all parts of the Province, would manifestly afford to its members, could not fail to secure the cordial cooperation of their brethren. These reasonable expectations, however, were not realised, and in order to save the Institute from extinction, it became necessary to change its strictly professional character for one which should admit to membership all who desired by their countenance and support to forward scientific pursuits.

This change, however, did not necessarily lessen the importance of the Institute to the members of those professions with whom it originated. On the contrary, it was believed that by establishing the *Canadian Journal*—a measure determined upon by the Institute during the first session after its incorporation,—a convenient medium would be afforded for recording the progress of those important professions which would not fail to secure many valuable contributions from those who desire to see the professions take that rank to which their importance in the material progress of the country so justly entitles them, and that by means of its pages the obstacles which opposed themselves to the progress of the Institute at an early period of its existence, and which appeared chiefly to consist in the dispersion of its members over so wide an extent of country as to prevent their attendance at its meetings, would be surmounted, and that a reservoir would be created in which all would deposit the stores of experience and observation for the general advancement of the professions. Whether the labours of our bretheren have been too onerous to admit of literary pursuits,—their professional prosperity so great as to make them indifferent to the spread and increase of that knowledge

which has secured their own success,—whether they have been indisposed to confide their contributions to the pages of a journal not edited by one of themselves,—or to whatever other cause it may be assigned, certain it is that the pages of the *Canadian Journal* have not heretofore borne evidence of a desire on the part of the engineering profession to assume a prominent position in the transactions of the Institute, nor do the weekly meeting of that body usually present an audience to whom papers on Civil or Mechanical Engineering could be expected to afford much interest. That such is the case can only be attributed to the absence of nearly all active co-operation on the part of the members of those professions. The pages of the *Journal* have ever been open to their contributions, and the few papers they have read at the meetings of the Institute have been uniformly listened to with patience, and on one or two occasions have elicited considerable discussion.

In commencing a new series of the *Journal*, it has been decided, notwithstanding the apathy evinced on the part of the Engineers, to devote a section specially to their pursuits. Our experience does not warrant us in indulging in any very sanguine anticipations of assistance to be derived from our professional brethren in conducting this section, but we are not altogether without hope that the members of the profession will yet appreciate the advantages that must result from the possession of a recognized representative in the "*Fourth Estate*," through which, to effect interchange of thoughts between those who are engaged, in all parts of the Province, in works of the most varied character, the expression derived from which cannot fail to be mutually interesting and instructive.

The vast engineering works already accomplished or in progress, the material prosperity of the country which they are so much accelerating, and the demand for first-rate engineering skill which must necessarily be thereby created, would seem to give that profession an importance sufficient to demand a record of passing events and of the advancement continually being made in its practice. We appeal, therefore, to its members for that support, by their contributions and countenance, which can alone enable us to give this section that prominence in the *Journal* which will entitle it to be received as the exponent of the "*Transactions* of the Civil and Mechanical Engineers of Canada." We ask them to communicate the progress of works under their charge, and to afford information of whatever may come under their notice that can contribute to the object we have in view. The importance of the information that could be accumulated by a liberal response to this appeal may be undervalued, but a brief reflection on the valuable data which would have resulted from a record of the progress of our public works to completion, with all the difficulties and triumphs of skill and perseverance incidental thereto, will fully establish the importance of our object. The history of the public works of Canada would not have been written in vain, and we doubt not, but that a faithful record of their progress would afford many buoys and land marks of inestimable value for the future.

This, however, is not the only point from which the value of the information we propose to collect should be viewed. We are of those who believe that professional eminence is best recognised when judged by a competent tribunal, and that in engineering as in other professions, empiricism can only thrive on public ignorance. Let us, therefore, lay before the public a history of our progress. Let us exhibit the manner in which we surmount difficulties and subdue unlooked for obstructions to our designs. Let each ingenious contrivance, whether for abridging labour or effecting a novel purpose, stand out in bold relief

against that routine which dares not tread a path unknown to precedent. Let us proclaim our triumphs and the means by which they have been accomplished. So shall we command confidence, and we shall doubly merit it if our self-love permits us to record our failures, for they are the guide posts to success.

So much machinery is now being put in motion in every part of the Province; our Lakes and Rivers are ploughed by a fleet of steamers so rapidly augmenting, and our Railways are attaining so great a magnitude, that the peculiar pursuits of the "Mechanical Engineer" have already become of vital importance to our commercial prosperity, and whatever tends to promote economy and efficiency in the construction and working of motive power deserves the best attention of all who are interested in that trade which the geographical position of Canada is so well calculated to develope.

Those who are charged with the practical superintendence of machinery must have presented to their minds modifications of the working parts, of which a more complete developement might be productive of important results. Such suggestions, if recorded, would doubtless be fruitful of others, and data would thus be accumulated of immense value. The History of the Steam Engine, especially of the Locomotive, is prolific of instances of the value of experimental research, and both the power and speed now attainable on our Railways are due to a change in the relative dimensions and adjustments of the valves of the Engines so limited that the difference would escape the notice of any but the most observant, though it is a difference that has doubled the duty of the machine in proportion to the consumption of fuel. Again we have recent instance of a descrepancy in the performance of two magnificent Marine Engines, built in every apparent particular the counter-part of each other, so considerable as to justify us in concluding that although not detected, a variation must exist in some important part, which if developed might suggest modifications beyond the reach of theory unaided by experiment.

The consumption of fuel requisite to produce a given effect in steam machinery is a subject which claims our most careful attention, and every improvement that tends to economise that important article widens the sphere in which steam machinery can be advantageously applied; and while it is no uncommon occurrence to see a given duty performed by one engine at an expenditure of fuel less by one-half than is required by another, we may be sure that our efforts in this direction if intelligently pursued will not be in vain.

Believing that the Mechanical Engineer has an ample field wherein to exercise his talents, we have every confidence in the value of the opportunity offered by the pages of the *Canadian Journal* for recording the numerous improvements made in that branch of the profession, and for diffusing a general knowledge of those observations and improvements which, though only of trivial importance in detail, are of great consequence in the aggregate. We invite all who are engaged in such pursuits to contribute the results of their observations, in the belief that the seed thus sown will yield a fruitful harvest. A. B.

THE BROCK MONUMENT.

This structure progressed very rapidly last year, and only awaits the return of the working season for its completion. The Monument itself, exclusive of the fosse enclosure, is already erected, and the scaffolding removed. The stone lions on the angles of the sub-basement are now set up; and the bas-relief of the Battle of Queenston will be completed by Messrs. Cochrane & Pollock of Toronto, in sufficient time to be inserted in the Pedestal of the Monument in May next.

The enclosure, with the military trophies at the angles, will be executed in accordance with the original design, in the course of next summer, so as to have the whole completed by the Anniversary of the Battle of Queenston, on the 13th October, when it is proposed to Inaugurate the Statue of General Brock with all due ceremony.

From the summit, a very extensive and beautiful view is obtained,—the high lands in Pennsylvania being visible when the weather is favorable.

The following are the details of this Canadian Monument:—

The Column is of the Roman Composite Order. Its Pedestal stands on a platform of an elevation of twenty-seven feet, at the angles of which are lions rampant, supporting shields with the armorial bearings of the Hero. The sub-basement is distinguished by plainness of character and great solidity, having on one of its sides a plain polished granite slab, with a suitable inscription in letters of bronze. The sub-basement is placed on a platform slightly elevated, within a dwarf wall enclosure seventy-seven feet square, with a fosse around the interior; at each angle are placed military trophies in carved stone twenty feet in height. The entrance to the enclosure, and doorway to the interior of the Monument, will be on the east side, giving access to a gallery, or corridor, round the inner pedestal, one hundred and fourteen feet in extent, by five feet wide; on the north and south sides, in suitable vaults under the floor, are deposited the remains of General Brock, and those of his Aid-de-Camp, Col. McDonnell. The gallery is lighted by circular wreathed openings. The bold rocky scenery of the Queenston Heights which surrounds the site of this Monument and the space immediately adjoining, together with the close masses of dense foliage in picturesque clumps, as seen in connection with it add not a little to the effect of the column. The pedestal is sixteen feet nine inches square and thirty-eight feet in height, the die having on its pannelled sides appropriate basso relievos. The plinth is enriched with lions' heads and wreaths, continued round each side, with wreathed openings between each, to give light to the interior. The column itself is ninety-five feet in height and ten feet in diameter, fluted, and having an enriched base of laurel leaves entwined on the lower torus; the base of the shaft is enriched with palm leaves, upon which the flutes terminate. The capital of the column is very appropriate. It is twelve feet six inches in height; on each face is sculptured a figure of Victory ten feet six inches high, with extended arms over military shields, as volutes, having on their outward angles lions' heads, helmets, &c., the spaces between the acanthus being wreathed with palm leaves, somewhat after the example of a capital of an antique column at Albano, near Rome. The enriched abacus is fifteen feet square, in the angles of which will be spaces for persons to stand outside to view the surrounding scenery, thus avoiding the unsightly appearance of iron railings. Upon the abacus stands the cippus, of cast iron, galvanized, having within a chamber six feet in diameter, for persons to stand in to view the magnificent scenery and interesting objects which the commanding situation affords. Upon the cippus will be placed the Statue of the Hero, now in process of execution in stone, sixteen feet high, in proper military costume. From the gallery in the sub-basement a staircase of stone is continued to the summit. It is of capacious breath, of two hundred and fifty steps, worked with a solid stone newel the entire height, lighted by small loop-holes in the fluting of the column. The whole height of the Monument, including the Statue, will be 187 feet, executed wholly in Queenston stone.

There is only one column, either ancient or modern, in Europe, that will exceed the entire height of the Brock Monument,—that known as "The Monument," erected in London by Sir Christopher Wren, in commemoration of the great fire of 1666.

ST. ANDREWS CHURCH, HAMILTON.

This building, now erecting from the design of William Thomas, Esq., Architect, was commenced in 1854. The design is in the early decorated style of English Gothic Architecture, and is being constructed wholly of stone. The tower is of what is styled bush hammered and rubbed work, and the flanks and west end walling of rock work. The windows in the flank walls are three lights, and those in the end recess of four lights, each of rich and varied tracery. They will be glazed with tinted glass in ornamental quarries, arranged in geometrical figures. The roof is open to the apex, with arched principals having tracery points in the compartments, and with ceiling ribs and boarded pannels.

The tower, with double buttresses at the angles, already presents a bold and massive effect. The spire, with clustering pinnacles at the tower parapet, will be of cut-stone, and from its details, as shown in a beautifully executed chromo-lithographic view which has been forwarded to us, it will have a very striking appearance when completed. Its only fault is, that from the richness of the tower and spire the body of the building looks plain by the contrast. The entire height will be one hundred and eighty-five feet, and the whole will be completed this summer. It is worthy of special note that this will, we believe, be the first stone spire erected in Upper Canada. The total expenditure on this handsome and substantial edifice will amount to about eleven thousand pounds.

CHRIST'S CHURCH, HAMILTON.

In the year 1853 it was proposed to take down the old dilapidated building of Christ's Church, and erect a new one in the pointed style of Architecture, which has of late years come so much into favour, and to complete it with nave and side aisles. The east end, including the chancel and two compartments of the body of the Church, was completed in accordance with the new scheme in 1854. The new nave thus commenced, measures forty feet in width, and, including the side aisles, seventy-five feet in clear width. The style adopted is the early decorated; the whole of the exterior being executed in cut-stone. The ceiling of the nave is arched and groined with moulded ribs springing from very rich corbels, and with rich bosses at the intersections. The height of the nave is sixty feet. The clerestory windows are of the trefoil design, adopted as emblematical of the Trinity, and are glazed with stained glass. The interior of the Church is also finished in colours, and a very handsome chancel window of seven lights with rich tracery is filled with stained glass, executed by Messrs. Ballantine & Allan, of Edinburgh,—the same Glass Painters by whom the colored windows of the House of Lords were executed, from designs by Pugin. The whole of the exterior is to be completed in cut-stone, and the plan includes a tower and spire at the west end two hundred and twenty-five feet in height, and in a style corresponding with the richness of the parts already finished.

The estimated cost of the whole when completed is about £25,000. The Architect, Mr. Thomas, of Toronto, we understand has received instructions to renew operations; and it is expected that this Church will make some further progress towards completion during the present year.

TRAFALGAR-SQUARE, LONDON.

Fronting Parliament-street, in the British metropolis, is an open area, decorated and environed with a variety of architectural and artistic works, which, if they existed in Washington, would be pronounced by the citizens of the States the eighth wonder of the world. There is the National Gallery with a handsome, if not imposing façade; Northumberland House, with its quaint Elizabethan skreen and Percy Lion; the famous Charles I. statue; the not very famous George IV. statue; and the notorious, if not famous, Cockspur-street George III. with his redoubtable pigtail! Besides all these the lofty Nelson Column towers over the fountains and all else in the Square, making a *tout ensemble* which anybody but John Bull would find some other use for than to grumble at. What words would suffice for our colonial self-laudation could we transfer the whole to displace the stumps in one of our vacant Toronto "town lots." Yet since ever John Bull got it completed, he has been revolving in his mind, with sufficiently audible grumbling, how it is to be got rid of; and here is the latest scheme, which we would have fancied to be one of *Punch's* pleasantries, did it not come to us gravely authenticated by the testimony both of the *Times* and *Builder*:—

"Among the plans and notices deposited at the Private Bill Office of the House of Commons, for bills to be brought before the present Parliament, is one for a large hotel, on the plan of the Hotel du Louvre, Rue de Rivoli, Paris, to be built on the site of the National Gallery, and on the ground in the rear, now occupied by St. Martin's workhouse and the adjacent barrack-yard. The recommendation by a Committee of the House of Commons of the removal of the national collection of paintings from the building, suffices in some degree to give countenance to this sweeping project; though the idea generally entertained was that the whole building would be transferred to the Royal Academy, by whom the east wing is at present occupied."

LITERATURE AND THE FINE ARTS.

THE CODEX VATICANUS.

Mr. T. E. Moresby, through the *Times*, suggests an application to the authorities at Rome for permission to have the *Codex Vaticanus* No. 1209 photographed; a mode of copying manifestly superior to all others, from its certain accuracy, being equally free from the chance of errors by accident or design. "It is," he says, "probably the oldest Greek MS. of the Scriptures extant. The second volume contains the whole of the New Testament, with the exception of a few verses." If one manuscript can be photographed successfully, and that an ancient one, nearly all might; and then learned bodies and owners of private collections of MSS. might exchange copies, just as casts are now exchanged by the museums of Europe.

BACKING AND PAINTING COLLODION OR PAPER POSITIVES.

Of all the forms of Photography, perhaps a good collodion positive is the most pleasing: its softness and delicate gradation of tone far surpasses the harsh outline and metallic lustre of the Daguerreotype, or the heavy massing of light and shade, 'the soot and whitewash' of a copy on paper: it is therefore of consequence to Photographers to know the best mode and material for "backing up" in order to preserve to it these peculiar excellencies. The first method, as proposed by Dr. Diamond, of simply placing black velvet behind the plate, leaves little to

be desired: the velvet can be readily applied and at the same time preserved from creasing by being pasted on to paper, the edges of which can be turned over and pasted round the glass; it is, however, an improvement if the picture be first coated with a film of transparent varnish, such as gum damar or powdered amber dissolved in chloroform, and run on the plate in the same way as the collodion: this not only prevents the velvet from rubbing the picture, and the paste from acting on it chemically, but also imparts to it something of that beautiful tone which marks the pictures when wet and which they lose on drying. It is a slight objection to the above method that the velvet will often exhibit a whitening of its threads, but more serious is the objection arising from its expensiveness: a cheaper method has accordingly been employed by pouring a black varnish (such as the black Japan, or Coachmaker's varnish) over the picture, but in order to prevent the whites of the picture from being affected, it is necessary first to give a coating of the transparent varnish above mentioned, and even then, this object is not fully attained; for, the solvent of the two varnishes being the same, they act on each other and cannot be removed without destroying the collodion film; this defect is, however, obviated by using for the black a water-varnish instead of a bituminous one; that used by bootmakers for polishing patent-leather is found to answer perfectly, it dries readily and can at any time be dissolved off without injuring the film of transparent varnish or the picture. A third method has been proposed of applying a black varnish to the other side of the plate; this, however, has the great drawback of presenting objects in reverse like the Daguerreotype.

For painting the pictures on glass, three ways are open: either to lay dry colour on the collodion picture as in the Daguerreotype, or to varnish with a transparent film, and paint in either oil or water colours on that, or lastly, to paint on the reverse side of the plate: either of these methods is good enough for such as affect this meretricious style.

For colouring positives on paper, the most obvious mode is to apply colour to the face of the picture, in fact to make a painting of it, so that it ceases to be a "Photograph" and becomes a picture, by the hand of an artist more or less skilful, of which the outline only has been sketched by Photography. Another method however has been proposed, and was published in the *Genie Industriel*, by M. Minotto, and a patent seems to have been taken out for it in England by a Mons. Duppa, in July, although there can be little doubt that this must have been granted through inadvertence, as its claim could not possibly be supported. This consists in applying to positives on paper the process used many years ago for colouring Lithographs, under the title of CHROMO-LITHOGRAPHY; for this purpose the paper was varnished or waxed so as to be rendered transparent, and the colours were daubed upon the reverse side so as to shine through. Though inartistic in the extreme, this work is said to give passable results.

There can be no doubt that these plans of colouring Photographs, however repugnant to science, are legitimate exercises of art, and furnish a cheap and easy mode of supplying portraits without any heavy call either on the purse of the patron or the skill of the artist; but a system extensively pursued in the United States must be placed in quite a different category. We have reason to believe that hardly a photograph issues from a professional gallery in the U. S. which has not been first *doctored* by the Manipulator, touching up and supplementing defective bits, and painting over and obliterating blotches and blemishes. This practice

cannot be too severely reprobated, as the Photographer thus lays claim under false colours to a degree of excellence in his art from which it is certain he is removed *toto cœlo*. In the eyes of a genuine Photographer, the man who doctors a picture is an impostor to the public and a traitor to science.

J. B. C.

BUST OF TENNYSON.

The Edinburgh Correspondent of the *Inverness Advertiser* says—Mr. Brodie returned from the Isle of Wight a few days ago with what seems to be an admirable clay model for a bust of Alfred Tennyson, which has been commissioned, I believe, by one of our Edinburgh merchants, a man of taste and a great admirer of the poet. The bust in plaster will probably be sent to the Royal Scottish Academy's Exhibition this year, and it will doubtless excite a good deal of attention, for the likeness which Mr. Brodie has taken of the Laureate is really almost the only one in existence—at least it is the only one which gives a true idea of the poet's present appearance." On the same subject a writer in the Scottish Press remarks:—"As this work has been publicly referred to, we may state that we had an opportunity of seeing it in Mr. Brodie's studio, and in addition to what is said regarding it, we do not hesitate to express our belief that when the bust is exhibited, it will be generally pronounced to be the artist's highest effort in portrait sculpture. The clay model has been very carefully prepared. Mr. Brodie spent several days with Mr. Tennyson in the Isle of Wight, and had ample opportunities, of course, of studying his physiognomy—opportunities which are not often afforded, but which are of the highest value to the artist. He finished his model before returning home, and the bust may therefore be considered as complete as it was possible to make it in its present stage. The head is a very noble one, remarkable for its elevation at what phrenologists call the organ of veneration, and for the breadth and height of the forehead, over which the hair curls or rolls with a natural careless gracefulness. The features are large, and all the lines of the face powerful and strongly marked. The head is indicative alike of intellectual and physical power."

Mr. Brodie is well known as a young sculptor of great promise, and entirely self-taught. He executed a marble bust of Dante some years ago, for the late Lord Rutherfurd, which attracted great and deserved attention. He is now engaged on a beautiful statue designed to embody his idea of Œnone,—the Œnone of Tennyson's exquisite poem bearing that name.

CANADIAN INSTITUTE.

Session 1855-56.

THIRD ORDINARY MEETING—*12th January*, 1856.

E. A. Meredith, Esq., Vice President, in the Chair.

The following Gentlemen were elected Members:

R. S. Jameson, Esq., Toronto.
T. S. Hill, Esq., Yorkville,
Doctor Haswell, Toronto.
C. E. Anderson, Esq., Toronto.
W. McD. Dawson, Esq., C. L. Dep't., Toronto.
G. W. Wickstead, Esq., Leg. Ass'y, Toronto.
Edmund Morris, Esq., Toronto.
Joseph T. Kerby, Esq., Toronto.

Life Member.

[illegible] PAGE, Esq., Matilda.

The following Donations were announced, and the thanks of the Institute voted to the Donors:

Presented by M. De L. A. Huet Latour, N. P.—

Les Servantes de Dieu en Canada, 1853.

Essai de Logique Judicaire.

Catéchisme de l'Histoire du Canada, par M. Bibaud.

Court Traité sur l'Art Epistolaire.

Presented by the Hon. J. M. Broadhead, Washington, per A. H. Armour.

Smithsonian Report, 1854.

Statistical History of the United States' Navy, 1775 to 1853.

Report of the United States Coast Survey for year 1852.

The following Papers were read:

1. By Capt. Noble, Royal Artillery, F.R.S., "On the value of the Factor in the Hygrometric Formula."

2. By Professor Cherriman, M. A., "On a Method of reducing the general Equation of the second degree in plane co-ordinate Geometry."

3. By Professor Chapman, "Report of the Committee appointed to examine a specimen of the Proteus exhibited before the Institute."

4. By Professor Croft, D. C. L., "On some new Salts of Cadmium, and on the Iodides of Barium and Strontium."

MEAN RESULTS OF METEOROLOGICAL OBSERVATIONS AT HAMILTON, CANADA WEST, FOR THE YEAR 1855.

BY DR. CRAIGIE.

1855.	THERMOMETER.					BAROMETER.			DAYS.			YEARS.
MONTHS.	Mean at 9 a.m	Mean at 9 p.m.	Mean of both.	Highest.	Lowest.	Mean.	Highest.	Lowest.	Rainy.	Slight Showers.	Dry.	Mean Temperature of
	°	°	°	°	°	°	°	°				°
January	28·9	29·86	29·37	60	0	29·65	30·50	28·70	3	11	17	1846...50·215
February	18·857	19·43	19·143	45	—20	29·626	30·05	29·20	4	10	14	1847...48·163
March	31·22	33·00	32·11	60	11	29·559	30·04	29·00	3	8	20	1848...49·295
April	45·8	45·16	45·48	82	15	29·694	30·03	29·32	2	8	20	1849...48·105
May	58·0	55·9	56.95	85	36	29·6	29·98	29·40	1	5	25	1850...48·732
June	63·03	62·23	62·63	93	35	29·593	29·84	29·05	6	5	19	1851...48·756
July	72·1	71·2	71·65	96	50	29·71	29·90	29·48	2	12	17	1852...48·248
August	69·06	67.1	68·08	96	44	29·7465	30·02	29·28	3	3	25	1853...49·474
September	64·76	63·63	64·2	91	38	29·787	30·03	29·40	3	7	20	1854...49·013
October	48·13	47·65	47·89	83	30	29·586	29·90	29·16	5	8	18	1855...47·316
November	40·86	41·3	41·08	64	21	29·707	30·13	29·03	4	8	18	
December	29·13	29·29	29·21	55	0	29·616	30·16	28·54	6	8	17	Mean 48·732
Mean temperature of Year			47·316			29·6645		42	93	230		

MONTHLY METEOROLOGICAL REGISTER, AT THE PROVINCIAL MAGNETIC OBSERVATORY, TORONTO, CANADA WEST—DECEMBER, 1855.

Latitude—43 deg. 39.4 min. North. Longitude—79 deg. 21 min. West. Elevation above Lake Ontario, 103 feet.

Day.	Barom. at temp. of 32°.				Temp. of the Air.				Mean Temp. + or − of the Av'age	Tension of Vapour.				Humidity of Air.				Direction of Wind.			Mean Direction.	Velocity of Wind.				Rain in Inches.	Snow in Inches.
	6 A.M.	2 P.M.	10P.M.	MEAN	3 A.M	2 P.M	10PM	ME'N		6 A.M	2 P.M	10PM	ME'N	6 A.M	2 P.M	10 P.M	M'N	6 A.M.	2 P.M.	10 P.M.		6 A.M	2 P.M	10PM	ME'N		
					°	°	°	°	°																		
1	29.382	29·277	29.174	29·269	38.1	45.9	42.5	41.8	+ 11.0	0.154	0.207	0.217	0.194	68	78	81	76	S W	S S W	S S W	S 51 W	11.2	20.6	9.6	10.31	...	...
2	28.966	28·880	—	—	40·9	44·7	—	—		235	236	—	—	93	80	—	—	S b W	W b N	W S W	W 15 S	5.3	26.0	13.9	14.23	0.145	...
3	29.244	29·356	·499	·380	33.5	33·7	31.7	32.8	+ 2.7	177	138	143	146	93	71	80	78	W b S	W b S	W	W 6 S	12.2	20.3	12.2	15.55	...	Inp
4	·626	·634	·677	·651	32·3	38·8	34.2	34·2	+ 4.5	149	135	154	144	81	58	78	74	W	S W	W S W	W 28 S	14.5	12.0	5.6	10.65	...	...
5	·706	·698	·684	·698	31.6	44.4	38·8	37.5	+ 8.1	151	168	178	167	84	58	76	75	S W b W	S W b S	S S W	S 35 W	5.5	12.8	2.8	6.91	0.030	...
6	·636	·632	·777	·697	38·8	42.7	33.5	37.3	+ 8.3	216	132	151	179	93	67	79	79	S W	W	W b N	W	8 2	12.9	6.5	9.02	Inap	...
7	·950	30.014	30.001	·992	32·3	38.6	28.7	32·8	+ 4.1	162	156	134	144	89	58	84	78	W b S	N W	N E b E	N 6 W	5.7	6.2	4.0	7.00	...	...
8	·857	29·630	29·351	·577	34.1	36.8	37·0	36.0	+ 7.5	158	154	208	175	79	71	95	82	E S E	E S E	E S E	E 21 S	12.6	11.7	9.5	11.78	1.030	...
9	28.807	28·459	—	—	37.7	43·9	—	—	—	213	272	—	—	95	96	—	—	E b S	W	S W b W	W 54 S	21.0	10.4	14.2	17.84	0.140	Inp
10	28.740	28·079	·266	·029	29.1	25·5	20.0	24.0	— 3.9	143	114	069	109	89	80	61	76	W b S	N W	N W b W	W 29 N	21.0	18.6	26.2	19.30	...	Inp
11	29 559	29.735	·956	·786	18·3	24.9	21·2	21.3	— 6.4	058	085	075	073	55	61	63	63	W b N	N W b N	W N W	W 29 N	13.3	23.2	14.4	15.59	...	...
12	30.110	30.151	30·041	30.102	21·0	26.6	27·3	24.7	— 2.7	096	104	131	109	82	71	86	80	N W	S S E	E S E	E 2 S	10.5	5.7	7 9	6.82	...	0.6
13	29.909	29.963	30.079	30·007	26.6	30·9	19·5	25.7	— 1.5	127	143	091	120	87	82	82	84	N N E	N N E	N b W	N 1 W	6.8	5.0	5.6	5 57	...	...
14	30.084	29·964	29.760	29·926	21·2	32.0	35.5	30.3	+ 3.3	102	153	192	152	85	85	93	87	N N W	E	E b S	E 1 S	5.8	14.4	19.0	14.15	0.485	...
15	29.582	·598	·682	·626	39·5	40.8	36.0	38.4	+ 11.7	216	226	163	195	90	89	79	84	E	S S W	S W	S 40 W	8.5	6.2	3.2	4.29	0.015	...
16	·544	·398	—	—	35·2	39.3	—	—		182	214	—	—	89	90	—	—	S E b E	W N W	S W	W 34 S	0.9	5.0	12.8	6.73	...	...
17	·450	·424	·530	·477	32·9	35.7	26.4	31·3	+ 4.9	132	121	125	132	87	58	86	76	S W b W	W b S	W	W 5 S	9.4	21.5	22.6	17.94	...	0.1
18	·703	·818	·918	·825	21·2	24·5	21.3	22.1	— 4.1	091	062	085	083	78	46	73	67	W b S	W N W	S W b W	W 2 N	18.8	19.5	2.6	10.63	...	...
19	·910	·889	·946	·921	19.7	27.6	19.8	22.1	— 3.9	090	105	089	095	81	69	80	76	W N W	S W b S	N b W	N 41 W	6.5	2.6	4.2	3.54	...	...
20	·966	·897	·770	·865	17·6	32·9	34.1	28.4	+ 2.5	083	140	162	130	81	79	82	80	N N W	S S E	S E	S 23 E	3.0	9.9	5.8	6.73	...	...
21	·592	·352	·438	·435	36·2	41.2	39·8	38.7	+ 12.9	150	189	176	168	71	73	73	72	S E b S	S S W	W b N	S 35 W	9.4	8.2	11.7	9.69	...	...
22	·508	·311	·122	·312	34.1	32.7	32.7	32.9	+ 7.2	177	156	164	165	91	85	89	89	N N E	E N E	N	N 36 E	6.8	15.6	11.0	11.03	...	4.6
23	·355	·359	—	—	30.5	36.1	—	—		155	177	—	—	91	84	—	—	S W b W	S W b S	W	W 14 S	6.5	16.2	17.4	14.23	...	...
24	·965	30·027	·972	·985	15.8	19·8	16.5	16.9	— 8.6	075	078	077	075	78	71	80	76	W b N	W	N	N 29 W	9.8	1.8	5 5	6.58	...	5.2
25	·747	29·600	—	—	16.0	18·0	—	—		040	084	—	—	84	82	—	—	N E	N b E	N	N 9 E	13.0	8.0	9.8	9.68	...	5.8
26	·596	·722	·915	·775	10.8	15·8	10.2	11.1	— 14.2	067	053	057	057	88	53	77	74	N W	W b S	W S W	W 10 S	5.4	27·8	14.8	16.54	...	...
27	30.014	30·052	·997	30.017	7·2	17.8	16.3	13.3	— 12.0	052	063	067	064	79	66	70	75	W b S	W b S	W b S	W 16 S	24.6	26.8	12.5	16.39	...	0.2
28	29.833	29.829	·998	29·886	15.1	19.7	5 0	12.3	— 12.9	076	078	051	061	84	71	85	78	W	N W	N	W 41 N	8.0	21.0	2.0	9.28	...	...
29	·949	·769	·267	·608	−2.1	9.8	11.1	6.6	— 18 6	027	056	070	052	62	77	90	77	N b E	N E	N E	N 29 E	9.0	16.1	19.8	16.28	...	15.0
30	·262	·377	—	—	4.5	22.2	—	—		048	092	—	—	83	75	—	—	W	W S W	W S W	W 22 S	8.7	14.0	24·8	16.56	...	...
31	·062	·071	707	·686	14·4	22.4	18.3	17.7	— 7.5	070	105	081	082	78	85	78	79	W S W	W S W	W S W	W 26 S	12.2	15·2	11.8	12·48	...	...
M	29·701	29.697	29.701	29.702	24.8	30.5	26.3	27.0	— 0.10	0.121	0.127	0.124	0.123	81	70	80	77				W 2 S	10.15	14 04	11.06	11.38	1.845	20.5

Highest Barometer ..... 30.201 at 10 a. m., on 12th } Monthly range=
Lowest Barometer ..... 28.459 at 2 p. m., on 9th } 1.742 inches.

Greatest Barometric range in 24 hours, from 2 p. m., of 8th to 2 p. m., of 9th..... } = 1.171 inches.

Highest registered temperature..... 47°0 at p. m., on 9th } Monthly range=
Lowest registered temperature..... -5°2 at a. m., on 29th } 52°2

Mean maximum Thermometer..... 32°91 }
Mean minimum Thermometer..... 18°75 } Mean daily range = 14°16

Greatest daily range ..... 25°6 from p. m. of 28th to a. m. of 29th.
Least daily range..... 0°8 from p. m. of 8th to a. m. of 9th.

Warmest day..... 1st ... Mean temperature..... 41°78 }
Coldest day.....29th ... Mean temperature..... 6°60 } Difference = 35°18.

Greatest intensity of Solar Radiation ... +58°0 on p. m. of 9th } Monthly range=
Lowest point of Terrestrial Radiation... -11°5 on a. m. of 29th } 69°5

Aurora observed on 4th, from 10.30 p. m., till midnight; possible to see aurora on 13 nights; impossible to see aurora on 18 nights.

Rain fell on 6 days, amounting to 1.845 inches—raining 28.8 hours. Snow fell on 10 days, amounting to 29.5 inches—snowing 54.7 hours.

Mean of cloudiness 0.67; most cloudy hour observed, 4 p. m., =0.74; least cloudy hour observed, 10 p. m., =0.59.

Halo's observed round the moon on 1st. at 6 a. m., diameter 45°0; on 18th. at 10 p. m., diameter 44°0; on 20th, at 10 p. m., diameter 45°0; on 26th, at 6 a. m.

Sum of the Atmospheric Current, in miles, resolved into the four Cardinal directions.

North.	West.	South.	East.
1825.54	5358.60	1990.35	1404 06

Mean direction of the wind, W 2° S.

Mean velocity of the wind..... 11.38 miles per hour.

Maximum velocity ..... 30 8 miles per hour, from 7 to 8 p. m., on 23rd.

Most windy day ..... 10th...Mean velocity 19.30 miles per hour.

Least windy day ..... 19th...Mean velocity 3.54 ditto.

Most windy hour ..... 1 to 2 p. m....Mean velocity 13.87 ditto.

Least windy hour..... 7 to 8 a. m....Mean velocity 9.04 ditto.

Mean diurnal variation ... 4.83 miles.

MEAN temperature 0°8 above the average of 16 years.

RAIN..... 0.323 inches above the mean of 15 years.

SNOW..... 15.3 inches above the mean of 13 years and more than double the average; only once equalled, *i. e.* in December, 1850.

WIND..... 4.13 miles per hour above the mean, being the greatest monthly mean velocity yet recorded.

BAROMETER..... The greatest barometric depression ever recorded, occurred on Sunday, 9th. December, at 2 p. m.

COMPARATIVE TABLE FOR DECEMBER.

YEAR.	TEMPERATURE.					RAIN.		SNOW.		WIND.	
	Mean.	Diff. from Aver.	Max. obs'd.	Min. obs'd.	Range.	Days.	Inch's.	Days.	Inch's.	Mean Direc'n.	Mean Force or Velocity.
	°	°	°	°	°						
1840	24.3	— 1.9	41.0	— 4.4	45.4	3	Inapp	18	...	...	...
1841	28.7	+ 2.5	45.5	+ 2.4	43.1	7	6.600	5	...	...	1.83 lbs.
1842	24.7	— 1.5	40.3	+ 3.8	36.5	3	0.880	17	...	...	0.61 "
1843	30.0	+ 3.8	41.1	+ 2.7	38.4	6	1.040	8	8.1	...	0.53 "
1844	28.2	+ 2 0	48.9	— 0.8	49.7	6	Imp't	6	4.2	...	0.40 "
1845	21.1	— 5.1	37.6	— 2.7	40.3	2	Inapp	12	4.7	...	0.70 "
1846	27.5	+ 1.3	49.2	+ 3.7	45.5	5	1 215	9	6.0	...	0.57 "
1847	30.1	+ 3.9	50.0	+ 6.6	43.4	7	1.185	8	6.8	...	0.35 "
1848	29.1	+ 2.9	49.1	+ 0.6	48.5	7	2.750	7	16 5	W 7° S	5.44 miles.
1849	26.5	+ 0.3	41.3	— 5.2	46.5	5	0.840	12	9.6	W 8° N	6.23 "
1850	21.7	— 4.5	48.3	— 9.7	58.0	2	0.190	18	29.5	N 44° W	7.40 "
1851	21.5	— 4.7	43.8	—10 5	54.3	6	1.075	15	10.7	W 8° N	7.37 "
1852	31.9	+ 5.7	51.0	+13.9	37.1	7	3 995	10	20.1	W 21° S	6.54 "
1853	25.3	— 0.9	42.2	— 5.2	47·4	4	0.625	13	22.3	N 38° W	4.98 "
1854	21.9	— 4.3	41.8	— 5.9	47.7	5	0.590	12	17.2	W 43° N	8.66 "
1855	27.0	+ 0.8	45.9	— 2.1	48.0	6	1.845	10	29.5	W 2° S	11.38 "
Mean	26.22	...	44.81	— 0.80	45.61	5.1	1.522	11.2	14.2	...	0.64 lbs. 7.25 miles.

MONTHLY METEOROLOGICAL REGISTER, AT THE PROVINCIAL MAGNETIC OBSERVATORY, TORONTO, CANADA WEST.—JANUARY, 1856.

Latitude. 43 *deg.* 39·4 *min. North. Longitude.* 79 *deg* 21 *min. West. Elevation above Lake Ontario,* 108 *feet.*

Day.	Barom. at temp. of 32°.				Temp. of the Air.				Mean Temp. + or − of the Av'age.	Tens. of Vapour.				Humidity of Air.				Direction of Wind.			Mean Direction.	Velocity of Wind.				Rain in Inches.	Snow in Inches.
	6 A.M.	2 P.M.	10 P.M.	MEAN.	6 A.M	2 P.M	10 P.M	ME'N		6 A.M	2 P.M	10 P.M	M'N	6 A.M	2 P.M	10 P.M	M'N	6 A.M.	2 P.M.	10 P.M.		6 A.M	2 P.M	10 P.M	ME'N		
					°	°	°	°	°																		
1	29.802	29.922	29.999	29·9183	15·8	21.2	20·5	18·65	— 6.57	.077	.085	.098	.085	83	73	86	81	S W b W	W S W	Calm	W 10° S	5.0	6.2	0.0	4.64	...	...
2	.994	.845	·737	.8432	12·8	28.9	21.9	21·82	— 3.38	063	109	106	097	77	68	87	79	N	S E b S	N E	E 3 S	2 6	4.2	0.5	2.16	...	...
3	.545	.522	·928	.6853	24.8	28.5	15.3	21.52	— 3 63	115	115	066	093	84	73	71	75	N W b W	W b S	W S W	W	0.7	19.6	14.0	13.43	...	...
4	30.136	30.231	30·172	30.1795	9.1	12·2	12.4	11.88	—13.25	054	062	052	057	76	77	64	72	N b E	N b W	N b E	E 17 N	4.6	3.2	5.4	6.55	...	In p
5	29.970	29.798	29.726	29·8330	17.2	11.1	12.0	13 60	—11.55	081	063	068	070	81	81	83	81	E b S	N E b N	N E b N	N 38 E	20.2	16.8	12.5	14.73	...	2.0
6	.757	.773	—	—	8.6	19.7	—	—	—	058	090	—	—	83	81	—	—	N	S W b W	W	S 32 W	10.0	4.8	0.2	6.55	...	...
7	.664	.321	·343	29·4342	22·8	31.7	22.6	24.78	— 0·35	105	148	101	121	83	83	81	87	S S E	S b W	W b S	S 43 W	12.5	13.7	17.2	17.82	...	1.0
8	.452	.506	·612	.5300	128	−0·3	—4.3	—1.87	—27.00	035	038	021	032	69	83	50	72	W S W	W S W	W b S	W 14 S	23.6	28.8	21.0	24.19	...	...
9	.624	.607	·649	.6295	−1.1	0.4	—4.3	—4·63	—29·77	028	034	034	033	1.00	71	90	85	W b S	W b S	W S W	W 14 S	27.6	23·0	16.6	20.56	...	...
10	.713	.785	30·006	.8525	6·5	23.4	16.2	15.92	—10·03	045	091	084	074	.70	71	88	78	W S W	W N W	W b S	W 1 S	24·7	23.4	10.2	16.29	...	In p
11	30.048	30.062	30.035	30·0502	15·2	18.6	2.0	9.62	—15.43	071	080	029	060	79	76	67	76	S W b W	S W b S	Calm	W 23 S	11.8	11.1	0 0	7.25	...	...
12	29.975	29.776	29·621	29.7698	8.3	29.1	28.7	22.60	— 2.48	061	136	151	116	90	84	96	89	N	E	E	E 12 N	5.0	16.0	22.0	15.45	...	4.4
13	.370	·270	—	—	24.1	23·0	—	—	—	126	115	—	—	96	90	—	—	N E b N	N	N N W	N 2 E	12.0	17.0	6.2	11.64	...	2.8
14	.459	.503	.550	·5105	18·3	21.3	17.1	18·58	— 6.52	098	092	088	088	94	78	89	84	N N W	N b W	N W b N	N 25 W	15.4	10.0	8.5	11.17	...	0.1
15	.572	·510	·508	.5275	16·9	24.1	9·3	17·43	— 7.67	083	104	061	081	84	77	85	79	N W	N W b N	W b N	W 19 N	11.3	12.0	7.3	8.71	...	...
16	.382	.197	·202	·2497	18.6	25·3	24.8	23.03	— 1.97	084	121	108	103	80	87	79	80	S W	S W b W	W S W	W 24 S	18.4	18.1	13.0	15.54	...	0.5
17	.238	·265	.402	·3122	25·1	33.0	29·8	29·30	+ 4.28	112	169	142	139	81	90	86	85	W	W S W	S W b W	W 23 S	15.2	11 9	13.3	8.75	...	...
18	.435	.424	.436	.4348	29 1	32.9	29.3	29·95	+ 4.98	143	166	131	142	89	89	81	85	W b S	S W	N	N 38 W	1.0	7.8	11.2	7.47	...	In p
19	.539	·730	·863	.7112	18.3	11.2	3.6	10.40	—14.48	091	048	042	057	88	63	74	74	N	N	N	N 5 E	15.0	11.2	13.2	11.64	...	...
20	.772	.690	—	—	0.2	6.9	—	—	—	032	049	—	—	68	75	—	—	N b E	N	N N W	N 4 W	10.6	15.6	4.4	9.37	...	...
21	.611	·615	.645	.6297	10·2	13.3	5.2	9·45	—15.33	062	055	046	052	83	65	77	72	N	N N W	N W	N 25 W	13.4	11.0	5.2	9.43	...	...
22	.612	·608	.662	·6357	7.6	24·4	24 4	18.65	— 6.72	055	115	113	090	83	86	84	84	Calm	Calm	W b N	W 6 N	0.0	0.0	4.0	2.59	...	1.2
23	·710	·697	.702	7072	14.1	24.6	18.5	19.23	— 5.43	077	098	085	085	87	72	81	78	W N W	S W	S W b W	W 27 S	6.3	13.4	15.8	12.65	...	...
24	.637	.577	.872	·7160	16.5	22.9	13.3	16·80	— 7.77	077	080	061	071	80	64	72	71	S W b W	W S W	N W b N	W 21 N	18.0	21.0	12.0	17·48	...	In p
25	30.144	30.260	30.280	30.2388	−1.1	9·3	−2.1	2.42	—22.17	031	057	028	035	67	81	61	63	N W b N	W N W	W b S	N 42 W	15.5	8.0	4.1	9.20	...	...
26	30.265	30·134	29·982	30.1090	1·1	21.6	7.1	10.15	—14.33	033	081	053	058	66	69	81	74	W N W	S W b W	Calm	N 6 W	5,8	2.2	0.0	3.81	...	...
27	29.758	29.492	—	—	12.2	20·8	—	—	—	069	096	—	—	83	83	—	—	N N E	N E	N E b N	N 34 E	8.0	14.3	13.0	10.19	...	1.1
28	.176	·252	·418	29.2898	18 7	23.8	23.7	21.93	— 2.37	093	107	099	098	88	82	75	81	N E b N	Calm	W b N	N 27 W	8 2	0.0	5.4	2.96	...	0.3
29	.465	·393	.327	.3993	10.8	25 8	24.0	21·33	— 2.87	061	109	108	091	80	76	82	78	W N W	W S W	S W b W	W 21 S	0.5	9.6	11.5	8.23	...	0.2
30	.304	·333	.484	.3847	18·3	21.0	12.2	16.52	— 7.58	081	075	063	071	78	65	79	74	W b S	W S W	W b S	W 16 S	16.6	18.9	16.8	16.86	...	In p
31	·589	.527	.405	.5018	11.4	18.7	15.1	15.03	— 8.95	061	083	072	071	78	78	80	77	W S W	S W b S	Calm	W 32 S	14.8	1.8	0.0	3.91	...	...
M	29.6689	29.6446	29.6854	29.6696	13.19	20.67	14.60	16.02	— 8.78	.073	.093	.078	.080	.81	.76	.79	.78	W 15° N	W 4° N	W 24° N	W 15 N	11.43	12.08	9.18	10.69	none	13.6

REMARKS ON TORONTO METEOROLOGICAL REGISTER FOR JANUARY.

Highest Barometer ..... 30.280 at 10 p. m. on 25th } Monthly range=
Lowest Barometer ..... 29.186 at midnig't on 16th } 1.094 inches.

Highest registered temperature ..... 34°4 at p. m. on 18th } Monthly range=
Lowest registered temperature .....—12°1 at a. m. on 9th } 46°5

Mean maximum Thermometer ..... 22°65 }
Mean minimum Thermometer ..... 6°02 } Mean daily range = 16°63

Greatest daily range..... 34°6 from p. m. of 7th to a. m. of 8th.
Least daily range ..... 8°4 from p. m. of 13th to a. m. of 14th.

Warmest day ..... 18th ... Mean temperature..... 29°95 }
Coldest day..... 9th ... Mean temperature..... —4°63 } Difference= 34°58.

Greatest intensity of Solar Radiation..... 44°6 on p. m. of 3rd } Monthly range=
Lowest point of Terrestrial Radiation ... —19°8 on a. m. of 9th } 64°4

Aurora observed on one night, viz., on the 15th; possible to see aurora on 12 nights; impossible to see aurora on 19 nights.

Snowing on 14 days, depth 13.6 inches—snowing 88.4 hours. No rain fell during this month at the Observatory.

Mean of cloudiness 0.66; most cloudy hour observed, 8 a. m., =0.73; least cloudy hour observed, midnight, =0.59.

No thunder or lightning recorded this month.

Sum of the Atmospheric Current, in miles, resolved into the four Cardinal directions.

North.	West.	South.	East.
2621.41	4734.20	1585.27	972.97

Mean direction of the wind, W 15° N.

Mean velocity of the wind..... 10.69 miles per hour.

Maximum velocity ..... 30.4 miles per hour, from 1 to 2 p. m. on 8th.

Most windy day ..... 8th...Mean velocity 24.19 miles per hour.

Least windy day..... 2nd...Mean velocity 2.16 ditto.

Most windy hour..... noon to 1 p. m....Mean velocity 12.34 ditto.

Least windy hour ... 11 p. m. to mid't...Mean velocity 9.02 ditto.

Mean diurnal variation ... 3.32 miles.

The mean temperature of the month, and the absolute maximum temperature of the month, were the lowest ever recorded for January.

No rain fell during the month. This deficiency of rain was not compensated by any unusual amount of snow, the quantity of snow having scarcely differed from the average.

This month was the most windy January on the records of the Observatory.

COMPARATIVE TABLE FOR JANUARY.

Year.	Temperature.					Rain.		Snow.		Wind.	
	Mean.	Diff. from Aver.	Max. obs'd.	Min. obs'd.	Range.	Days.	Inch's.	Days.	Inch's.	Mean Direc'n.	Mean Force or Velocity.
	°	°	°	°	°						
1840	17.0	—6.8	40.6	—13.8	54.4	4	1.395	11	...	...	...
1841	25.6	+ 1.8	41.7	— 4.1	45.8	2	2.150	14	...	...	0.36 lbs.
1842	27.9	+ 4.1	45.8	+ 1.3	44.5	5	2.170	9	...	...	0.78 "
1843	28.7	+ 4.9	54.4	+ 1.5	52.9	6	4.295	12	14.2	...	0.69 "
1844	20.2	- 3.6	44.6	— 7.7	52.3	7	3.005	11	24.9	...	0.70 "
1845	26.5	+ 2.7	43.0	— 3.4	46.4	5	Imp't	9	22.7	...	0.70 "
1846	26.7	+ 2.9	41.2	+ 0.3	40.9	5	2.335	10	6.0	...	0.55 "
1847	23.3	— 0.5	42.6	— 2.2	44.8	7	2.135	5	7.5	...	1.09 "
1848	28.7	+ 4.9	51.5	—12.0	63.5	7	2.245	8	7.1	W 9° N	5.82 miles.
1849	18.5	— 5.3	40.1	—15.2	55.3	4	1.175	10	9.2	W 27° N	6.71 "
1850	29.7	+ 5.9	46.3	+10.6	35.7	5	1.250	8	5.2	N 37° W	5.80 "
1851	25.5	+ 1.7	43.2	—12.8	56.0	4	1.275	10	7.8	W 13° S	7.69 "
1852	18.4	— 5.4	37.3	— 7.0	44.3	0	0.000	19	30.9	W 22° N	7.67 "
1853	23.0	— 0.8	40.9	— 6.6	47.5	1	0.290	6	7.5	N 27° W	6.34 "
1854	23.6	— 0.2	45.2	— 4.3	49.5	7	1.270	11	7.5	W 12° N	6.86 "
1855	25.9	+ 2.1	48.2	— 4.7	52.9	5	0.525	13	23.3	W 10° N	7.67 "
1856	16.0	—7.8	33.1	—12.1	45.2	0	0.000	14	13.6	W 15° N	10.69 "
Mean	23.83		43.51	— 5.42	48.94	4.4	1.595	10.6	13.4		7.25 miles.

MONTHLY METEOROLOGICAL REGISTER, ST. MARTIN, ISLE JESUS, CANADA EAST—DECEMBER, 1855.

(NINE MILES WEST OF MONTREAL.)

BY CHARLES SMALLWOOD, M. D.

Latitude—45 de,. 32 min. North. Longitude—73 dcg, 36 min. West. Height above the Level of the Sea—118 feet.

Day.	Barom. corrected and reduced to 32° Fahr.			Temp. of the Air.			Tension of Vapor.			Humidity of Air.			Direction of Wind.			Velocity in miles per hour.			Rain in Inches.	Snow in Inches.	Weather, &c. A cloudy sky is represented by 10; A cloudless sky by 0.		
	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.			6 A. M.	2 P. M.	10 P. M.
1	29.545	29.482	29.440	25.5	43.6	35.4	.147	.274	.189	.92	.80	.89	S S E	SbyW	S S E	3.66	2.64	1.23	...	...	Cir. Cum. Str. 4.	Cir. Cum. Str. 10.	Str. 4.
2	.246	28.987	28.965	34.2	48.0	42.0	194	290	253	90	83	85	S E	SE by S	S W	6.92	3.31	6.43	0.166	...	Cir. 4.	Cum. Str. 8.	Cir. Str. 9.
3	.239	29.293	29.484	33.0	37.1	32.1	179	167	167	89	70	83	W S W	W S W	S W b W	12.81	17.45	2.54	...	...	Str 2.	Do. 2.	Str. 9.
4	.634	.860	.836	31.0	34.0	33.1	178	186	187	92	87	90	W S W	S W	S W	10.82	11.70	8.44	...	...	Do. 9.	Do. 8.	Cum. Str. 4.
5	.852	.857	.880	25.6	43.1	33.3	147	252	178	92	85	86	S by W	S W	S S W	14.82	4.06	1.23	...	...	Clear.	Clear.	Clear, ft Au. Bo.
6	.857	.767	.805	28.0	37 2	33.0	153	199	199	88	84	96	S E	NE by N	S W by S	0.20	Calm	0.06	0.133	In p	Do.	Cum. Str. 8.	Snow.
7	.938	30.001	30.124	31.6	32.0	19.1	182	146	103	94	73	82	N W b W	W N W	W by N	6.00	11.05	10.62	...	...	Do.	Clear.	Clear, Aur. Bor.
8	30.083	29.974	29.854	13.1	29.8	19.0	088	152	110	87	84	88	W	W	S E	4.00	1.78	0.08	...	...	Do.	Do.	Do.
9	29.408	.041	28.738	20.0	32.3	30.6	114	191	177	90	95	95	NE by E	NE by E	NE by E	6.22	9·21	12.53	1.900	In p	Snow.	Sleet.	Sleet.
10	28.689	28.820	29.110	32·5	30.6	21.8	197	152	115	95	78	82	S W	W	W S W	12.22	11.06	15.82	...	In p	Cum. Str. 4.	Cir. Str. 10.	Cir. Str. 10.
11	29 560	29.730	.976	11.0	12.6	8.0	087	073	028	93	73	80	W	W	W by N	17.13	21.18	16.73	...	...	Do. 10.	Do. 8.	Clear, Zod. Light
12	30.177	30.264	30.329	5.5	13.1	7.7	031	083	028	82	81	80	W	W	W by S	17.12	10.55	4.27	...	...	Clear.	Clear.	Do. Aur. Bor.
13	.296	.206	.231	5.0	15.6	10.1	031	078	074	82	73	82	NE by N	NE by E	N N W	0.38	5.33	2.13	...	...	Do.	Str. 10.	Do. Aur. Bor.
14	.172	.282	.207	20.0	29.1	23.2	114	161	129	87	89	90	W S W	W	NE by E	1.73	1.60	0.27	...	...	Cum. Str. 9.	Cum. Str. 6.	Cum. Str. 9.
15	.119	.101	.091	18.3	32.0	31.1	153	167	178	88	83	92	NE by E	NE by E	NE by N	9·93	9.07	9.10	...	0 90	Snow.	Snow.	Do. 10.
16	29.839	29.545	29.580	18 5	33.0	33.4	161	199	205	89	99	99	N E	N E	S W	4 68	5.82	0.62	0.388	...	Cir. Str. 10.	Rain.	Rain.
17	.540	.489	.504	31.3	38.1	32.0	185	227	186	96	90	94	S W	S W	S W	9.93	16.00	9.02	0.243	...	Do. 6.	Cir. Str. 4.	Cum. Str. 8.
18	.721	.832	.989	20.5	25.0	21.7	118	128	123	88	80	88	W	W	W	12.15	10.32	7.70	...	...	Clear.	Cir. Cum. Str. 4.	Do. 9.
19	30.139	30.126	30.149	14.2	17.1	7.0	095	096	061	90	83	92	N N W	N E	N E	1.99	3.01	Calm	...	...	Cir. Str. 10.	Do. 5.	Do. 6.
20	.259	.124	.124	0.9	20.9	12.6	042	077	080	84	60	81	N W b W	N E	E by N	0.06	Calm	Calm	...	...	Clear.	Clear.	Cir. Cum. Str. 9.
21	29.923	29.753	29.634	9.4	18.6	31.0	067	097	185	93	79	95	N E by E	N E by E	S by E	2.02	1.27	0.50	...	...	Cir. Str. 10.	Cir. Str. 9.	Cir. Str. 10.
22	.700	.834	.516	33.0	38.9	31.8	187	194	191	90	75	95	W by S	E by N	N E by E	Calm	0.61	5.63	...	0.40	Do. 9.	Do. 9.	Snow.
23	.346	.533	.589	31.1	35.0	34.4	186	203	204	99	91	98	W	W S W	S S W	13.45	10.42	6.08	0.140	2.60	Rain.	Do. 8.	Cum. Str. 10.
24	30.071	30.173	30.152	14.4	15.8	10.1	091	087	065	86	78	74	W	W by S	N E by E	19.03	9.67	4.64	...	...	Str. 4.	Do. 4.	Str. 10.
25	.058	29.892	29.679	4.2	4.0	5.3	038	051	058	95	80	92	N E by E	N E by N	N E by N	5.60	18.26	20.23	...	3·40	Snow.	Snow.	Snow.
26	29.435	.620	.916	4.8	9.2	3.8	056	061	050	95	80	85	W N W	W	W	20.16	20.80	14.83	...	2.68	Do.	Clear.	Clear, Zod. Light
27	.954	30.037	30.059	4.2	11.2	8.6	038	077	066	95	83	92	S W	W	S W	3.41	10.76	4.32	...	0.34	Clear.	Cir. Str. 8.	Cir. Str. 8.
28	.914	29.908	30.078	9.3	12.1	3.8	067	080	034	93	83	90	W N W	W by N	N W	4.06	4.17	7.11	...	3.06	Str. 10.	Do. 4.	Clear, Zod. Light
29	30.239	30.196	30 085	23.2	5.1	10.4	014	027	023	87	68	81	W	N E by N	N E by E	1.11	0.01	5·01	...	...	Clear.	Do. 10.	Str. 10. [Light.
30	29.297	29.407	29.871	1.1	11.2	1.8	043	067	049	92	73	94	N E by N	W S W	S W	19.22	12.20	7.77	...	6.30	Snow.	Clear.	Clr., Au. Bo. Zod.
31	.731	.845	.852	16.4	26.8	17.5	098	118	102	90	73	88	W W	W S W	S S W	6.37	14.23	1 86	...	0.75	Do.	Cir. Str. 4.	Cir. Str. 10.

MONTHLY METEOROLOGICAL REGISTER, ST. MARTIN, ISLE JESUS, CANADA EAST—JANUARY, 1856.

(NINE MILES WEST OF MONTREAL.)

BY CHARLES SMALLWOOD, M. D.

Latitude—45 deg. 32 min. North. Longitude—73 deg. 36 min. West. Height above the Level of the Sea—118 feet.

Day.	Barom. corrected nd reduced to 32° Fahr.			Temp. of the Air.			Tension of Vapor.			Humidity of Air.			Direction of Wind.			Mean direction of Wind.	Velocity in miles per hour.			Rain in Inches.	Snow in Inches.	WEATHER, &c. A cloudy sky is represented by 10; A cloudless sky by 0.		
	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.		6 A.M.	2 P.M.	10 P.M.			6 A. M.	2 P. M.	10 P. M.
1	29.836	30.016	30.241	18.4	17.0	2.1	.106	.096	.052	.87	.83	.89	W S W	W	W N W	W 24 ° S	7.14	20.31	6.34	...	...	Cum. Str. 6.	Clear.	Clr. Zod. L. B.
2	30.283	.233	.139	1.1	12.9	3.0	048	064	049	90	63	87	N E by N	N E by E	N E by E	E 37 N	4.25	4.70	6.01	...	Inp	Do. 10.	Cir. Cm. St. 4.	Cir. Str. 2.
3	29.842	29.547	29.614	14.0	24.4	25.0	091	127	129	87	85	82	N E by E	N E by E	W S W	E 43 N	7.54	6.74	2.00	...	6.50	Snow.	Snow.	Do. 10.
4	30.237	30.260	30.520	—5.3	—1.0	—12.6	031	035	019	89	74	63	W N W	W N W	W N W	W 13 N	25.97	15.06	4.74	...	...	Clear.	Clear.	Clr. Zod. L. B.
5	.411	.356	.184	—20.9	—10.1	—4.9	016	023	034	85	76	80	N E by E	N E by E	N E by E	E 35 N	7 37	5.31	16.05	...	...	Cir. Cum. 4.	Cir. Cm. St 10	Str. 10.
6	.081	29.838	.077	—1.8	6 0	—8.1	039	059	029	87	90	84	N E	E N E	N E	N 40 E	21.66	14.51	1.09	...	...	Cir. Cm. St. 9.	Str. 6.	Clr. Zod. L. B.
7	.146	.987	29.901	—13.9	5.4	7.8	023	056	063	90	88	90	E by N	E N E	E N E	E 24 N	0.44	13.20	8.12	...	Inp	Cir. Str. 2.	Cir. Str. 2.	Cir. Str. 6.
8	29.531	.456	.553	18.8	14.6	—0.4	110	069	039	88	64	83	W S W	W by S	W by S	W 12 S	11.68	16.80	18.20	...	2.15	Snow.	Cir. Cm. St. 3.	Clr. Zod. L. B.
9	.639	.641	.642	—9.0	1.0	—7.4	028	044	033	83	80	81	W by S	W by S	W by S	W 12 S	13.41	16.75	10.65	...	...	Cir. Cum. 4.	Cir. Str. 6.	Do.
10	.654	.871	.902	—8.1	8.0	9.0	026	065	067	79	80	87	W by S	W by S	W by S	W 12 S	11.91	28.40	22.15	...	...	Cir. Str. 8.	Do. 6.	Do.
11	30.036	30.051	30.210	6.1	17.0	5.9	059	079	031	89	74	90	W by S	W	N W	W 10 S	17.10	17.32	6.92	...	...	Clear.	Clear.	De.
12	.256	.251	.193	4.2	9.1	8.3	056	067	065	93	90	91	E N E	N E by E	N E by E	E 37 N	0.41	2 30	12.13	...	...	Cir. Str. 9.	Cum. Str. 10.	Cir. Str. 10.
13	29.780	29.580	29.454	11.0	13.6	14.0	068	083	091	80	82	87	N E by E	N E by E	N E by E	E 37 N	13.16	23.35	35.27	...	8.70	Snow.	Snow.	Snow, gt. stm.
14	.576	.590	.603	16.2	20.0	17.3	105	107	096	94	82	84	N E by E	N N W	N W b W	N 22 E	28.14	6.47	Calm	...	3.51	Do.	Do.	Do.
15	.614	.536	.562	15.2	27.4	12.7	095	156	088	87	85	87	W N W	W S W	S W b W	W 18 S	Calm	Calm	2.00	...	...	Cir. Str. 6.	Clear.	Clear.
16	.496	.314	.255	11.1	26.1	25.0	087	141	129	93	88	88	W S W	W S W	S W	W 35 S	15.40	7.75	2.22	...	2.80	Str. 10.	Snow.	Cir. Str. 10.
17	.273	.342	.476	23.7	27.9	17.0	135	153	096	90	88	83	W S W	W S W	W N W	W 34 S	3.07	2.40	5.53	...	Inp	Cir. Cum. 4.	Cir. Str. 2.	Clear.
18	.621	.568	.678	15.5	22.9	13.0	105	099	088	90	69	87	W S W	W by N	N W	N 43 W	5.88	6.66	1.56	...	...	Cum. Str. 6.	Cum. Str. 6.	Cir. Str. 8.
19	.811	.849	.982	—3.0	10.7	—4.7	041	065	038	90	80	89	N by E	W S W	W by N	N 16 W	5.00	4.80	4.91	...	...	Clear.	Clear.	Clear.
20	.970	.895	.751	—15.5	9.0	—3.0	019	051	036	80	66	84	S W b S	S W	S W	W 29 N	3.06	0.06	2.41	...	...	Do.	Do.	Light Cir.
21	.738	.621	.689	—12.4	14.0	—1.9	023	067	043	89	71	90	W by S	S W	W S W	W 25 S	0.00	2.10	3.63	...	...	Do.	Do.	Clear.
22	.764	.662	.741	—9.1	19.0	14.5	029	070	085	89	60	93	W by S	W S W	W by S	S 40 W	0.03	1.34	7.53	...	...	Do.	Do.	Cir. Cm. St. 10.
23	.707	.746	.782	9.0	23.0	13.3	067	106	081	90	76	92	W S W	S W by W	S W by W	W 6 S	8.21	13.25	13.00	...	...	Do.	Do.	Clear.
24	.652	.514	.634	20.9	25.8	7.5	112	132	055	96	84	81	S W by W	S W by W	N W b W	W 24 S	22.11	16.43	23.06	...	1.10	Cum. Str. 10	Cum. Str. 9.	Do.
25	30.113	30.168	30.252	—10.3	—0.2	6.2	023	036	036	79	74	76	N W b W	W	W S W	W 18 N	28.61	21 80	12.17	...	...	Clear.	Clear.	Clr. Zod. L. B.
26	.232	.094	.095	—8.0	17.9	7.0	027	098	061	80	87	90	W S W	W S W	S W	W 34 S	7.53	8.46	5.44	...	...	Do.	Do.	Do.
27	29.900	29.712	29.670	—1.9	24.0	3.2	038	112	048	85	79	85	S W	S W	S by E	W 8 S	5.11	1.08	0.03	...	...	Do.	Light Cir. 4.	Do. Aur. Bor.
28	.516	.441	.550	—0.5	11.2	8.5	059	068	065	86	80	95	W N W	N E by E	E by N	E 17 N	1.60	13.22	2.95	...	...	Cir. Cm. St. 6.	Cir Str. 4.	Do. Zod. L. ft.
29	.680	.598	.561	9.6	26.1	17.5	068	118	089	92	73	89	N E	S S W	S S W	S 18 W	0.07	0.05	0.14	...	Inp	Cum. Str. 6.	Cum. Str. 9.	Cir. Str. 2.
30	.367	.345	.387	12.7	29.1	18.0	073	152	101	87	89	90	S S W	W S W	S W by W	S 10 W	0.05	0.50	6.94	...	2.00	Do. 10.	Snow.	Do. 4.
31	.705	.727	.755	1.4	13 8	1.0	044	074	043	84	80	82	N E by E	W by N	S by W	W 20 S	7.47	6.60	1 87	...	0.50	Clear.	Clear.	Clr. Zod. L. ft.

REMARKS ON THE ST. MARTIN, ISLE JESUS, METEOROLOGICAL REGISTER FOR DECEMBER.

Barometer.....	Highest, the 12th day	30.329
	Lowest, the 10th day	28.689
	Monthly Mean	29 429
	Monthly Range	1.640
Thermometer...	Highest, the 2nd day	50°.4
	Lowest, the 19th day	23°.4
	Monthly Mean	20°.84
	Monthly Range	73°.8
Greatest Intensity of the Sun's Rays		90°.2
Lowest Point of Terrestrial Radiation		25°.0
Mean of Humidity		.872

Rain fell on 6 days, amounting to 2.970 inches; it was raining 23 hours 20 minutes.

Snow fell on 12 days, amounting to 20.43 inches; it was snowing 92 hours 15 minutes.

The most prevalent Wind was W—1318.70 miles.

The least prevalent Wind was E by N—2.00 miles.

The most windy day was the 26th; mean miles per hour. 18.56.

The least windy day was the 20th; mean miles per hour, 0.02.

Most windy hour, from 2 till 3, a. m., on the 24th—36.40 miles; resolved with the Four Cardinal Points, gives N 768.20 miles, S 287.20 miles, W 3789.00 miles, E 1108.80 miles; total 5952.20 miles.

Aurora Borealis visible on 5 nights—might have been seen on 7 nights.

Zodiacal Light visible during the month.

The electrical state of the atmosphere has been marked by a very high tension of a negative character.

OZONE—was in moderate quantity, amounting to saturation on the 16th.

EMARKS ON THE ST. MARTIN, ISLE JESUS, METEOROLOGICAL REGISTER FOR JANUARY.

Barometer.....	Highest, the 4th day	30.520
	Lowest, the 16th day	29.255
	Monthly Mean	29.777
	Monthly Range	1.265
Thermometer...	Highest, the 30th day	59°.10
	Lowest, the 5th day	—20°.90
	Monthly Mean	7°.59
	Monthly Range	50°.00
Greatest Intensity of the Sun's Rays		79°.4
Lowest Point of Terrestrial Radiation		—20°.9
Mean of Humidity		.828

No rain fell during the month.

Snow fell on 12 days, amounting to 28.11 inches; it was snowing 74 hours 40 minutes.

The most prevalent Wind was N E by E—1627.90 miles; it was blowing from this quarter 122, hours. 10 minutes.

The least prevalent Wind was N N W—1.00 miles; it was blowing 1 hour from this point.

The most windy day was the 15th; mean miles per hour, 25.56.

The least windy day was the 29th; mean miles per hour, 0.08.

Most windy hour, from 2 till 3, p. m.. on the 13th—44.40 miles.

The total miles traversed by the Wind was 6351.23 miles, viz.: N 395.40 miles, S 95.77 miles, W 4115.66 miles, E 1744.40 miles.

Aurora Borealis visible on 2 nights—might have been seen on 15 nights—impossible on 14 nights.

The electrical state of the atmosphere has been marked by very high tension.

Electromation almost constantly affected.

OZONE—was in moderate quantity.

This is the coldest January on record here, being 10°.29 less than the mean of January, 1855.

MONTHLY METEOROLOGICAL REGISTER, QUEBEC, CANADA EAST, DECEMBER, 1855.

BY CAPT. A. NOBLE, R.A., F.R.S., AND MR. WM. D. C. CAMPBELL.

Latitude, 46 *deg.* 49.2 *min. North; Longitude,* 71 *deg.* 16 *min. West. Elevation above the level of the Sea,* 200 *feet.*

Date.	Barometer corrected and reduced to 32 degrees, Fahr.				Temp. of Air.				Tens. of Vapour.				Humid'y of Air.				Direc'n of Wind.			Vel'ty of Wind.			Rain in Inches.	Snow in Inches.	Remarks.
	6 A.M.	2 P.M.	10 P.M.	MEAN.	6 A.M.	2 P.M.	10 P.M.	M'N	6 A.M.	2 P.M.	10 P.M.	M'N	6 A.M.	2 P.M.	10 P.M.	M'N	6 A.M.	2 P.M.	10 P.M	6 A.M	2 P.M	10PM			
					°	°	°	°																	
1	29.481	29.376	29.376	29.411	24 3	32.5	33.4	30.1	.116	.129	.129	.125	0.87	0 70	0.68	0.75	Calm.	W N W	Calm.	0·0	3·8	0.0	...	...	
2	.286	.024	28.900	.070	31·8	38·8	39·3	36.6	139	168	162	155	77	71	68	72	Calm.	E N E	Calm.	0·0	5·2	0.0	.092	...	
3	28.978	.062	29.277	.106	34·1	35·2	29·7	33.0	175	147	092	138	89	71	56	72	W N W	N N W	N N W	14·7	10·9	14.3	...	...	3rd—Auroral arch. altitude
4	29.414	.619	.718	.584	27.3	29.5	30.5	29.1	086	102	127	105	57	62	75	65	N N W	W S W	Calm.	15·2	7·2	0.0	...	...	of dark segment 8°.
5	.737	.780	.809	.775	32.1	35.0	33·2	33·4	136	139	149	141	75	68	79	74	Calm.	W N W	Calm.	0·0	5·2	0.0	...	...	
6	.806	.737	.695	.746	31.1	34·9	31.1	32.4	131	147	148	143	75	73	85	78	Calm.	Calm.	Calm.	0·0	0·0	0.0	...	...	
7	.742	.807	.865	.805	31.0	32·6	26·0	29.9	144	153	101	133	83	83	70	79	N b W	Calm.	W	7·2	0·0	16.0	...	...	
8	.847	.802	.728	.792	20·4	24·3	17·3	20.7	071	072	078	074	62	55	78	65	W	W	S	13·9	9·3	3.8	...	...	
9	.517	.260	2·.735	.171	14·3	24·0	26·2	21·5	080	121	144	115	91	92	1·00	94	Calm.	E	E N E	0·0	35·9	39·4	...	8.0	
10	28.536	28.666	.992	28.718	29·3	33.2	32.1	28.2	163	154	096	138	1·00	82	79	87	S E	W S W	W S W	5·2	8·0	13.9	...	...	
11	29.292	29.490	29.705	29.496	13 6	14·3	10·2	12.7	060	059	045	055	71	67	61	66	W S W	W S W	W S W	12·4	10·0	8·0	...	...	
12	.923	30.067	30.201	30.064	1·8	7·3	4·0	4·4	035	042	045	041	69	63	79	70	W N W	W N W	W N W	11·3	10·0	7.2	...	...	
13	30.242	.136	.132	.170	—0.1	12.3	12.8	8.3	035	045	050	043	74	55	60	63	W S W	Calm.	Calm.	3·8	0·0	0.0	...	...	
14	.132	.173	.273	.192	13.5	21.9	13.5	16.3	064	081	057	067	75	67	67	70	W S W	W S W	Calm.	2·0	3·8	0.0	...	1.0	
15	.262	.112	29.985	.120	15.6	19.1	23.0	19.2	075	086	124	095	81	80	98	86	E N E	E N E	E N E	12·4	16·0	13.9	...	.8	
16	29.881	29.618	.394	29.631	26.9	31.2	32·3	30.1	138	174	182	165	93	1·00	1·00	98	E N E	E N E	Calm	14.7	13·9	0.0	.357	.4	
17	.431	.347	.310	.363	13.5	34.7	32·3	33.5	171	166	160	166	90	82	88	87	Calm.	W	W S W	0.0	5·2	3.8	...	.7	
18	.448	.637	.873	.653	21·8	18.2	14·4	18.1	090	066	062	076	82	64	69	72	W S W	W N W	W N W	12.4	7·2	11.5	...	...	
19	30.016	30.038	30.050	30.035	11.0	13.2	8.3	10·8	054	051	062	056	71	61	91	74	W b N	W b N	W b N	12.4	2·0	2.0	...	...	
20	.066	.055	.050	.057	0.7	11.9	7.2	6.6	048	055	056	053	98	68	86	84	S	W N W	Calm	2.0	3·8	0.0	...	...	
21	29.952	29.738	29.602	29.764	4·1	19.8	24.2	16.0	055	090	107	084	96	80	81	86	Calm.	Calm.	Calm.	0.0	0·0	0.0	...	2.0	
22	.522	.630	.532	.561	26.3	32.4	28.7	29.1	136	168	129	144	95	92	81	89	Calm.	W S W	E	0.0	2·0	15.6	...	4.0	
23	.227	.384	.464	.358	29.5	29.1	30.3	29.6	149	087	169	135	90	54	1·00	81	E N E	Calm.	Calm	17.9	0·0	0.0	...	2.0	
24	.766	30.056	30.192	.998	26.2	11.9	3.3	13.8	091	045	046	059	63	56	71	63	W S W	W S W	W S W	15.4	10·9	8.0	...	...	24th—At 10, p. m., a lunar
25	30.144	29.988	29.699	.944	2.7	5.7	5.9	4.8	044	051	055	050	81	82	88	84	E	E N E	E N E	7.2	16·0	34.1	...	10.0	halo 60° in diameter.
26	29.153	.373	.702	.409	11.4	2.6	0.2	4·7	059	043	034	045	76	80	71	76	E N E	W	N W	10.9	16·0	13.9	...	3.0	
27	.889	.828	.927	.881	—4.4	8.5	2.3	2.1	030	055	045	043	77	79	85	80	W	N W	W S W	6.2	11·3	8.8	...	...	
28	.849	.713	.953	.838	—0.6	7.7	—7·9	—0.3	046	043	024	037	1.00	64	60	75	W N W	W N W	W N W	5.2	5·2	5.2	...	...	
29	30.056	30.024	.829	.970	-17.6	—9.6	—9.6	-12.3	019	026	027	024	90	87	87	88	W N W	W	E S E	5.2	6·2	3.8	...	2.0	
30	29.378	29.227	.512	.372	5.2	4.9	7.0	5.7	040	045	050	045	65	76	76	72	E N E	E N E	Calm.	16.0	17·9	0.0	...	3·0	
31	.637	.694	.763	.698	8.1	18.0	10·8	12.3	067	064	067	066	1.00	62	88	83	Calm.	W N W	Calm.	0.0	6.2	0.0	...	2.0	
M	29.6648	29.6501	29.6885	29.6709	16.29	20.49	17.48	18.09	.0880	.0927	.0906	.0903	.817	.725	.789	.777				6.94	8.01	7.20	.449	38.9	

MONTHLY METEOROLOGICAL REGISTER, QUEBEC, CANADA EAST, JANUARY, 1856.

BY CAPT. A. NOBLE, R.A., F.R.S, AND MR. WM. D. C. CAMPBELL.

Latitude, 46 *deg.* 49.2 *min. North; Longitude*, 71 *deg.* 16 *min. West. Elevation above the level of the Sea*, 200 *feet.*

Date.	Barometer corrected and reduced to 32 degrees, Fahr.				Temp. of Air.				Tens. of Vapour.				Humid'y of Air.				Direc'n of Wind.			Vel'ty of Wind.			Rain in Inches.	Snow in Inches.	Remarks.
	6 A.M.	2 P.M.	10 P.M	MEAN.	6 A. M.	2 P.M	10 P.M.	M'N.	6 A.M.	2 P.M.	10 P.M.	M'N	6 A.M.	2 P.M.	10 P.M.	M'N	6 A.M.	2 P.M.	10 P.M	6 A.M	2 P.M	10 PM			
					°	°	°	°																	
1	29.716	29.810	30.158	29.895	18.3	17.5	1.4	12.4	.087	.064	.028	.060	0.83	0.64	0.55	0.67	W S W	W S W	Calm.	11.3	15.2	0.0	...	...	
2	30·254	30.191	.062	30.169	−3.2	9.5	12.5	6.3	036	058	080	058	85	80	97	87	Calm.	Calm.	W	0.0	0.0	7.2	...	1.0	
3	29.809	29.537	29.374	29.573	18.1	22.3	22.6	21.0	102	123	124	116	1.00	1.00	1.00	1.00	E N E	E S E	Calm.	12.4	7·2	0.0	...	4.0	
4	.779	30.138	30.362	30.093	−3.0	−3.6	11.5	−6.0	028	022	015	022	65	54	52	57	W N W	N W	N W	12.4	13.9	17.9	...	...	
5	30.454	.348	.200	.334	-16.0	−3.8	−0.4	−6.7	021	035	047	035	96	87	1.00	94	Calm.	N N E	E N E	0.0	10.0	17.6	...	1.0	
6	29.964	29.886	29.971	29.940	0.5	1.8	−0 7	0.5	048	045	045	046	98	88	98	95	E N E	E N E	Calm.	20.3	18.3	0.0	...	...	
7	30.044	29.930	.748	.907	−3.5	4.0	11.8	4.1	038	044	067	049	77	77	84	79	Calm.	E N E	E N E	0.0	5.2	11.3	...	8.0	
8	29.512	.230	.316	.353	17.5	16.8	1.8	12.0	084	082	039	068	80	83	77	81	E N E	W S W	W S W	16·0	10.9	10·0	...	5.2	
9	.346	.326	.343	.338	−6.2	− 2 4	−1.6	−3.4	025	030	035	030	69	71	77	72	W	W	W	13·9	11.3	10.0	...	...	
10	.373	.331	.463	.389	−2.1	4.8	13.1	5.3	028	051	070	050	64	86	83	78	W S W	W S W	W	10·0	13.4	19·0	...	...	
11	.640	.850	30.032	.841	9.4	12.9	7.8	10.0	057	056	043	052	80	67	64	70	W	W S W	W	14·3	10.9	5·2	...	...	
12	30.141	30.194	.115	30.149	−0.5	8.6	7.2	5.1	044	045	052	047	96	65	79	80	N N W	N W	E	3·8	5.2	3·8	...	...	
13	29.963	29.778	29.512	29.758	13.5	13.6	16.0	14.4	085	073	095	084	1.00	86	1.00	95	E N E	E N E	E N E	21·3	45.4	46·0	...	9.0	13th—Gusts of wind at the rate of 52 miles per hour.
14	.439	.422	.421	.427	17.6	18.1	18.4	18.0	101	089	091	094	1.00	86	87	91	E N E	E N E	Calm.	42·5	39.4	0·0	...	3.0	
15	.391	.342	.330	.355	16.5	21.4	13.4	17.1	091	091	080	087	94	85	94	91	W S W	S W	W S W	7·2	6.3	3·8	...	...	
16	.350	.201	.129	.227	11.0	17.2	19.5	15.9	077	098	095	090	1.00	99	86	95	W	Calm.	Calm.	8·8	0.0	0·0	...	2.0	
17	.141	.123	.160	.175	21.8	26.8	19.1	22.6	119	145	089	118	98	98	82	92	Calm.	W S W	W S W	0·0	3.8	3·8	...	...	
18	.383	.360	.496	.413	12.4	18.2	16.3	15.6	067	067	070	068	82	65	73	73	W S W	W S W	W S W	7·2	6.2	7·2	...	...	
19	.562	.644	.674	.627	0.6	1·3	−3.6	−0.6	035	028	033	032	72	56	80	69	N W	W N W	W	6·2	6.2	10·0	...	...	
20	.709	.595	.476	.593	−5.0	6.6	4.4	2.0	033	036	039	036	87	56	69	71	W N W	W	W N W	10·0	13.9	3·8	...	...	
21	.440	.397	.436	.424	4.5	9·1	6.2	6.6	040	040	040	040	69	57	63	63	W	W	W S W	10·0	13.4	5·2	...	...	
22	.460	.499	.496	.485	−4.1	4·5	9 0	3.1	035	040	053	043	88	69	76	78	W	W	W	5·2	7.2	10·0	...	...	
23	.486	.256	.584	.444	14.2	19·3	12.2	15·2	065	076	073	071	74	70	90	78	W	W	N W	10·0	14.7	5·2	...	...	22nd—At 8. a. m., coloured ring round sun 40° in diameter.
24	.541	.372	.443	.452	14.8	22·3	4.4	13.8	087	091	038	072	97	74	65	79	W S W	W S W	W S W	2·0	3.8	15·2	...	3.0	
25	.672	.872	.961	.835	−7.8	−1.8	−0.9	−3.5	027	029	036	031	76	64	77	72	N W	N W	N W	8·0	13.9	14·3	...	...	
26	.904	.809	.812	.855	1.5	12.2	6.5	6.7	048	048	044	047	94	59	70	74	W	W	W	10·0	10.0	8·0	...	...	
27	.662	.549	.558	.590	2.8	15.2	8.8	8.9	037	049	047	044	68	54	67	63	W S W	S W	S W	8·8	8.8	6·2	...	...	
28	.494	.402	.459	.452	−0.2	11.1	6.3	5.7	045	056	050	050	90	73	79	81	E	E	E	2·0	2.0	2·0	...	...	
29	.523	.546	.423	.497	7.5	14.8	14.4	12.2	049	067	084	066	74	74	94	81	Calm.	Calm.	Calm.	0·0	0.0	0·0	...	2.0	
30	.326	.228	.249	.268	7.4	18.6	15.4	13.8	063	087	082	077	95	83	89	89	Calm.	Calm.	N	0·0	0.0	7·2	...	3.0	
31	.369	.530	.644	.514	7.0	8.7	1·4	5.7	048	042	045	048	73	60	88	74	W N W	W N W	W N W	12·9	15.2	3·8	...	...	
M	29.6402	29.6031	29.6261	29.6231	5.33	11.15	8.10	8.19	0565	0615	0590	0590	.846	.789	.805	.797				9.2	10.7	8.1	...	41.2	

REMARKS ON THE QUEBEC METEOROLOGICAL REGISTER FOR DECEMBER.

Maximum Barometer, 10 p.m. on the 14th	30.273
Minimum Barometer, 6 a.m. on the 10th	28.536
Monthly Range	1.736
Monthly Mean	29.6709
Maximum Thermometer on the 2nd	40°1
Minimum Thermometer on the 29th	—19.2
Monthly Range	59.3
Mean Maximum Thermometer	23.37
Mean Minimum Thermometer	11.02
Mean daily Range	12.35
Mean monthly Temperature	18.09
Greatest daily Range of Thermometer, on 28th	26°0
Least daily Range of Thermometer, on 22nd	3°0
Warmest Day, 2nd. Mean Temperature	36.6
Coldest Day, 29th. Mean Temperature	—12.3
Climatic Difference	48.9
Greatest intensity of Solar Radiation, on the 6th	80.0
Lowest point of Terrestrial Radiation, on the 29th	—26.0

Possible to see Aurora on 11 nights.
Aurora visible on 7 nights.
Total quantity of Rain, .449 inches.
Total quantity of Snow, 38.9 inches.
Rain fell on 2 days.
Snow fell on 13 days.

REMARKS ON THE QUEBEC METEOROLOGICAL REGISTER FOR JANUARY.

Maximum Barometer, 6 a.m. on the 5th	30.454
Minimum Barometer, 2 p.m. on 17th	29.123
Monthly Range	1.331
Monthly Mean	29.6231
Maximum Thermometer, on the 17th	27°0
Minimum Thermometer, on the 5th	—16.5
Monthly Range	43.5
Mean Maximum Thermometer	13.81
Mean Minimum Thermometer	—0.81
Mean daily Range	14 62
Mean monthly Temperature	8.19
Greatest daily Range of Thermometer, 24th	30.6
Least daily Range of Thermometer, 14th	3.9
Warmest day, 17th	22.6
Coldest day, 5th	—6.7
Climatic difference	29.3

Possible to see Aurora on 16 nights.
Aurora observed on 12 nights.
Total quantity of Rain —.
Total quantity of Snow, 41.2 in.
Snow fell on 11 days.

TABULAR STATEMENT

OF THE

MEAN RESULTS OF METEOROLOGICAL OBSERVATIONS MADE AT ST. MARTIN, ISLE JESUS, C. E., FOR 1855.

BY CHARLES SMALLWOOD, M. D.

(Compiled for the Canadian Journal.)

MONTHS. 1855.	Mean of Barom. in inches.	Mean Temp. of air.	Mean of Humidity.	Am't of Evaporation in inch.	Depth of Snow in inches.	Depth of Rain in inches	Days of Snow.	Days of Rain.	Snowing in hours.	Raining in hours.	Most prevalent Wind.	Least prevalent Wind.	Mean Maximum Velocity.	Mean Minimum Velocity.	Thunder on days.	Aurora on nights.	Range of Barometer in inch.	Range of Thermometer.
		°							H. M.	H. M.								°
January	29.926	17.88	.897		20.10	1.436	8	4	78.10	25.50	N E by E	E	18.33	0.00	.....	1	1.671	61.2
February	29.400	11.23	.857	Frosty Weather.	15.00	.....	8	...	21.50	.....	N E by E	N	15.87	0.00	.....	2	0.844	74.5
March	29.716	24.08	.815		15.60	0.531	7	2	58.10	7.40	W by S	E by N	17.71	0.05	.....	5	1.142	56.6
April	29.849	40.15	.808	1.70	4.34	4.194	4	10	17.40	41.20	W	N	33.80	0.10	1	3	1.171	71.1
May	29.637	56.85	.743	4.22	.....	1.756	...	6	.....	15.10	N E by E	E	12.11	0.00	2	3	0.621	62.9
June	29.757	62.39	.809	2.61	.....	8.217	...	15	.....	81.50	W S W	E by S	6.47	0.00	2	0	0.881	55.6
July	29.803	72.73	.757	3.19	.....	2.351	...	7	.....	14.15	S	S by E	10.72	0.15	4	3	0.587	52.6
August	29.862	64.94	.773	3.80	.....	4.366	...	11	.....	34.40	W	S by E	13.37	0.00	3	5	1.000	64.8
September	29.832	58.55	.803	3.04	.....	3.471	...	12	.....	42.29	N W by W	E	12.25	0.00	1	2	0.826	57.3
October	29.695	46.35	.849	1.40	2.10	8.728	1	17	14.00	98.35	W S W	E	16.45	0.43	.....	3	0.958	45.6
November	29.838	31.58	.884	Frosty Weather.	8.34	3.923	4	10	30.10	50.30	W N W	E by N	24.37	0.65	.....	5	1.268	57.2
December	29.429	20.84	.872		20.43	2.970	10	4	92.15	23.20	W	E by N	18.56	0.04	.....	5	1.640	73.8

Winter.																		
December 1854.	29.540	7.35	.859	...	18.67	0.110	10	1	44.31	4.30	N E by E	E	22.25	0.00	.....	3	1.534	78.1
January 1855....	.926	17.88	.897	...	20.10	1.436	8	4	78.10	25.50	N E by E	E	18.33	0.00	.....	1	1.671	61.2
February	.400	11 23	.857	..	15.00	.....	8	..	21.50	....	N E by E	N	15.87	0.00	.....	2	0.844	74.5
Quar'ly Means .	29.622	12.15	.868	..	53.77	1.546	26	5	143.91	29.87	N E by E	N	18.81	0.00	.....	6	1.349	71.2
Spring.																		
March	29.716	24.08	.815	...	15.60	0.531	7	2	58.10	7.40	W by S	E by N	17.71	0.05	.....	5	1.142	56.6
April	.849	40.15	.808	1.70	4.34	4.194	4	10	17.40	41.20	W	N	33.80	0.10	1	3	1.171	71.1
May	.637	56.85	.743	4.22	...	1.756	...	6	.....	15.10	N E by E	E	12.11	.....	2	3	0.621	62.9
Quar'ly Means .	29.734	40.36	.788	5.92	19.94	6.481	11	18	75.50	63.70	W	N	21.20	0.05	3	11	0.978	63.5
Summer.																		
June	29.757	62.39	.809	2.61	.....	8.217	...	15	.....	83.50	W S W	S by E	6.47	0.60	2	.....	0.881	55.6
July	.803	72.73	.757	3.19	.....	2.351	...	7	.....	14.15	S	E by S	10.72	0.15	4	3	0.587	52.6
August.....	.862	64.94	.773	3.80	.....	4.366	...	11	.....	34.40	W	S by E	13.37	.....	3	5	1.000	64.8
Quar'ly Means .	29.807	66.68	.779	9.60	.....	14.934	...	33	.....	132.05	W	E by S	10.18	0.25	9	8	0.822	57.6
Autumn.																		
September	29.832	58.55	.803	3.04	.....	3.471	...	12	.....	42.29	NW by W	E	12.25	0.00	1	2	0.826	57.3
October...	.695	46.35	.849	1.40	2.10	8.728	1	17	14.00	98.35	W S W	E	16.45	0.43	.....	3	0.958	45.6
November	.838	31.58	.884	...	8.34	3.923	4	10	30.10	50.30	W N W	E by N	24.37	0.65	.....	3	1.268	57.2
Quar'ly Means .	29.788	45.49	.845	4.44	10.44	16.122	5	39	44.10	190.94	W N W	E by N	17.67	0.36	1	8	1.280	53.3
Yrly Means 1855	29.730	42.29	.822	19.96	85.91	41.943	42	98	312.15	437.39	W	E by N	15.33	0.16	14	37	1.050	61.10
Do. do. 1854	29.677	41.57	.804	23.36	97.45	40.505	53	80	222.06	231.16	N E by E	S S E	19.53	0.16	14	50	1.017	59.95
Do. do. 1853	29.578	42.89	.825	19.40	116.81	44.201	37	99	.....	.....	W	S S W	15.81	0.32	17	39	0.993	59.27

GENERAL METEOROLOGICAL REGISTER FOR THE YEAR 1855.—Provincial Magnetical Observatory, Toronto, C. W.

Latitude, 43°.39.4 *North*; *Longitude*, 79°.21.5 *West*. *Elevation above Lake Ontario*, 108 *feet*; *approximate elevation above the Sea*, 342 *feet*.

	Jan.	Feb.	March.	April.	May.	June.	July.	August.	Sept.	Oct.	Nov.	Dec.	Year 1855.	Year 1854.	Year 1853.
Mean Temperature	° 25.95	° 15.41	° 28.46	° 42.43	° 53.07	° 59 93	° 67.95	° 64.06	° 59.49	° 45 38	° 38.58	° 26.99	° 43.98	° 45.21	° 44.78
Difference from average (16 years)	+1.63	−7.63	−1.91	+1.09	+1.56	−1.44	+1.15	−2.15	+1.39	+0.21	+1.82	+0.77	−0.29	−0.87	+0.44
Thermic Anomaly (Lat. 43°40 N)	−6.85	−19.29	−11.64	−7.77	−5.03	−4.67	−0.75	−4.44	−2.01	−8.41	−4.62	−9.01	−7.02	−5.8	−6.2
Highest Temperature	49.0	39.0	49.4	69.4	77.5	91.5	92.8	83.5	82.6	68.0	59.2	47.0			
Lowest Temperature	−5.4	−25.4	−2.9	10.7	33.0	36.2	49.2	40 0	33.6	22.6	15.5	−5.2	50.63	50.90	48.47
Monthly Range	54.4	64.4	52.3	58.7	44.5	55.3	43.6	43.5	49.6	45.4	43.7	52.2			
Mean Maximum Temperature	32 83	23 19	36.52	52.93	65.40	68.89	76.75	74.61	68.44	52.66	45.50	32.91			
Mean Minimum Temperature	17 51	4.81	19.63	32.06	41.42	50.68	60.05	54.09	49.91	34.55	28.74	18.75	18.19	19.77	16.89
Mean daily Range	15 29	18.38	16.89	20.87	23.98	18.21	16.70	20.52	18.51	18.05	16.76	14.16			
Greatest daily Range	35.0	34.2	37.3	37.2	39.4	30.8	33.0	34.2	28.8	33 2	26 5	25 6			
Mean Height of Barometer	29.6395	29.6248	29.5129	29.6539	29.6513	29.5134	29.6111	29.6530	29.7211	29.5514	29.6643	29.7020	29.6249	29.6077	29.6299
Difference from average (12 years)	+0.0097	+0.0123	−0.1185	+0.0468	+0.0678	−0.0681	+0.0138	+0.0169	+0.0670	−0.0884	+0.0455	+0.0557	+0.0050	−0.0122	+0.0100
Highest Barometer	30.552	30.088	30.079	29.998	29.902	29.811	29.833	30.019	30.092	29.922	30.131	30.201			
Lowest Barometer	28.717	29.172	28.792	29.2	29.283	28.942	29.337	29.130	29.247	28.945	28.983	28 459	1.032	1 071	0.986
Monthly Range	1.835	0.916	1.287	0.765	0.619	0.869	0.496	0.889	0.845	0 978	1.148	1 742			
Mean Humidity	.82	.80	.81	.75	.65	.78	.79	.74	.79	.76	.74	.77	77	.79	.79
Mean Elasticity of Aqueous Vapour	0.125	0.088	0.132	0.208	0.258	0.406	0.530	0.444	0.406	0.247	0.190	0.123	0.263	0.279	0.271
Mean of Cloudiness	.79	.71	67	.51	.46	.65	.59	.44	.45	.68	.60	.67	0 60	0.59	0.57
Mean direction of the Wind	W 10 N	N37 W	W 16 N	N 36 W	N 1 W	W 21 N	S 19 W	W 27 N	N 20 E	W 8 N	W 24 N	W 2 S	W 28 N	N 42 W	N 38 W
Mean velocity (miles per hour)	7.67	8.17	9.95	7.57	5.93	5.70	6.47	6.97	7.61	9.88	10.81	11 38	8 18	6.02	5.08
Difference from average (8 years)	+0.85	+1.22	+2.94	+6.77	+0.51	+1.40	+2.11	+2.39	+2.47	+4.54	+4.56	+4.13	+2.33	+0.53	−0.33
Total amount of Rain (inches)	0.525	1.770	1.485	2.030	2.565	4.076	3.245	1.455	5.585	2.485	4.590	1.845	31.650	27.765	23.550
Difference from average (15 years)	−1.176	+0.682	−0.128	−0.541	−0.410	+1.028	−0.475	−1.264	+1.127	−0.441	+1.564	+0.323	+0.286	−3.576	−8.076
No. of days Rain	5	2	5	8	6	17	13	7	12	14	8	6	103	114	109
Total amount of Snow (inches)	23.3	21.8	18.1	1.6	0.9	...	...	...	...	0.8	3.0	29.5	99.0	49.5	53.2
Difference from average (13 years)	+9.9	+3.5	+8.2	−0.4	+0.8	...	...	...	...	−0.4	+0.5	+15.3	+37.4	−8.9	−6.1
No. of days Snow	13	14	11	3	2	...	...	...	...	5	6	10	64	52	52
Number of Fair days	13	12	15	19	23	13	18	21	18	12	16	15	198	199	204
Number of Aurora's observed	1	4	5	9	4	4	2	5	2	4	5	1	46	52	57
Possible to see Aurora (No. of nights)	8	12	16	19	20	17	19	24	20	17	13	13	204	203	233
Number of Thunder storms observed	0	0	0	5	3	4	13	5	6	2	0	0	38	58	34

MEAN METEOROLOGICAL RESULTS AT TORONTO, DURING THE YEAR 1855.

BY PROFESSOR KINGSTON, M.A.

DIRECTOR OF THE PROVINCIAL MAGNETIC OBSERVATORY, TORONTO.

Read before the Canadian Institute, 2d February, 1856.

The mean temperature of the year 1855 was 43°.98, or 0°.29, below the average of 16 years. This was caused by the great and continued depression in February, for which there was no adequate compensation during the rest of the year, notwithstanding that the mean temperature of every month was above the average, with the exception of February, March, June and August.

The hottest month in the year was July, and the coldest February. The climatic difference was 52°.5, which is 8°.8, above the average, and 1°.1, greater than in the preceding year.

The mean temperature of February was 15°.4, which is the lowest monthly temperature on record, except that of February 1843, when the temperature of the month was 14°.5.

The lowest temperature ever recorded, —25°.4, occurred on February 6th. The lowest that ever occurred before having been on January 17, 1840, when it fell to — 18°.4.

The hottest day was July 19th, with a mean temperature 79°.45; and the coldest day February 6th, when the mean temperature of the day was —14°.38. It is to be noticed that the coldest day, February 6th, was also the day in which the lowest temperature occurred. The mean temperature of the day was nearly 10° lower than that of any day ever before experienced at the Observatory.

The greatest daily range was 39°.4, and occurred on May 24th. The range of the whole year from —25°.4, on February 6th, to 92°.8, on July 19th, was 118°.2; the greatest yearly range that occurred in past years having been 111°.9, in 1846.

There have been 42 instances in which the temperatures at the hours of observation have deviated more than 20° from the normal march of temperature, the most extreme instances being at 8 A.M. on February 6th, when the temperature was 45°.7, below the normal, and at 6 A.M on January, when the temperature was 23°.7, above it.

The most remarkable periods of continued deviation are as follows:

February 3— 9 when the mean deviation was	—23°.1,
February 23—24	—20°.6,
February 26—28	—13°.3,
December 26—29	—14°.4,

The thermic anomalies, as given in the table, would make it appear that the mean temperature of every month was below that proper to the latitude of Toronto; but as the depression is, to the extent of 1°, due to the elevation of Toronto above the sea level, the temperature of each month should be increased by 1°. Even with this modification the temperature of every month was below that dependent on geographical position excepting the temperature of July, which was, however, only 0°.25 in excess.

The highest reading of the barometer was 30·552 in., at 6 A.M. of January 8th, and the lowest 28.459 inches, at 2 P.M. of December 9th, giving a range 2.093 inches, the greatest range on record. The minimum just given, 28.459 inches, is the lowest ever registered at the Observatory.

The mean humidity of the year was ·77; the greatest monthly humidity ·82, having been that of January, and the least ·65 that of May. Complete saturation occurred five times, viz —on February 13th, at midnight; March 15th, at 6 A.M.; June 10th, at 6 A.M; September 21st, at midnight; and November 17th, at 10 P.M. There were besides, five instances in which the humidity fell short one per cent. only of complete saturation—on January 12th, at 10 P.M.; February 13th, at 10 P.M.; February 14th, at 6 A.M.; March 13th, at midnight; and November 12th, at 10 P.M. The lowest humidity ·19 was on April 27th, at 2 P.M.

The extent of sky clouded was on an average three-fifths of the whole; and for nine months the sky was on an average more than half overcast. Clouds were most prevalent in January and least so in August.

The mean direction of the wind has been W 28°N, with a mean velocity of 8·1 miles per hour, a velocity one-third greater than that of any other former year. This excess of mean velocity, when compared with that of former years is to be noticed, not only with respect to the year taken as a whole, but to each month also taken separately.

The depth of rain has been 31·650 inches, which is ·286 more than the average. By adding 9 9 inches, the equivalent corresponding to the 99 inches of snow that has fallen, we obtain a total fall of 41·55 inches. The greatest quantity of rain fell in September, and the least in February. The rain was distributed over 103 days, and the snow over 64, so that there have been 198 days without either rain or snow.

Frost occurred in every month but July; the latest in spring having been on June 12th, and the earliest in autumn on August 18th. The last snow in spring was on May 8th, at noon; and the first snow in autumn on October 13th, at 8 A.M. The Indian Summer, which was not well marked, occurred from October 16th to October 26th. Toronto Bay was clear of ice on April 16th, and again crossed on foot on the 21st December.

There have been 38 thunder-storms in the year. Of these none occurred in January, February, March, November or December; 13 occurred in July; 12 were distributed through April, May, and June; 13 through August, September and October. The most violent were those of April 18th, May 15th, June 21st, July 12th, 13th, and 27th, August 15th and 31st, and September 1st, 9th, 7th, and 25th.

On 204 nights the atmosphere has been suitable for the display of any aurora which might have existed; and on 46 of them auroras have been actually seen. The most remarkable were those of August 23d and October 4th. That of October 4th was accompanied by considerable magnetic disturbance.

METEOROLOGICAL OBSERVATORY AT UNIVERSITY OF QUEEN'S COLLEGE, KINGSTON, FOR JANUARY, 1856.

BY JAMES CARMICHAEL AND JOHN MAY.

Latitude 44°. 13'. 30". *Longitude* 76°. 31'. 51". *Height above the Sea* 280 *feet.*

Day of the Week.	Day of the Month.	Observations taken at 9, A. M., (Local Time.) Barometer. Barometer Reading.	Thermometer.	Corrected for Index error, Capillary action, and to temperature of 32°.	Hygrometer. Dry Bulb Therm.	Wet Bulb Therm.	Temp. of Dew-point computed.	Elastic Force of Vapour.	Humidity 0—1.	Wind. Direction.	Force in lbs. per square foot.	Cloud. 0—10.	Observations taken at 3, P. M. (Local Time. Self-Registering Thermometers. Dry Bulb. Max. in Air.	Min. in Air.	Mean in Air.	Wet Bulb. Min. Wet.	Rain in previous 24 hours. On Ground.	Feet above Ground.	Wind, Max. in previous 24 hours.	Observations taken at 3, P. M., (Local Time.) Barometer. Barometer Reading.	Thermometer.	Corrected for Index error, Capillary action and to temperature of 32°.	Hygrometer. Dry Bulb Therm.	Wet Bulb Therm.	Dew-point computed.	Elastic Force of Vapour.	Humidity 0—1.	Wind. Direction.	Force in lbs. per square foot.	Cloud. 0—1.	Remarks. On the Prevalent Diseases.	On the Weather, and any remarkable circumstance.
Tuesday	1	29·900	32·5	29·905	18·5	18·	14·2	·104	·785	W.S.W.	1·125	1	21·	18·25	19·625	17·75	...	...	4·25	29·050	40·	28·996	21·5	21·	17·3	·117	·941	W.	·875	1		Beautiful.
Wednesday	2	29·100	32·	29·097	24·	23·5	19·75	·128	·765	S.	·125	4	26·75	17·5	22·125	16·5	...	...	0·00	30·016	41·	29·991	25·75	24·75	19·3	·126	·939	S.	·0	4	Small	
Thursday	3	29·592	40·2	29·568	31·5	30·5	30·5	·189	·768	S	·75	10	34·00	24·	29·	23·	...	...	1·50	29·530	42·	29·500	32·	30·	25·8	·160	·802	W.	·875	0		
Friday	4	30·262	36·	30·248	2·	1·5	-2·25	·068	·642	W.N.W.	1·125	0	32·	1.	16·5	5·	...	...	4·25	30·382	47·	30·337	7·	6·5	2·7	·068	·678	W.N.W.	1·	0	Pox.	Bay frozen over.
Saturday	5	30·200	30·	30·202	-2·	-2·5	-2.25	·060	·640	N.E.	·5	5	0·	-3·5	-1·75	-3·5	...	...	1·25	30·042	33·75	30·033	1·	1·	1·	·064	1·000	N.E.	1·	10		
Sunday	6	29·836	27·	29·838	2·	1·5	2·25	·068	·642	N.E.	1·000	4	8·5	-2·5	5·5	-2·5	...	...	1·25	29·862	30·5	29·864	9·75	9·	3·5	·070	·731	N.E.	·875	4	Influ-	Snowy and stormy.
Monday	7	29·838	35·25	29·827	17·	16·25	10·2	·090	·780	E.	·75	10	18·	4·	11·	3·	...	Snow ...	1·50	29·868	54·5	29·803	18·	17·5	12·9	·099	·826	E.	·875	10		
Tuesday	8	29·452	34·	29·443	10·5	10·	6·25	·077	·783	W.S.W.	1·125	10	20·	2·	11·	2·	4	inches.	7·00	29·520	57·5	29·467	2·	1·5	-2·2	·068	·642	W.S.W.	1·	8	enza.	
Wednesday	9	29·604	31·	29·603	2·5	-2·	1·8	·066	·681	W.	·875	10	0·	-1·5	—·75	-1·5	...	...	2·50	29.642	54·75	29·578	1·25	1·	8·	·067	·679	W.	1·5	2		
Thursday	10	29·720	28·5	29·725	0·	0·	0·	·051	1·000	W.	·125	9	14·	-2·5	8·25	-2·5	...	...	3·25	29·578	54·5	29·514	14·	13·5	9·7	·088	·871	W.	1·	1		
Friday	11	30·062	31·5	30·061	19·	18·	10·5	·091	·730	W.	25	5	24·	10·	17·	9·	...	...	2.125	30·100	55·5	30·033	24·	23·	16·7	·115	·762	W.	·875	8	Rheu-	
Saturday	12	30·086	41·	30·058	19·	18·	10·5	·091	·732	W.	1·25	7	24·5	18·5	21·5	17·5	...	...	·375	30·008	44·5	29·964	22·5	22·	18·2	·121	·937	N.E.	·125	19		Stormy with snow and wind.
Sunday	13	29·426	31·	29·425	16·	15·5	11·75	·096	·686	N.	1·	10	21·	13·5	17·25	13·	...	...	4·00	29·294	36·	29·280	18·5	18·	14·2	·104	·785	N.E.	1·25	10	ma-	
Monday	14	29·498	33·	29·492	18·	17·	9·5	·088	·728	N.E.	·25	10	23·	11·	17·	10·5	12	inches.	2·75	29·568	57·75	29·495	22·	21·	13·5	·102	·728	N.	·875	6		
Tuesday	15	29·592	43·	29·560	12·5	12·	8·25	·084	·946	N.W.	·5	9	22·5	16·5	19·5	15·5	...	...	0·25	29·582	58·	29·510	19·25	19·	16·6	·114	·874	N.W.	·0	1	tisms.	Mild and pleasant.
Wednesday	16	29·404	37·5	29·388	22·	21·25	15·2	·068	·775	S.W.	·875	9	25·3	3·	14·25	2·5	...	...	3·125	29·330	63·	29·265	24·75	24·	18·3	·121	·937	S.W.	1·25	10		Snowy.
Thursday	17	29·296	43·5	29·234	25·	24·75	23·7	·148	·952	W.	0·	10	31·	28·	29·5	22·	1	inch.	2·50	29·344	61·	29·294	30·	29·25	27·2	·168	·905	W.	·25	10	Colds,	
Friday	18	29·582	48·	29·536	23·75	23·25	19·6	·127	·886	W.N.W.	5·	5	31·	22·	26·5	21·	...	...	0·00	29 574	63·	29·489	29·5	29·	26·	·161	·898	W.S.W.	0·	10	&c.,	
Saturday	19	29·767	39·	29·745	4·5	4·	·25	·074	·782	N.N.E.	·25	5	28·5	4·	16·25	2·5	...	...	1·50	29·298	44·5	29·266	7·5	7·	3·2	·069	·775	N.N.E.	5·	0	&c.,	
Sunday	20	29·820	37·25	29·804	-4·5	-3·5	-4·	·052	·643	N.N.E.	·25	10	7·	-7·5	—·25	-8·75	...	...	0·25	29·720	35·5	29·709	8·	7·5	3·7	·085	·680	N.N.E.	·25	10		
Monday	21	29·674	38·5	29·658	6·	5·	-2·5	·051	·731	N.N.E.	0·	1	11·25	5·	8·125	4·5	...	...	0·75	29·658	54·	29·597	9·75	9·25	5 5	·087	·727	S.W.	0·	5		Solar halo.
Tuesday	22	29·648	33·5	29·642	-1·5	-1·25	·6	·048	·679	N.	·25	0	17·25	-5·25	6·	-5·	...	...	·00	29·668	45·	29·630	18·	17·5	14·6	·106	·878	W.	·25	10	Scarlet	
Wednesday	23	29·694	31·5	29·693	14·	13·75	12·3	·097	·938	W.	2·	6	26·	11·	18·5	11·	...	...	0·25	29·748	52·	29·692	26·	25·	19·9	·129	·804	W.S.W.	1·	0		
Thursday	24	29·670	38·5	29·651	21·5	21·25	19·3	·126	·939	S.W.	·75	0	26·5	21·	23·75	21·	...	...	4·125	29·606	55·5	29·542	23·	22·75	21·3	·136	·943	S.W.	·75	10	Fever	Flumes of snow.
Friday	25	30·198	38.75	30·178	-6·	-5·75	-3·8	·036	·680	N.W.	·5	0	19·	-9·	5·	-7·	...	...	3·50	30·284	56·	30·216	6·	5·75	3·8	·071	·680	W.N.W.	·5	0		
Saturday	26	30·244	38·	30·224	1·	1·	1·	·053	1·000	N.	0·	8	14·	-1·75	6·875	·5	...	...	0·75	30·142	38·	30·122	14·25	13·25	7·2	·080	·782	N.	·0	0	in the	Very bright.
Sunday	27	29·762	27·	29·764	3·	2·75	·85	·063	·679	W.	0·	10	16·	-4·	6·	—1.	...	...	0·00	29·610	39·	29·588	17·	16·75	15·3	·109	·943	N.	·0	10		
Monday	28	29·288	37·	29·272	13·	12·5	8·7	·088	·871	N.N.E.	0·	8	18·	14·	16·	14·	...	...	0·00	29·341	55·	29·277	18·	17·75	16·3	·113	·939	N.N.E.	·0	10	vicinity	Snowy.
Tuesday	29	29·570	42·	29·540	19·	18·5	15·6	·110	·882	N.W.	0·	8	24 75	15·	19·875	14·	...	...	0·00	29·544	57·	29·475	23·	21·	7·7	·082	·871	N.N.W.	·25	10		
Wednesday	30	29·376	45·5	29·338	19·	18·75	16·4	·114	·882	W.	1·25	8	20·5	17·	18·75	16·5	...	...	2·50	29·386	56·75	29·319	20·	18·5	6·4	·078	·601	W.S.W.	0·	10	of the City.	
Thursday	31	29·676	43·	29·644	9·5	9·	5·2	·074	·727	W.	3·00	8	16·	7·	1·5	5·5	...	...	4·50	29·616	56·	29·549	16·	14·5	4·1	·072	·643	W.	·25	8		
Sums		920·837	1124·75	920·363	354·75	342·5	283·52	2·680	24·354	...	20·375	200	621·5	245·75	438·75	246·	17	...	60·	919·778	1538·5	918·362	529·	567·5	370·5	3·150	24·899	...	17·375	188		
Means		29·704	36·28	29·689	11·45	11·05	9·14	·086	·786	...	·657	6·5	20·05	7·92	14·1	7.93	·55	...	1·94	29·670	49·6	29·624	17.	16·4	11·9	·102	·803	...	·560	6·06		

ABSTRACT.

	Barometer. Inches.	Inches.	Thermometer. Temperature of Air.		Temperature of Evaporation.		Hygrometer. Temperature of Dew-point.		Elastic Force of Vapour.		Humidity 0—1.		Self-Registering Thermometers. Max. in Sun's rays.	Max. in Air.	Min. in Air.	Max. Wet.	Min. Wet.	Rain. Inches in 24 hours.		Wind. Pressure in lbs.		Cloud. 0—10.	
																		Snow.					
Max.	30·248	30·337	31·5	30·	30·5	30·	30·5	27·2	·148	·168	1·	1·	71	34	28	...	23	12	...	3	1·5	10	10
Mean	29·689	29·620	11·45	17·	11·05	16·4	9·14	11·9	·086	·102	·786	·803	...	20·05	7·92	...	7·9	5·5	...	·657	·560	6·5	6·06
Min.	29·234	28·996	— 6	1·	-5·75	1·	-4·	-2·2	·036	·064	·642	·571	...	0·	—9	...	-8·75	0·	...	0·	·0	6·	0·