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// THE CANADIAN JOURNAL.

NEW SERIES.

No. XVIII.—NOVEMBER, 1858.

NEW COMPOUND RAIL.

BY SANDFORD FLEMING, C. E.

Read before the Canadian Institute, February 13th, 1858.

The improvement on railway construction now referred to consists in forming a continuous rail, of uniform strength throughout its length, by means of two light bridge rails, placed the one over the other, and breaking joint. The lower rail is inverted, and rests in grooves cut in the ties or sleepers to receive it; the upper rail is placed immediately over the lower one and secured to it by means of clamps or bolts; wrought iron cores are inserted in the internal cavities at each of the joints, for the double purpose of giving vertical strength and locking the two halves so as to prevent any lateral motion.

The necessity of improving the mode of constructing "The Permanent Way" has doubtless forced itself upon the attention of those who daily witness the care and labour bestowed on the rail track to maintain it in a serviceable state, and more especially of railway proprietors, who too frequently learn at their annual meetings that the earnings of the company are very largely absorbed in the account headed, "Track Repairs" or "Maintenance of Way."

The annual cost of keeping in efficient repair what is termed "The Permanent Way" of railways is very great. It is found, when proper allowances are made for the deterioration of the iron rails and destruction of the ties or sleepers, to amount to about half as much as all the other expenses of the company. When we consider the large sums necessarily required for repairs of engines and rolling stock generally, repairs of buildings and fences, management, salaries, office and station expenses, fuel, oil and waste, legal expenses, damages, taxes, &c., it appears not a little astonishing that the cost of keeping the iron rails in a proper state of safety and usefulness should bear such a large proportion to the gross expenditure on those various services.

That the maintenance of the permanent way, forming such a heavy charge against the revenue of a company, indicates some defect in its construction, is quite within the bounds of possibility; it at least leaves an opening for enquiry, if not for some improvement, in that portion of a railway which is permanent only in name.

For some years back an endless variety of plans have been invented to render more perfect this essential part of railways. Many of them have been tried with various degrees of success, while not a few have, by common consent, remained the useless property of their originators. The plan now submitted may form an addition to the long list of those last mentioned, although I am not without hopes that on a consideration of the advantages which it appears to possess, it may justify the cost of a practical test, and perhaps be a means not only of enhancing the comfort and safety of railway travellers, but also of assisting in some degree to make railways pay, by reducing the present heavy cost of maintenance.

It is of vast importance to ascertain the weak and defective points of existing systems of "permanent way," since, by so doing, we know where remedies should be applied. Experience shows that the ordinary rail track is defective in one essential principle, inasmuch as its continuity of strength is broken at the ends of every rail bar. The joints being deficient in the requisite strength, they are affected more than other parts of the rail bars by the weight and percussive shocks of passing loads, the ballast underneath yields from the unequal pressure, the chairs and spikes at these points constantly get broken and displaced, and as a consequence the whole track, without frequent inspection and repairs, rapidly becomes deranged. The climate of this country too, I am constrained to believe, tells much more severely on the permanent way, as at present constructed, than it does in England. The frost enters the ground to a great depth, and results at certain seasons in softening the substratum. Thereupon a depression of the ballast under the weight of train, and a vertical work-ing of the rail ends at the joints take place, in consequence of which the rails are subjected to percussive blows, the chairs not unfrequently are broken, the spikes drawn, and the whole track is liable to be injuriously thrown out of line and level. This circumstance of climate goes to prove the necessity of a more perfect system of permanent way in this country than where the seasons are more temperate. And hence we may account for the otherwise remarkable fact, that America when compared with England has been so much more prolific in compound rails, and similar expedients, to remedy the objections above named.

Amongst other expedients which have been tried to lessen the evils referred to, the application of fishing plates at the joints has been found, when they are kept in perfect order, to answer an excellent purpose. The fishing plates, however, are liable to get deranged, as the bolts by which they are fastened readily become loose through the vibration of the rails, and in this state they are of little service. When this expedient was discussed at a meeting of the Institution of Civil Engineers held last year in England, it was stated that "a recent examination of some brackets and fish plates which had been laid down about twelve months, and were secured by bolts and nuts, showed, that in 125 pairs of joints, each pair having 8 bolts, 261 bolts were loose, and 6 were out altogether, though they had been tightened up within 48 hours. The number of loose bolts at each joint varied from 1 to 8. It was contended, therefore, that bolts and nuts, such as were ordinarily used, were unsafe, inefficient, and expensive fastenings for connecting together the parts of a permanent way, and that they were not to be relied on."

Compound rails of various kinds have been tried of late years on some American roads to overcome the defects of the ordinary rail track. They have been found, when newly laid and in good order, to be remarkably smooth to ride over, and easy on the engines and rolling stock, but as the plan of their construction required that they should be secured with the same description of fastenings as those used with the fishing plates above referred to, they soon got out of order, were difficult and expensive to keep in repair, and are now, I believe, but little used. The Plate shows different patterns of compound rails which have been tried, six on American railways and one on the Great Western in Canada. They are all, with slight modifications, designed after the same general plan, that is, two halves joined together vertically, breaking joint longitudinally, and fastened with bolts and nuts.

It is evident that the joints of these rails, forming as they do a series of long scarfs, must be very much stronger and better than the common chair joints, but still the joints are not so strong as the body of the rails; since at the points where they occur one half only of the sectional area of the rail is solid. If there had been no other objection to these compound rails than the absence of as much strength at the joints as elsewhere, they would, no doubt, be more generally in use than we find them, inasmuch as in them the weak and defective part of the common rail is very materially remedied. Experience, however, has demonstrated that all these patterns of rails are open to serious objections, the most important of which may be stated as being increased first cost over the common rail, excessive cost of maintenance, and too rapid wearing out.

It is evident that these objections may readily be attributed to the plan of construction, as the application of bolts or rivets throughout the entire length of the rail is indispensable to hold the two halves together. As already explained, bolts cannot be relied on, inasmuch as they constantly shake loose, and in this state the stability of the rail is impaired. It is found, too, that rivets for other reasons are perhaps even more objectionable, and whether bolts or rivets are used it is not long before laminated portions of the upper surface of the rail get in between the two plates, and these acting like small wedges, and driven tight by every passing train, gradually open up the rail and hasten its destruction. It is found, moreover, that unless the bolts are properly performing their duty, the whole weight of trains not unfrequently comes on a single half of the rail, producing violent strains which soon tell on the durability of the several parts. For these reasons such compound rails as have been already tried have not proved economical in maintenance, and in consequence have fallen into disuse.

The design of the compound rail now submitted may be executed of any required weight which a heavy traffic might demand. It is thought, however, that a good serviceable rail may be made weighing 80 lbs. per yard including wrought iron cores, the cores themselves weighing 25 lbs., and each half of the rail 36½ lbs. The ties could be grooved by a machine at a trifling cost, and the grooves for both rails could be cut at the same operation; by this means the proper guage of the track would be permanently secured, and the whole superstructure would be laid with the greatest ease and with very little skilled labour; it would be unnecessary to flatten the ties on any but the lower side, as the machine would form a perfect seat for both rails. The cores may be from 2½ to 3 feet in length, inserted at the joints of both upper and lower half rails, and secured in their position by a small rivet or pin; they would have the same sectional area as each half rail, and being deeper, they would give fully more strength where the joints occurred than the rail possessed at intermediate points.

A permanent way constructed with a compound rail similar in design to the one now submitted may, when put on its trial, have some inherent defects which we cannot at present discover, but in the absence of a practical test, and in ignorance of any strong objection to the plan proposed, I think it may fairly claim the following advantages:

1st. Simplicity of construction and fewness of parts.

2nd. Sufficiency of lateral as well as vertical strength at every point.

3rd. Could be easily laid in perfect guage with little skilled labour.

4th. The rails would be equivalent to continuous bars of uniform strength, and probably would be found more elastic than solid rails.

5th. Great stability, the rails being securely bedded in the ties and their surfaces reduced to the least vertical height practicable above the ballast.

6th. The rails would be thoroughly secured from spreading or displacement.

7th. The track would be smooth to ride over, free from jolts or jars, and easy on the rolling stock.

8th. Economy in cost and maintenance.

Some of these advantages will be readily admitted on a simple inspection of the drawings, others may be inferred from previous explanations, but the last, which is in fact the most important of all, requires some further observations.

Those who have had opportunities of overlooking the operations of the workmen engaged in track repairs must have observed that a great portion of their time is occupied in restoring the injury done to the rail joints, either in removing broken chairs, tightening bolts, or raising the ballast and ties,—indeed at some seasons of the year the most of their time is occupied in raising the joints. With the improved rail this could not be the case, as practically it has no joints, being of uniform strength throughout its length. In this view of the case I cannot be far astray in estimating, that the improved rail compared with the common rail would not require more than half the number of track men to keep it in repair, and that in this service a saving of not less than $120 per mile would annually be effected.

Again, the ends of the common rail bars laid in the ordinary way, being deficient in strength, are invariably the first portions of the iron to laminate and give way, it may very reasonably be argued that the wearing surface of the improved rail, being equally supported at all points, would not be so much exposed to percussive blows and unequal wear as the common rail, and would, as a natural consequence, last longer. However just this conclusion may be, it will at once be apparent, that the improved rail may undoubtedly claim very much greater durability and usefulness for other reasons. The lower half being an exact counterpart of the upper, by simply inverting both when the wearing surface of the upper is destroyed, we have a fresh surface brought into play, which in all probability may last quite as long as the first. In view of both these circumstances we may, in all fairness, claim that the improved rail will serve its purpose not less than double the period that the common rail would endure, and hence the annual deterioration of the latter should be reckoned as being very much greater than the former. To illustrate the financial value of these advantages possessed by the improved rail, I present an approximate estimate of the annual saving it would effect.

Assuming that the improved rail, including wrought iron cores, weighs 80 lbs. per yard, and that the common rail weighs 65 lbs. per yard exclusive of chairs, the first cost of a rail track constructed with the former will exceed one with the latter by about $800 per mile:

	Annual excess per Mile of Improved Rail over Common.	Annual excess per Mile of Common Rail over Improved.
Annual interest on $800 excess in first cost of improved Rail	$48	
Annual exess of cost of track repairs..................	....	$120
Annual excess of deterioration of iron rails	....	260
	$48	380
Saving per mile per annum in favor of Improved Rail...	....	$332

It is not pretended that the above estimate is perfectly correct and adapted to every case, as the amount and character of the traffic engaged in by any particular line, as well as the weight of rails used, would affect the calculations. The figures are sufficient, however, to give a comparison between the existing and the proposed system, and to show roughly the commercial value of the latter. Allowing, if need be, one half of the above estimate for unforeseen possible contingencies, we have still a saving of over $180 per mile per annum; a sum which, if reckoned on the mileage of existing Canadian railways, would be equal to a yearly saving of $320,000, sufficient to pay a dividend of 6 per cent. on $5,400,000 of railway capital.

I need scarcely lengthen these observations in order to show that the suggested improvement appears to possess many important advantages, but as the economic test is after all the true financial standard by which such improvements should be measured, I may add, that as the rolling stock is greatly affected by the condition of the track, and the cost of its repairs is proportionate to the state in which the road is kept, we have in this circumstance another element of saving, inasmuch as the improved rail could doubtless be maintained from first to last in a much smoother state than we usually find existing rail tracks.

If still another illustration be needed to show the economic value of the improved rail, it will be seen in the comparative amount of capital required to re-lay the rails after the first set are worn out. For this comparison it matters not what the average life of a common rail may be considered, since we have already shown that the improved rail may be found serviceable for double the period. Let us assume that the life or serviceable duration of a common rail is 8 years, then that of the improved rail may be taken as 16 years,—before the expiration of 8 years the whole of the former has to be renewed, but the latter being reversible, and a worn out surface being equally good for the lower portion, one half of it only has to be replaced before 16 years expire. In the case of the common rail one-eighth of its first cost should annually be set aside out of the company's earnings to replace it in eight years, while only one thirty-second part of the first cost of the improved rail would be needed as an annual sinking fund to renew the wearing surface in sixteen years As a more practical illustration, take a line of railway 200 miles long, and assume the life of a rail as above given, we find, after making ample allowance for the value of the worn out rails as old iron, that the Company would require to expend in round numbers the sum of $600,000 before eight years expire in running the ordinary rail, while about $300,000 would be sufficient to replace the wearing surface of the improved rail in double the period. In other words, while the renewal of the common rail would prove an annual drain of $75,000 on the earnings of the Company, the improved compound rail would annually draw upon receipts to the extent of from $18,000 to $19,000 only.

It may be observed that the strongest claim which this improvement possesses is, economy in maintenance, and unless this advantage be satisfactorily established the adoption of the system on new or existing lines cannot be hoped for. The fact that railway investments have almost universally turned out profitless to the stockholders, while the public has received and daily receives unmeasured benefits, is a sufficient reason why all improvements in railway construction or in railway management, should have a tendency to distribute the benefits in a more equitable proportion. The public ought not to have a monopoly of them. The parties who invest their capital in railways should have a fair return for their money and their enterprise; indeed it would be infinitely more satisfactory to the thinking public to know and feel that they were in the enjoyment of the most perfect system of internal communication without loss or it may be ruin to the proprietors. Railways must be made to pay, or their extension into unoccupied fields must cease, and thus suspend the progress of modern civilization. Before they can pay one of two things is neceesary, either the receipts must be increased or the expenditure diminished. Experience goes to prove that the amount of traffic which centres in any particular railway is limited by variable local circumstances and the laws of commerce, and beyond this limit the traffic cannot safely be forced; if the earnings cannot be increased beyond what the limit of traffic will allow, then, to make the enterprise pay, a reduction of expenditure must be attempted. In this latter respect it is thought that the change now proposed in the construction of the permanent way has every appearance of being one step in the proper direction, and I avail myself of the facilities furnished by the Canadian Institute for giving such publicity to the proposed plan as may bring it under the notice of those most interested in the removal of the evils which it is designed to avert.

THE ODAHWAH INDIAN LANGUAGE.

BY F. ASSIKINACK,
A WARRIOR OF THE ODAHWAHS.

It is my intention to submit in this paper a few remarks on the language spoken by the above named Tribe of Indians, with the view of showing at least some of the peculiarities in it. On the question whether the languages spoken by the different Tribes in America descend from one common stock, as some writers seem to think, I will not at present undertake to offer any opinion; but I am perfectly satisfied in my own mind that there are Indian Tribes who differ from each other in language as much as the English, French, and German differ from one another in their respective languages. The undermentioned Tribes may be considered as speaking nearly the same language, disagreeing merely in small matters, such as letters, syllables, terminations, and by using in a few instances totally different terms: namely, the Ojibwas, Odahwahs, Omissahgees, (Mississages as they are commonly called), and Odashkwahguhmees. Perhaps the reader may wish to know the reason for my not employing the terms, "*Ottawa*" and "*Chippewa*," in this and my other papers; in answer, I would simply state, that I believe the writers who first made use of these terms, meant to write, *Odahwah* and *Ojibwa*, and having not the slightest doubt that the latter are the correct proper names by which certain Indian Tribes are known in America, I have thought it right to introduce them in these papers for the information of those who may do me the honor to read them. Having made these statements I may now observe that there appear to be twenty-one letters in the Odahwah alphabet. The letters which are wanting, are F, L, R, V and X. From the circumstance of not having these letters in our own tongue, we find great difficulty in pronouncing words where these letters occur, when we commence to learn the English language. Other Tribes appear to be laboring under greater difficulties arising from the deficiency of letters in their alphabet, or rather, the sounds in the language suggestive of corresponding alphabetic signs. The Mohawk Indians, for example, I understand, have only nineteen letters, and no labials at all, and are liable to put B when P should be used; T in place of D; G instead of C; and this defect is noticeable both in their conversation and writings, I mean of course when they make use of the English language.

With respect to the parts of speech, although I am without a guide on the subject, I may venture to say that the Indians have the substantive, the adjective, the verb, the adverb, the pronoun, the conjunction, the interjection, and a sort of a preposition; but they have no article either definite or indefinite. The genders are two, namely, the common and neuter. In Indian, nouns seem to be divided into two classes, viz., nouns without life, if I may be allowed to use the expression, and nouns possessing life. The latter class includes many substances without life, which are nevertheless spoken of as if they possessed life. The former does not contain one single noun possessing life. It is the custom among the Indians to speak of every species of animated nature precisely in the same terms, no matter how small soever the living object may be,—from the largest of quadrupeds to the most insignificant worm or insect, every class of animals may be placed under the heading of common gender, or living nouns. Substances which appear to be capable of motion, growth, or of producing, are generally of the common gender, such as the sun, the moon, the stars, trees, fruit trees and other kinds of vegetables; but those which are without motion or growth, such as land, soil, a stone, a rock, an island, belong commonly speaking to the neuter. Though a tree belongs to the common gender as we have seen above, yet the different parts of it, viz., the branches, bark, roots, leaves, are of the neuter gender. On the other hand some common nouns may be divided and actually taken into parts without any change of the kind; for instance, a corn stock is common, though the ear may be removed from it, and the grain from the ear, yet all these parts would be of the same gender as the whole. I state these particulars in order to give you an idea of the peculiarities of the Indian language.

The plural number is generally formed by adding *g* or *ug* to animate nouns, and *un* to those inanimate; thus, *ahmoo,* a bee, *ahmoog,* bees; *ahnine,* a man, *ahninewug,* men; *minis,* an island, *minisun,* islands. Some few vowel endings only take *g* for the animate, and *n* for the inanimate. There are of course many exceptions.

Taking it for granted that a few specimens of modern compounds will be acceptable, I submit the following, viz., Ahshkoda-naubegwun, a steamboat, from Ahshkoda, a fire, and Naubegwun, a ship; Piwahbikomekun, a railroad, from Piwahbik, iron, and mekun, a road; Tibahkonigawenine, a lawyer, from Tibahkoniga, he gives law, and ahnine, a man; Tibahahkiwenine, a land surveyor, from Tibahiga, he measures, ahke, land, and ahnine, a man; and I know that the telegraph is called "*Piwahbiconce-madwawag,*" that is to say, *a little iron making a noise.* I hope from the above examples the reader is satisfied that his Indian friends are endeavoring to keep up with the great progress of the age, at least in words, if not materially.

As regards adjectives, I may simply state, that they are employed for the same purpose as in English; but they are not very distinct, and many of them are more like adverbs in composition, such as *bene, male,* in Latin. Thus we say in Indian, Meno-ahnine, a good man; Meno-ahyah, he is well; Meno-dodum, he is doing what is right; and a noun adjective seems always to be incomplete without annexing to it the proper syllable or termination; thus *mahkuhda* evidently means black, though in its modern signification it denotes powder. When it signifies an animal that is black, where in English we should use the verb "*is,*" we are obliged to increase the word by adding one or more syllables; for example, you say in English the bird is black, the Indians would simply say, Mahkuhdaweze; the thing is black, Mahkuhdawah. In many cases adjectives are not used at all, thus, Ahkwa, a woman: Ahkwazans, a little girl: Mitig, a tree: Mitigonce, a small tree. We now come to the verb, and I think the reader will agree with me in the opinion, that Indian verbs present more peculiarities than either Latin or Greek verbs, at least in some respects; they certainly differ widely from the English. In the Indian language, almost every change that takes place in nouns causes a change in the termination of verbs, and it is by means of these terminations that the gender to which nouns belong is shown. Perhaps it would be more correct to say that the genders of nouns affect the terminations of verbs. Before proceeding further, it may be well to give the personal pronouns, which are as follows:

SINGULAR.		PLURAL.	
Indian.	*English.*	*Indian.*	*English.*
Nin,	I,	Ninahwind and Kinahwind,	We,
Kin,	You,	Kinahwah,	Ye,
Win,	He,	Winahwah.	They.

In the following examples you will perceive no change in the English verb; viz., the man falls, ahnine pungishin; the branch falls, odikwun pungisin. In the first example, the syllable *hin,* shows that *ahnine* is masculine, whilst in the latter, *in,* without the *h,* proves *odikwun* to be of the neuter gender. Again,

SINGULAR.

Masculine,	The man appears....	Ahnine nahgoze.
Neuter,	The island appears ..	Minis nahgwud.

PLURAL.

Masculine,	The men appear......	Ahninewug nahgozewug.
Neuter,	The islands appear ..	Minisun nahgwudoon.

Let us take a verb transitive and a common gender; I see a star, Niwahbuhmah ahnung; I see an island, Niwahbundaun minis, *neuter;* Niwahbuhmahg ahnungwug, I see stars; Niwahbundaunun minisun, I see islands.

I give this pipe to you,...... Kiminin mahbah opwahgun.
You give this pipe to me,.... Kimeezh mahbah opwahgun.
He gives this pipe to me,.... Niminig ahnoonduh opwahgunun.

In the last example not only the verb changes, but the demonstrative pronoun used in the first and second persons is no longer available in the third, and *un* is added to the end of the substantive. Sometimes the *n* in the personal pronoun is dropped, as is shown in the above examples; other times it is preserved, and occasionally *d* is put between it and the following word beginning with a vowel; thus, I went, Nin-ge-izhah; I go, Nind-izhah.

The foregoing will show some of the varieties in Indian verbs, yet, notwithstanding these endless variations, insertions and omissions of syllables in the verbs and other words, a stranger will be surprised to hear Indian children speak their language as fluently and correctly as persons in grey hairs.

In order to show that none of the Tribes speak exactly alike, the following will serve as examples, how and wherein they differ:

ODAHWAH.	ENGLISH.	OJIBWA.
Ahnine..............	A man..............	Enine.
Nibeesh..............	Water..............	Nibe.
Dokisin..............	It is calm.............	Onwahtin.

The Algonquins say, *Naupij* for *very,* Odahwahs, *Ahpidji.* I may here observe that I am informed some of the Tribes west of the Rocky Mountains call the sun *Kesoos,* and the earth, *Ke,* while the Odahwahs call them *Kezis* and *Ahke.* If my information is correct, it would tend to show that there is similarity of words among various Tribes, however distant they may be from one another.

It is also my desire to take notice in this paper of the inaccurate manner in which Indian words are pronounced and spelled by white people in general, and I hope to be able to show how a wrong spelling may alter a word completely from its original form, and how an incorrect proper name may be repeated and taken as an historical truth after a considerable space of time, especially when the language in which the error originally occurred is not properly understood. By way of beginning, I beg to state that there is a place on the "Ottawa" river called by the Indian, *Mahdahwaun*, while our white friends persist in pronouncing the name, *Matawan*. *Mississippi* is the Indian name of a large river in America. An Indian of my tribe would not have the slightest idea of the original form of this word, although the reader has seen a part of it in the beginning of this article. Our way of writing this name is, *Mashizebe;* it is compounded of *Missi*, which in composition words corresponds to *Michah*, and signifies very great, enormous. The rest of the name speaks for itself, *sebe*, a river.

I shall close this paper by citing another example, and in doing so, will have to criticise the "*Canadian Journal*" itself. In a paper "read before the Canadian Institute on February 14, 1857," the following passages occur,—speaking of Champlain's voyages,—"He ascended the Ottawa beyond the limit of his first journey, till he branched off into the chain of lakes, which led him to the Lake of the Epicerini, or Nebicerini, as later writers call them, an Algonquin Tribe, who were long celebrated for their power as sorcerers, *and whose name we still preserve in that of Lake Nipissing.*" From the above it would appear that "Nipissing" is derived from "Nebicerini"; with all due deference to the learned author, I submit that the very reverse is the case, and that "Nebicerini" is derived from "Nipissing" as much as the name of "Torontonians" is taken from "Toronto." In the first place the spelling in both cases is wrong; Nipissing should be written with b not p, thus *Nibissing*, from the Odahwah word *Nibis*, a small lake. That lake is called Nibissing by way of distinction, being about the largest of the lesser lakes in these parts; in the same way *Mississippi* is applied to the largest river to distinguish it from others. It follows then that the correct form of Nebicerini is *Nibissiwinine.* The term we apply to any one who resides at Nipissing and the country round about is "*Nibissing-dahshi-ahnine,*" i. e., a man belonging to Nibissing; and *Nibissi-ahnine*, and *Nibissinine*, plural, *Nibissininewug*, inhabitants at Nibissing, which I presume "Nebicerini" was meant to represent. The termination *ng* denotes generally *in, at,* so that *Nibissing* signifies *at the little lake.*

DONATI'S COMET.

BY THE REV. JAMES WILLIAMSON, LL.D.,
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The appearance of Donati's Comet excited so much interest during the whole period of its being visible in this latitude, that it may be acceptable to the readers of the *Canadian Journal*, to be put in possession of some of the results of observations made with the aid of the fine instruments in possession of the University of Queen's College, Kingston. These observations have a further interest and value, from the fact that they include an observation a day later than the last on which a similar one was obtained in Britain, and which it may therefore be not unimportant to place on record in our Canadian journal of science.

From the 7th September, when Donati's Comet was first observed here by the naked eye, to the 12th, its tail rapidly increased in magnitude. On the 13th and 14th it pointed nearly in the direction of the Pole-star, while the nucleus was as bright as a star of the first magnitude. On the 17th the Comet was still in the southern part of Ursa Major, with a tail of about 5° in length, pointing between χ and ψ, but nearer to the latter. On the 24th its tail had increased to 8° in length. On the 26th it was a little south of Cor Caroli, with a tail of about 10°, pointing nearly through δ of Ursa Major to the Polestar, and a little concave towards the sun. On October 2nd the tail was 20° in length, and on the 5th the head was about a degree southeast of Arcturus, with a tail of about 32°, which was nearly its maximum length. On the 15th both the nucleus and the tail had rapidly decreased in brightness and the latter also in length, so that it was not much more elongated than when it was first visible to the eye. On the 18th it was scarcely distinguishable by the naked eye, even when its place was known. Although its position, not far above a somewhat hazy horizon, and the moonlight, impeded a distinct view of its appearance through the telescope, it evidently now exhibited only traces of the tail in the winged appearance of the head; and the nucleus, though tolerably round and well defined, was still further diminished in brightness.

The tail was comparatively narrow at first, with the greatest brightness in the centre, and not at the sides, but afterwards increased greatly both in length and in breadth, while a darker portion in the centre appeared to separate it into two luminous portions. On the 2nd October the coma round the head had become broader, while the nucleus had become brighter. On the 15th the tail, though much fainter and diminished in magnitude, appeared broader and of a more hyperbolic form than before, and the nucleus which was round and pretty well defined on the side away from the sun, exhibited a brighter and more irregular appearance, with flame-like jets, in that portion which was turned towards it.

"The following approximate places were obtained at 7 P. M., on the 13th and 14th September:

	Right Ascension.	Declination North.
13th.........	11h 12′ 35″	36° 32′
14th.........	11h 18′ 24″	36° 33′

From the 13th to the 20th the variation both in Right Ascension and Declination was slow. The following are the places more recently observed, and which may be taken as very nearly correct:

	P. M.	Right Ascension.	Decline.
Sept. 20,	7:00......	11h 48′ 56″.........	36° 20′ N.
" 24,	"	12h 6′ 8″.........	35° 10′
" 25,	"	12h 24′ 39″.........	34° 34′ 30″
Oct. 2,	"	13h 36′ 36″.........	26° 10′
" 5,	6:50......	14h 12′ 50″.........	19° 3′
" 14,	6:31......	15h 58′ 10″.........	10° 44′ S.
" 15,	6:11 47′	16h 8′ 28″.........	13° 48′
" 18,	6:14 30′	16h 37′ 25″.........	21° 51′

The observations were made in the Observatory here with the large equatorially mounted telescope constructed by Mr. Alvan Clarke, the object-glass of which has 6¼ inches of aperture, and of which the Right Ascension reads to four seconds of time, and the Declination Circle to one minute of arc.

The motion of the Comet is, as will be seen from the above, retrograde. The elements of its orbit have not yet been given, so far as we have observed, either in Britain or here: and although three observations, taken at short intervals, are theoretically sufficient for their determination, some time must elapse, and the whole series of observations will require to be taken into consideration before they be fully ascertained, and their accordance with the observed places verified. We know, however, by simple trigonometrical calculation, its nearest distances from the sun and earth, and the[illegible], by micrometrical and other instrumental measurement, the breadth of the nucleus and coma, and the length of the tail. In its perihelion it passed nearer to the sun than the mean distance of Venus, being a little more than 50,000,000 of miles from the former luminary.

REVIEWS.

Elements of Inorganic Chemistry: By THOMAS GRAHAM. Edited by HENRY WATTS and ROBERT BRIDGES. Lea and Blanchard, Philadelphia, 1858.

Otto's Handbuch der Anorganischen Chemie: VIEWEG und SOHN. Braunschweig, 1855.

It is some years since the first part of Graham's Elements of Chemistry was republished in America, and it is with great pleasure that we have now to notice the appearance of the complete work as issued in very creditable form by Lea and Blanchard, under the editorship of Dr. Bridges, who, although making some valuable additions to the first part of the treatise, does not seem to have added anything to the second; a circumstance which may however be explained, by the great completeness of the original work and by the short period which elapsed between its appearance in England and its re-issue in America.

The present work is issued under the title of "Elements of Inorganic Chemistry," and there does not seem much probability of the organic part being ever published. But from the excellence of the portion before us it must be a matter of regret that Mr. Graham should not be induced to devote his attention to that department also.

All chemists must, however, be deeply grateful to the author for the excellent manual with which he has furnished them, for we have no hesitation in stating, that there is no work in the English language which can for a moment compare with it.

In French (leaving out of consideration the work of Dumas, of which, as far as we know, there is no recent edition,) we have the excellent and tolerably extensive treatise of Regnault, and the still more extensive manual of Fremy and Pelouze, but on a careful comparison we are inclined to give the preference to the work of the British

Chemist. In German we have Gmelin's "Handbuch," which will ever remain a memorial of the almost incredible diligence and ability of its author, a work that as one of reference is unsurpassed in any science. The only book which can compare with and perhaps surpass Graham's is the "Lehrbuch der Anorganischen Chemie," by Otto, formerly known as "Otto Graham's Chemie," being founded on the previous edition of that author's elements, but which has now assumed a form and extension fully entitling it to the position of an independent work. Although it is now some years old, having been completed in 1855, it may not be altogether out of place to say a few words concerning this most excellent publication.

To all lovers of chemistry, and especially to those engaged in the arduous duties of instruction, we cannot sufficiently recommend a perusal of this specimen of German accuracy and completeness. Perhaps the objection may be raised, and not altogether without reason, that the author has rather too great a tendency to diffusiveness. Imagine seventy-five pages of close print on nitric acid, forty-five on phosphoric, and about the same on sulphuric; and yet there is little or nothing that we could desire to see left out. So many various branches of chemical science are treated of, and so much attention is paid to analysis and to technical and toxicological applications, and the first volume of the four, on Heat, Electricity, and Chemical Physics, has been so thoroughly elaborated by Kopp, Zamminer and others, that the work in reality replaces a whole chemical library To the lecturer also it is exceedingly valuable, from the number of excellent hints for the performance of lecture-room experiments.

The "Elements" of Graham, however, if not quite so extensive as the work of Otto, is undoubtedly the most philosophical and instructive treatise on chemistry, in the English language. We have already noticed the first part, as it appeared in its American dress in 1852, and have only now to add, that the recent edition has been brought up to the present state of the science by the carefully compiled and elaborate supplement appended by Mr. H. Watts, the English editor, to whom this second edition owes much of its completeness, and who must share with Graham the commendations awarded to it.

The supplement is very extensive, occupying nearly two hundred pages, and commences with an excellent resumé of the advances made in Heat, Electricity, and Chemical Physics, e. g. Specific Heat, Vapours, Conduction, the dynamical theory of Heat, the application of the

Polarization of Light to chemical investigation, which had not been treated of in the first edition, and which by means of Duboscq's electrical lamp can now be so conveniently made a class experiment and exhibited to a large audience. The elaborate researches of Bunsen and Roscoe on Photo-chemical induction, of Gladstone on Chemical Affinity, of Graham on Osmotic Force, and of Favre and Silzerman on the Heat of Chemical Action, are all, with many others, here reproduced in a condensed form.

In the portion of the supplement devoted to the elements we have a tolerably complete account of that difficult and puzzling question, the nature of Ozone, leaving us at its termination nearly in the same state of uncertainty as at the commencement. Mr. Watts says, "Although the existence of an allotropic modification of oxygen seems to be established, the existence of hydrogen in the ozone obtained by the electrolysis of acidulated water can scarcely be denied." This may be so, but it seems rather difficult to imagine that there can be any difference in composition between substances possessing so precisely identical properties as the two ozones thus obtained; further investigations are required on this subject.

Under the head of the metals of the earths and alkaline earths, we have a full description of the new processes by which these curious bodies have been lately obtained, and by which, for instance, magnesium can be prepared in such quantity and at such moderate expense as to render it available for that most beautiful of all lecture-room experiments, the combustion of magnesium in air or oxygen

The work, especially the first part, is profusely illustrated with wood engravings, which greatly enhance its value to the student. In looking over the drawings of apparatus for the evolution and absorption of gases, we have been rather struck with an error, or perhaps more correctly an oversight which occurs in several, and to a remarkable apparent misapprehension of the action of safety tubes. We allude to the absence from many of the drawings of the safety tube required to prevent the reflux of the liquid from the washing bottle into the generating flask, and to the erroneous explanation of the action of the wide tube in fig. 138, page 294.

In the well known arrangement for preparing pure hydrochloric acid, the generating flask is furnished with a doubly bent tube (Welter's safety tube), containing a little sulphuric acid, and each of the three-necked bottles has a straight tube passing through the centre neck and dipping a little into the liquid. If we call the flask A, and the bottles B, C and D, then the straight tube in C prevents the reflux of the liquid from D, caused by a partial vacuum or absorption in C; the tube in B does the same for C, and the bent tube in A allows air to enter if a vacuum be produced in the flask and the wash water rises into the delivery tube, thus preventing reflux from B.

In the work before us, and in many others it is recommended, when we have no three-necked bottles, but only those with two apertures, or when we are compelled to use a cork with two perforations fitted into a wide-mouthed vessel, to insert into one neck or perforation a wide tube dipping into the water, and to pass the gas-delivery tube through this into the liquid. If the above series were arranged in this way, then the wide tube in C would prevent reflux from D, in B from C, but the wide tube in B would have no action in preventing reflux from B into A, that would have to be guarded against by a safety tube attached to the flask itself. And yet we find such an arrangement recommended in Graham's Elements, which by its adoption might frequently lead to very disagreeable if not dangerous consequences, and against which the beginner in practical chemistry cannot be sufficiently warned.

At page 275 we have an apparatus for evolving carbonic oxide from a heated mixture of sulphuric acid and ferrocyanide of potassium (Fownes' process). The flask is without safety tube, but the gas tube passes through a wide one into the washing bottle, which it is clear would not prevent the possibility of the wash water running back into the hot sulphuric acid.

At page 285 we have a similar want of safety tube in the preparation of olefiant gas.

At page 294, fig. 138, the same contrivance is employed in the apparatus for preparing a solution of sulphurous acid, and in the text we read that the washing phial and wide tube serves to "prevent the liquid in the second bottle from passing back into the generating flask, on the occurrence of a contraction of the air in the flask, by cooling or any other cause." It undoubtedly would prevent the return of the water from the second bottle into the first, but not of that in the first into the flask, and by the neglect of the proper precautions in this process very dangerous explosions may sometimes happen, as the writer knows to his cost.

At pages 307, 331 and 333 the same occurs; at 339, 347 and 348 the apparatus is correct, a safety tube being attached to the flask, although in the latter arrangement (348) the use of the wide tube is not very apparent, inasmuch as there is nothing that could possibly flow back under any circumstances.

In looking over the illustrations in the works of Otto, Mitscherlich, Regnault, and Pelouze, we do not find any in which the safety tube is omitted, where a dangerous explosion could possibly take place, and we point out this oversight merely for the purpose of showing how necessary it is, in a work intended for learners, to correct the engravings as carefully as the letterpress.

It is much to be regretted that the treatise before us is confined to inorganic chemistry, if it were continued to the organic department with the same completeness and ability that characterise the present portion, chemists would receive a work of which they are much in need. By the lamented death of Gmelin, his invaluable Handbuch remains incomplete, although it must be confessed that even this excellent work is not free from all objections, inasmuch as his system of arrangement is the most artificial and inconvenient that could possibly be imagined. A reader who is not already a good chemist is left entirely at the mercy of the index when hunting up the history of any compounds. The different organic combinations being arranged in classes according to the number of equivalents of carbon they contain, *if he does not remember their composition* he *cannot know* in which group to look for them; such an arrangement being moreover constantly variable with the results of improved analyses or more rational theories. Kolbe's continuation of Otto drags its slow length along, and promises to be completed about the same time as the Catalogue of the British Museum Library. Limpricht's excellent manual has not yet, as far as we know, been translated into English; and we cannot recommend to any aspiring translator, who is well acquainted with the advances of organic chemistry, a more praiseworthy undertaking than to prepare an edition of this small but most excellent work, bringing it up to the present state of the science.

In Mr. Watts' supplement he has very judiciously introduced a chapter on Chemical Notation and Classification, in which a short but comprehensive explanation is given of Gerhardt's unitary system, somewhat like that which forms the introduction to Limpricht's Chemistry. We are not aware of Gerhardt's views having been reproduced in any English work, as for a long time his theories have been rejected by both English and German chemists. Gradually, however, they are being adopted, and almost every new discovery in organic chemistry tends to prove their truth and their applicability to the explanation of the composition and formation of organic bodies. Berzelius, the great champion of the dualistic system, would be somewhat puzzled to give a rational formula for many of those complex bodies which have rewarded recent investigations, but the composition of which becomes perfectly simple when referred to the types of Gerhardt.

We consider this portion of the supplement as one of the most valuable departments of the whole work.

H. C.

The Story of a Boulder: By ARCHIBALD GEIKIE, of the Geological Survey of Great Britain. Edinburgh: Thomas Constable & Co., 1858.

The literature of Geology may be classed under three heads: first, works of original research, whether in the form of extended treatises, or in that of scientific papers, including reports on unexplored districts, and on the general progress of Geology; secondly, manuals and text-books, embodying a systematic exposition of the facts and theories of the science, or of some special department of it, arranged and displayed according to the ability of the respective authors, in a spirit of greater or less originality; and thirdly, popular essays, in which a scientific and literary treatment of the subject is alike attempted—using these terms in their general sense: the discoveries and deductions of science being here re-produced and set before us, with all the accessories of harmonious language and engaging style. Of these latter works we may take as typycal examples, Hugh Miller's *Testimony of the Rocks*, Ansted's *Ancient World*, and the *Geschichte der Schöpfung* of Professor Burmeister. To this class belongs also Mr. Geikie's "Story of a Boulder;" a little work of much merit, although necessarily, from the nature of its subject, with but slight claims to scientific originality. The student who has carefully read over any of our ordinary manuals,—for example, such as Lyell's Elements of Geology, or the Manual of Professor Phillips—will find in Mr. Geikie's book, little that he will not be already familiar with. A perusal of this unpretending little book, however, cannot fail to impress the known facts of the science more clearly and definitely upon his memory, and to expand his field of thought; and should the book fall into the hands of one unacquainted with the wondrous histories revealed to us by the teachings of Geology, its agreably-written pages will in all probability add another worker to the ranks of those already engaged in the advancement of this important science. As an example of Mr. Geikie's pleasing and lucid style, we give, entire, the second chapter of his Story of a Boulder; more especially, as this portion of the book admits of direct application to Canadian Geology.

Has the reader, when wandering up the course of a stream, rod in hand perhaps, ever paused at some huge rounded block of gneiss or granite damming up the channel, and puzzled himself for a moment to conjecture how it could get there? Or when rolling along in a railway carriage, through some deep cutting of sand, clay, and gravel, did the question ever obtrude itself how such masses of water-worn material came into existence? Did he ever wonder at the odd position of some huge grey boulder, far away among the hills, arrested as it were on the steep slope of a deep glen, or perched on the edge of a precipitous cliff, as though a push with the hand would hurl it down into the ravine below? Or did he ever watch the operations of the quarryman, and mark, as each spadeful of soil was removed, how the surface of the rock below was all smoothed, and striated, and grooved?

These questions, seemingly simple enough, involve what was wont to be one of the greatest problems of geology, and not many years have elapsed since it was solved. The whole surface of the country was observed to be thickly covered with a series of clays, gravels, and sands, often abounding in rounded masses of rock of all sizes up to several yards in diameter. These deposits were seen to cover all the harder rocks, and to occur in a very irregular manner, sometimes heaped up into great mounds, and sometimes entirely wanting. They were evidently the results of no agency visible now, either on the land or around our coast. They had an appearance rather of tumultuous and violent action, and so it was wisely concluded that they must be traces of the great deluge. The decision had at least this much in its favour, it was thoroughly orthodox, and accordingly received marked approbation, more especially from those who wished well to the young science of geology, but were not altogether sure of its tendencies. But alas! this promising symptom very soon vanished. As observers multiplied, and investigations were carried on in different countries, the truth came out that these clays and gravels were peculiarly a northern formation; that they did not appear to exist in the south of France, Italy, Asia Minor, Syria, and the contiguous countries. If, then, they originated from the rushing of the diluvian waters, these southern lands must have escaped the catastrophe, and the site of the plains of Eden would have to be sought somewhere between the Alps and the North Pole. This, of course, shocked all previous ideas of topography; it was accordingly agreed, at least among more thoughtful men, that with these clays and sands the deluge could have had nothing to do.

Other theories speedily sprang up, endeavouring to account for the phenomena by supposing great bodies of water rushing with terrific force across whole continents, sweeping away the tops of hills, tearing up and dispersing entire geological formations, and strewing the ocean-bottom with scattered debris. But this explanation had the disadvantage of being wofully unphilosophical and not very clearly orthodox. Such debacles did not appear to have ever taken place in any previous geologic era, and experience was against them. Besides, they did not account for some of the most evident characteristics of the phenomena, such as the northern character of the formation, the long parallel striations of the rock surfaces, and the perching of huge boulders on lofty hills, often hundreds of miles distant from the parent rock. Geologists were completely at fault, and the boulder-clay remained a mystery for years.

When we consider the physical aspect of the countries where the question was studied, we cannot much wonder that the truth was so hard to find. In the midst of corn-fields and meadows, one cannot readily realize the fact that the spot where they stand has been the site of a wide-spread sea; and that where now villages and green lanes meet the eye, there once swam the porpoise and the whale, or monsters of a still earlier creation, unwieldy in bulk and uncouth in form. Such changes, however, must have been, for their traces meet us on every hand. We have the sea dashing against our shores, and there seems nothing at all improbable in the assertion that once it dashed against our hill-tops. No one, therefore, has any difficulty in giving such statements his implicit belief. But who could have dreamed that these fields, so warm and sunny, were once sealed in ice, and sunk beneath a sea that was cumbered with many a wandering iceberg? Who could have imagined, that down these glens, now carpeted with heath and harebell, the glacier worked its slow way amid the stillness of perpetual snow? And yet, strange as it may seem, such is the true solution of the problem. The boulder-clay was formed during the slow submergence of our countr beneath an icy sea, and the rock surfaces owe their polished and striated appearance to the grating across them of sand and stones frozen into the bottom of vast icebergs, that drifted drearily from the north. That we may better see how these results have been effected, let us glance for a little at the phenomena observable in northern latitudes at the present day.

Icebergs are formed in three principal ways:—1st. By glaciers descending to the shore, and being borne seawards by land-winds; 2nd. By river-ice packed during spring, when the upper reaches of the rivers begin to thaw; 3rd. By coast-ice.

I. There is an upper stratum of the atmosphere characterised by intense cold and called the region of perpetual snow. It covers the earth like a great arch, the two ends resting, one on the arctic, the other on the antarctic zone, while the centre, being about 16,000 feet above the sea,* rises directly over the tropics,

* The average height of the snow-line within the tropics is 15,207 feet, but it varies according to the amount of land and sea adjacent, and other causes. Thus. among the Bolivian Andes, owing to the extensive radiation, and the ascending currents of air from the neighbouring plains and valleys, the line stands at a level of 18,000 feet, while, on mountains near Quito, that is, immediately on the equatorial line, the lowest level is 15,795.—See Mrs. Somerville's *Physical Geography*, 4th edit. p. 314.

Wherever a mountain is sufficiently lofty to pierce this upper stratum, its summit is covered with snow, and, as the snow never melts, it is plain that, from the accumulations of fresh snow drifts, the mountain-tops, by gradually increasing in height and width, would become the supporting columns of vast hills of ice, which breaking up at last from their weight and width, would roll down the mountain-sides and cover vast areas of country with a ruin and desolation more terrible than that of any avalanche. Olympus would really be superposed upon Ossa. By a beautiful arrangement this undue growth is prevented, so that the hill-tops never vary much in height above the sea. The cone of ice and snow which covers the higher part of the mountain, sends down into each of the diverging valleys a long sluggish stream of ice, with a motion so slow as to be almost imperceptible. These streams are called glaciers. As they creep down the ravines and gorges, blocks of rock detached by the frosts from the cliffs above, fall on the surface of the ice, and are slowly carried along with it. The bottom also of the glaciers is charged with sand, gravel, and mud, produced by the slow-crushing movement; large rocky masses become eventually worn down into fragments, and the whole surface of the hard rock below is traversed by long parallel grooves and striæ in the direction of the glacier's course. Among the Alps, the lowest point to which the glacier descends is about 8500 feet. There the temperature gets too high to allow of its further progress, and so it slowly melts away, choking up the valleys with piles of rocky fragments called *moraines*, and giving rise to numerous muddy streams that traverse the valleys, uniting at length into great rivers such as the Rhone, which enters the Lake of Geneva, turbid and discoloured with glacial mud.

In higher latitudes, where the lower limit of the snow-line descends to the level of the sea, the glaciers are often seen protruding from the shore, still laden with blocks that have been carried down from valleys far in the interior. The action of storms and tides is sufficient to detach large masses of the ice, which then floats off, and is often wafted for hundreds of miles into temperate regions, where it gradually melts away. Such floating islands are known as icebergs.

II. In climates such as that of Canada, where the winters are very severe, the rivers become solidly frozen over, and, if the frost be intense enough, a cake of ice forms at the bottom. In this way sand, mud, and rocky fragments strewing the banks or the channel of the stream, are firmly enclosed. When spring sets in, and the upper parts of the rivers begin to thaw, the swollen waters burst their wintry integuments, and the ice is then said to *pack*. Layer is pushed over layer, and mass heaped upon mass, until great floes are formed. These have often the most fantastic shapes, and are borne down by the current, dropping, as they go, the mud and boulders, with which they are charged, until they are stranded along some coast line, or melt away in mid-ocean.

III. But icebergs are also produced by the freezing of the water of the ocean. In high latitudes, this takes place when the temperature falls to 28.5° of Fahrenheit. The surface of the sea then parts with its saline ingredients, and takes the form of a sheet of ice, which, by the addition of successive layers, augmented sometimes by snow-drifts, often reaches a height of from thirty to forty feet. On the approach of summer these ice-fields break up, crashing into fragments with a noise like the thundering of cannon. The disparted portions are then carried towards the equator by currents, and may be encountered by hundreds floating in open sea. Their first form is flat, but, as they travel on, they assume every variety of shape and size.

On the shores of brackish seas, such as the Baltic, or along a coast where the salt water is freshened by streams or snow-drifts from the land, sheets of ice also frequently form during severe frosts. Sand and boulders are thus frozen in, especially where a layer of ice has formed upon the sea-bottom.* The action of gales or tides is sufficient to break up these masses, which are then either driven ashore and frozen in a fresh cake of ice, or blown away to sea. The bergs formed in this way have originally a low flat outline, and may extend as ice fields over an area of many miles, while, at a later time, they may be seen towering precipitously as great hills, some 200 or 300 feet high.

Few sights in nature are more imposing than that of the huge, solitary iceberg, as, regardless alike of wind and tide, it steers its course across the face of the deep, far away from land. Like one of the "Hrim-thursar," or Frost-giants of Scandinavian mythology,† it issues from the portals of the north, armed with great blocks of stone. Proudly it sails on. The waves that dash in foam against its sides shake not the strength of its crystal walls, nor tarnish the sheen of its emerald caves. Sleet and snow, storm and tempest, are its congenial elements. Night falls around, and the stars are reflected tremulously from a thousand peaks, and from the green depths of "caverns measureless to man." Dawn again arises, and the slant rays of the rising sun gleam brightly on every projecting crag and pinnacle, as the berg still floats steadily on; yet, as it gains more southern latitudes, what could not be accomplished by the united fury of the waves, is slowly effected by the mildness of the climate. The floating island becomes gradually shrouded in mist and spume, and streamlets everywhere trickle down its sides, and great crags ever and anon fall with a sullen plunge into the deep. The mass

* I was informed by the late Mr. Hugh Miller, that a seam of shale abounding in liassic fossils, had been found intercalated among the boulder-clay beds in the vicinity of Eathie. He explained its occurrence there by supposing that it had formed a reef along a shore where ground-ice was forming; and so having been firmly frozen in, it was torn up on the breaking of the ice, and deposited at a distance among the mud at the sea-bottom.

† The account of the origin of these giants, as given in the prose *Edda*, is very graphic, and may be not inaptly quoted here:—"When the rivers that are called Elivagar had flowed far from their sources," replied Har, "the venom which they rolled along hardened, as does dross that runs from a furnace, and became ice. When the rivers flowed no longer, and the ice stood still, the vapour arising from the venom gathered over it and froze to rime: and in this manner was formed in Ginnungagap many layers of congealed vapour, piled one over the other."—"That part of Ginnungagap," added Jafnhar, "that lies towards the north, was thus filled with heavy masses of gelid vapour and ice, whilst everywhere within were whirlwinds and fleeting mists. But the southern part of Ginnungagap was lighted by the sparks and flakes that flew into it from Muspellheim. . . . When the heated blast met the gelid vapour, it melted into drops, and, by the might of him who sent the heat, these drops quickened into life, and took a human semblance. The being thus formed was named Ymir, from whom descend the race of the Frost-giants (Hrim-thursar), as it is said in the Völuspá, 'From Vidolph came all witches; from Vilmeith all Wizards; from Svarthöfdi all poison-seekers; and all giants from Ymir.'"—See Mallet's *Northern Antiquities*, edit. Bohn, p. 402.

becoming top-heavy, reels over, exposing to light rocky fragments still firmly imbedded. These, as the ice around them gives way, are dropped one by one into the ocean, until at last the iceberg itself melts away, the mists are dispelled, and sunshine once more rests upon the dimpled face of the deep.* If, however, before this final dissipation, the wandering island should be stranded upon some coast, desolation and gloom are spread over the country for leagues. The sun is obscured, and the air is chilled; the crops will not ripen; and to avoid the horrors of famine, the inhabitants are fain to seek some more genial locality until the ice shall have melted away; and months may elapse before they can return again to their villages.

The iceberg melts away, but not without leaving well-marked traces of its existence. If it disappear in mid-ocean, the mud and boulders, with which it was charged, are scattered athwart the sea-bottom. Blocks of stone may thus be carried across profound abysses, and deposited hundreds of miles from the parent hill: and it should be noticed, that this is the only way, so far as we know, in which such a thing could be effected. Great currents could sweep masses of rock down into deep gulfs, but could not sweep them up again, far less repeat this process for hundreds of miles. Such blocks could only be transported by being lifted up at the one place and set down at the other; and the only agent we know of, capable of carrying such a freight, is the iceberg. In this way, the bed of the sea in northern latitudes must be covered with a thick stratum of mud and sand plentifully interspersed with boulders of all sizes, and its valleys must gradually be filled up as year by year the deposit goes on.

But this is not all. The visible portion of an iceberg is only about one-ninth part of the real bulk of the whole mass, so that if one be seen 100 feet high, its lowest peak may perhaps be away down 800 feet below the waves. Now it is easy to see that such a moving island will often grate across the summit and along the sides of sub-marine hills; and when the lower part of the berg is roughened over with earth and stones, the surface of the rock over which it passes will be torn up and dispersed, or smoothed and striated, while the boulders imbedded in the ice will be striated in turn,

But some icebergs have been seen rising 300 feet over the sea; and these, if their submarine portions sank to the maximum depth, must have reached the enormous total height of 2700 feet—that is, rather higher than the Cheviot Hills.† By such a mass, any rock or mountain-top existing 2400 feet below the surface of the ocean would be polished and grooved, and succeeding bergs depositing mud and boulders upon it, this smoothed surface might be covered up and suffer no change until the ocean-bed should be slowly upheaved to the light of day. In this way, submarine rock surfaces at all depths, from the coast line down to 2000 or 3000 feet, may be scratched and polished, and eventually entombed in mud

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* That beautiful expression of Æschylus occurs to me, so impossible adequately to clothe in English: *ἀνηριθμον γελασμα κυματων*. Who that has spent a calm summer day upon the sea, has not realized its force and delicate beauty?

† In the *American Journal of Science* for 1843, page 155, mention is made of an iceberg aground on the Great Bank of Newfoundland. The average depth of the water was about 500 feet, and the visible portion of the berg from 50 to 70 feet high, so that its total height must have been little short of 600 feet, of which only a *tenth* part remained above water.

And such has been the origin of the deep clay, which, with its included and accompanying boulders, covers so large a part of our country. When this arctic condition of things began, the land must have been slowly sinking beneath the sea, and so, as years rolled past, higher and yet higher zones of land were brought down to the sea-level, where floating ice, coming from the north-west, stranded upon the rocks, and scored them all over as it grated along. This period of submergence may have continued until even the highest peak of the Grampians disappeared, and, after suffering from the grinding action of ice-freighted rocks, eventually lay buried in mud far down beneath a wide expanse of sea, over which there voyaged whole argosies of bergs. When the process of elevation began, the action of waves and currents would tend greatly to modify the surface of the glacial deposit of mud and boulders, as the ocean-bed slowly rose to the level of the coast line. In some places the muddy envelope was removed, and the subjacent rock laid bare, all polished and grooved. In other localities, currents brought in a continual supply of sand, or washed off the boulder mud and sand, and then re-deposited them in irregular beds; hence resulted those local deposits of stratified sand and gravel so frequently to be seen resting over the boulder clay. At length, by degrees, the land emerged from the sea, yet glaciers still capped its hills and choked its valleys; but eventually a warmer and more genial climate arose, plants and animals, such as those at present amongst us, and some, such as the wolf, no longer extant, were ere long introduced; and eventually, as lord of the whole, man took his place upon the scene.*

It is pleasant to mark, when once the true solution of a difficulty is obtained, how all the discordant elements fall one by one into order, and how every new fact elicited tends to corroborate the conclusion. In some parts of the glacial beds, there occur regular deposits of shells, which must have lived and died in the places where we find them. From ten to fifteen per cent. of them belong to species which are extinct; that is to say, have not been detected living in any sea. Some of them are still inhabitants of the waters around our coasts, but the large majority occur in the northern seas. They are emphatically northern shells, and get smaller in size and fewer in number as they proceed southward, till they disappear altogether. In like manner, the palm, on the other hand, is characteristically a tropical plant. It attains its fullest development in intertropical countries, getting stunted in its progress towards either pole, and ceasing to grow in the open air beyond the thirty-eighth parallel of latitude in the southern hemisphere, and the forty-fifth in the northern. So, too, the ivy, which in our country hangs out its glossy festoons in every woodland, and around the crumbling walls of abbey, and castle, and tower, is nursed in the drawing-rooms of St. Petersburgh as a delicate and favourite exotic. In short, the laws which regulate the habitat of a plant or an animal are about as constant as those which determine its form. There are, indeed, exceptions to both. We may sometimes find a stray vulture

* The reader who wishes to enter more fully into the geological effects of icebergs, should consult the suggestive section on that subject in De la Beche's *Geological Observer;* also the *Principles*, and *Visit to the United States*, of Sir Charles Lyell, with the various authorities referred to by these writers.

from the shores of the Mediterranean gorging itself on sheep and lambs among the wolds of England,* just as we often see

"A double cherry seeming parted,
But yet an union in partition;"

or as we hear of a sheep with five legs, and a kid with two heads. But these exceptions, from their comparative rarity, only make the laws more evident. When, therefore, we find, in various parts of our country, beds of shells in such a state of preservation as to lead us to believe that the animals must have lived and died where their remains are now to be seen, we justly infer that the districts where they occur must at one period have been submerged. If the shells belong to fresh-water species, it is plain that they occur on the site of an old lake. If they are marine, we conclude that the localities where they are found—no matter how high above the sea—must formerly have stood greatly lower, so as to form the ocean bed. To proceed one step further. If the shells are of a southern type, that is, if they belong to species† which are known to exist only in warmer seas than our own, we pronounce that at a former period the latitudes of Great Britain must have enjoyed a more temperate and genial climate, so as to allow southern shells to have a wider range northwards. If, on the other hand, they are of an arctic or boreal type, we in the same way infer that our latitudes were once marked by a severer temperature than they now possess, so as to permit northern shells to range farther southwards. This reasoning is strictly correct, and the truth involved forms the basis of all inquiries into the former condition of the earth and its inhabitants.

The evidence furnished by the northern shells in the boulder-clay series is, accordingly, of the most unmistakable kind. These organisms tell us that at the time they lived our country lay sunk beneath a sea, such as that of Iceland and the North Cape, over which many an iceberg must have journeyed, and thus they corroborate our conclusions, derived independently from the deep clay and boulder beds and the striated rock-surfaces, as to the glacial origin of the boulder-clay.

Notwithstanding the length of the above quotation, we are tempted to lay before our readers another extract, in which the ancient impression of a stigmaria-fragment of the coal epoch, is gracefully contrasted with a *fleur-de-lis*, sculptured on the same stone in a long-succeeding although now far-vanished age. In the graphic picture of the decaying palace, with its hall and chapel, and gloomy dungeons, and the ruined fountain of its court-yard, which furnishes the sculptured matrix of the stigmaria for the author's text, we fancy we recognize

* Two of these birds (*Neopron percnopterus*) are stated to have been seen near Kilve, in Somersetshire, in October, 1825. One was shot, the other escaped.

† There is not a little difficulty in reasoning satisfactorily as to climatical conditions from the distribution of kindred forms. Even in a single genus there may be a wide range of geographical distribution, so that mere generic identity is not always a safe guide. Thus, the elephant now flourishes in tropical countries, but in the glacial period a long-haired species was abundant in the frozen north. I have above restricted myself entirely to *species* whose habits and geographical distribution are already sufficiently known.

the beautiful ruins that reflect their shadow in Linlithgow Loch. The passage altogether constitutes a good example of the general style and subject-treatment of this class of geological writings:

Some time ago I chanced to visit the remains of what had once been a royal residence, and still looked majestic even in decay. It gave a saddened pleasure to thread its winding stairs, and pass dreamily from chamber to hall, and chapel to closet; to stand in its gloomy kitchens, with their huge fire places, whose blackened sides told of many a roaring fagot that had ruddied merry faces in days long gone by; to creep stealthily into the sombre dungeons, so dank, earthy, and cold, and then winding cautiously back, to emerge into the light of the summer sun. The silent quadrangle had its encircling walls pierced with many a window, some of which had once been richly carved; but their mullions were now sorely wasted, while others, with broken lintels and shattered walls above, seemed only waiting for another storm to hurl them among the roofless chambers below. In the centre of the courtyard stood a ruined fountain. It had been grotesquely ornamented with heads of lions and griffins, and was said to have once run red with wine. But it was silent enough now; the hand of time, and a still surer enemy, the hand of man, had done their worst upon it; its groined arches and foliaged buttresses were broken and gone, and now its shattered beauty stood in meet harmony with the desolation that reigned around. I employed myself for a while in looking over the fragments, marking now the head of some fierce hippogryph, anon the limbs of some mimic knight clad in armour of proof, and ere long I stumbled on a delicately sculptured *fleur-de-lis*, that might have surmounted the toilet-window of some fair one of old. Turning it over, I found its unhewn side exhibited a still more delicately sculptured stigmaria. The incident was certainly simple enough, perhaps even trifling. And yet, occurring in a spot that seemed consecrated to reverie, it awoke a train of pleasant reflection. How wide the interval of time which was bridged across in that sculptured stone! Its one side carried the mind back but a few generations, the other hurried the fancy away over ages and cycles far into the dim shadows of a past eternity. The one told of a land of flowers, musical with the hum of the bee and the chautings of birds, and gladdened by the presence of man; the other told of a land luxuriant, indeed, in strange forms of vegetation—huge club-mosses, tall calamites, and waving ferns—yet buried in a silence that was only broken fitfully by the breeze as it shook the spiky catkins or the giant fronds of the forest. The *fleur-de-lis* recalled memories of France—the sunny land of France—which stood out so brightly in the dreams of our school days; the stigmaria conjured up visions of a land that was never gazed on by human eye, but rolled its rich champaign during the long ages of the Carboniferous era, and sometimes rises up dimly in the dreams of our maturer years. Between these two epochs how many centuries, how many cycles must have slowly rolled away! The *fleur-de-lis* was carved but yesterday; the stigmaria flourished when the earth was young, and had seen scarcely a third part of its known history.

The extracts given above, shew that our author possesses a cultivated taste, combined with descriptive powers of no ordinary kind.

Throughout the volume, moreover, great ability is displayed by the way in which the more important features of ths subject are brought out and depicted vividly before the reader. In this, indeed, lies th chief charm and merit of Mr. Geikie's book. We look forward, however, to meet its author at no distant day, in fields of strictly original research, in which alone a lasting reputation is to be obtained.

E. J. C.

The Hand-Book of Toronto; containing its Climate, Geology, Natural History, Educational Institutions, Courts of Law, Municipal Arrangements, &c. &c. By a MEMBER OF THE PRESS. Toronto: Lovell & Gibson, 1858.

The publication of a volume of 272 pages, devoted to the history and description of the Capital City of Upper Canada, must be looked upon as in itself a somewhat significant indication of the rapid progress of this City of the West, and of the Upper Province of Canada, of which it is the Metropolis. The volume, indeed, owes its bulk in part, to chapters not ordinarily included in the City Guide-book. What, it has been asked, has a Geological or a Natural History section, extending to upwards of fifty pages, to do in the Hand-Book of Toronto? And the question would be sufficiently pertinent in reference to any home city of like dimensions and population. But this capital of Upper Canada has been hewn out of the woods, and cleared out of the swamps, within the memory of living men. Its older citizens can remember when the Indian track led through the forest, and they have been scared by the wolf and bear, where now its principal thoroughfares are lined with well-stocked marts, and crowded by a gay and busy throng. Each year witnesses the progress of like changes. We have noted the lingering survivors of the ancient pine forest ejected from enclosed "town lots," and replaced by tasteful villas. The creek to which, only a year or two ago, we were wont to resort of a summer evening to watch the brilliant glancing of the fire-flies, now runs underground through a well built drain; and the stumps of the old clearing have given way to the planking and turnpiking of a city thoroughfare. Nor, with all the rapid progress of a city, now numbering nearly 8,000 dwellings and upwards of 50,000 inhabitants, is the natural history of Toronto entirely a thing of the past.

It might, indeed, be assumed from some of our author's remarks, that we are still in a considerably more primitive state, in relation to vulpine and ursine neighbourship, than recent experience would justify. After a detailed list of Canadian flora, the author thus proceeds :—

"The Fauna of the neighborhood has no doubt been considerably modified by the progress of civilization, or at least by the clearing of the forest. The Wolf and the Bear, and other large animals so frequently met with by the early settler, are now seldom seen except by the lumberman, whose store of bacon lures them to his hut. Now and again, indeed, one or other of these ferocious animals, impelled by hunger, or allured by the scent of prey, strays beyond the line marked by civilization, and finds, when too late, that it has wandered too near the haunts of its relentless enemy, man. Of several of the orders of mammals, we have no representatives here."

In other cases, however, the Canadian settler extends his courtesy to the old denizens of the woods, and welcomes them to the new seat of civilisation. The sociable House Wren (*Troglodytes domestica*), and also the Purple Martin (*Hirundo purpurea*), add to our migratory city population, along with other summer visitors, and find apartments prepared for them as welcome southern tourists :—

"This interesting and beautiful bird is so much a favorite in consequence of its social character, that it is no uncommon thing for persons to prepare it a place of abode during its brief sojourn. Hundreds of little boxes are stuck up on long poles in the gardens throughout the city, where these wanderers annually find a resting place, and a temporary home after their long flight."

Of the New York Bats (*Vespertilio Noveboracensis*) our Hand-Book informs us :—

"In the winter of 1854, Mr. Couper, Entomologist, found one of these bats asleep one forenoon suspended by the feet from the branch of a tree in the Homewood Estate. He stuffed it and sent it to the celebrated Naturalist, L. Agassiz, to whom it was of the utmost importance, for it enabled him to correct an error into which he had fallen in regard to the geographical range of this species. He had set it down as ranging no farther north than the Middle States; yet here it was apparently at home, a little north of Carlton Street."

So of the Sand Martin (*Hirundo riparia*). We learn that the sand banks near the Toronto Necropolis contain large colonies of them. And of the beautiful little Blue-eyed Yellow Warbler (*Mniotilta aestiva*) :—

"Great numbers of them may be seen in the gardens in the upper part of the city, among the shrubs and fruit trees, and sometimes in the streets, unmindful of the bustle and din of a crowded thoroughfare. For many summers past they have frequented in great numbers a large willow tree in Yonge street, nearly opposite Gerrard street, and always appeared most sprightly and joyful when there was any extra stir on the street."

The only unpleasant additions to such paragraphs of civic natural history are notes of information, that Mr. May *shot upwards of fifty beautiful and delicate little humming birds during the past summer;* or, that, of the Whip-poor-Will, whose plaintive cry is heard throughout the whole summer's night: "During the present season a large number of them have been shot in our neighborhood." Do our citizens indulge in Whip-poor-Will pies, and Humming Bird tartlets? or are these feats of mis-called sport mere exhibitions of wanton destructiveness? We learn indeed some curious hints of gastronomic tastes. We grow our own turtles. Indeed Toronto Aldermen have a choice in this respect, adapted to very varied tastes, from the Snapping Turtle, which takes a lesurely meal of a duck, to the Mud Terrapin, or Stinkpot: very abundant if not too savoury. Here are a couple of notes for our Canadian Meg Dods, which must close our notice of the city's *Natural* History:—

"The Bull Frog (*Rana pipiens*), attains to a very large size, measuring from six to seven inches in length, and having a corresponding corpulency. The hind legs (when cooked) are white, tender, and excellent eating. Some specimens weigh half a pound."

"The Spring Frog (*Rana fontinalis*) is the species which is so much esteemed as a delicacy, although I am not aware that that nicely adjusted Epicurean taste which would so peculiarly relish either Spring Frogs, or that other Imperial dish, 'Peacock's brains,' is much cultivated in Toronto."

The founder of the City of Toronto was Lieutenant-Governor Simcoe, an Officer who had seen service in the American war, and a Member of the House of Commons in 1791, when Canada was divided into the Upper and Lower Provinces. When, in the following year, the new Governor entered on his duties the population of the entire Province numbered little more than a third of the present inhabitants of Toronto, and its first Parliament, consisting of an Upper House of eight Members, and a Lower House, or Legislative Assembly, of only double that number, met at Niagara, or Newark, as the most populous village of the Upper Province was then called. It is impossible to look back without feelings of lively interest on this miniature reproduction in our first western clearing, of the old Saxon institutions of British freedom:

"The next point of importance for the Governor's consideration was the selection of a Seat of Government, a question at all times seemingly surrounded with difficulties. Lord Dorchester had his Head Quarters at Quebec, the only place then considered capable of defence; and he would appear to have demanded that Kingston should be selected as the capital of Upper Canada, a settlement having already been made there. But Governor Simcoe had a mind and a *will* of his own, which neither the greater proximity to Quebec, nor the convenience of obtaining orders and news more rapidly from Europe, which Kingston presented, could influence; and as Newark lay within range of the American Fort on the opposite bank of the river, and was not, therefore, the most appropriate place, he fixed upon the site on which Toronto now stands, as the scene of his future administrative operations, and carried out his determination irrespective of the opposition which he had to encounter.

"From the arrangements and plans which the Governor formed, the development of the resources of the country seems to have been the leading idea in his mind, and undoubtedly the magnificent harbour formed by nature at the very point at which he looked for an outlet to the trade of the north, was not the least attractive feature in the rude scene which presented itself to his keen scrutinizing eye, as he made his selection of this spot as his capital. Colonel Bouchette, Surveyor General of Lower Canada, and then engaged in the naval service of the Lakes was selected to make the first survey of the harbour of York, as the place was then named by Governor Simcoe. In looking back upon that time (1793) he says: 'I still distinctly recollect the untamed aspect which the country exhibited when first I entered the beautiful basin which then became the scene of my early hydrographical operations. Dense and trackless forests lined the margin of the Lake, and reflected their inverted images on its glassy surface. The wandering savage had constructed his ephemeral habitation beneath their luxuriant foliage—the group then consisting of two families of Mississaguas—and the Bay and neighboring marshes were the hitherto uninvaded haunts of immense coveys of wild fowl. In the spring following the Lieutenant-Governor removed to the site of the new capital, attended by the Regiment of Queen's Rangers, and commenced at once the realization of his favorite project.'

"The building of the Town of York may be said to have commenced in 1794, under all the disadvantages which an unhealthy locality, described as better fitted 'for a frog pond or a beaver meadow than for the residence of human beings, would necessarily present. The spot which the Governor selected for his own residence was on the high ground north of the old Don and Danforth Road, overlooking the 'flats' or valley of the Don—decidedly the most romantic and picturesque spot in the vicinity of Toronto. The log-house in which he established himself, and which was named Castle Frank,—after one of the members of his family,—was destroyed by fire upwards of thirty years ago; but the residence of Mr. Francis Cayley, erected near the site of the old castle, still bears, and very appropriately, the name of Castle Frank."

From this initial stage of Toronto, or York, as it was then styled, our author traces its history onward, through various successive stages of prosperity and adversity, to its condition in 1857, when the little Village of York had grown to the City of Toronto, with real property valued by the assessors of that year at £7,288,150, besides City corporation property estimated at £430,418, and personal property valued at £1,296,616. Many interesting glimpses of the ups and downs of our Canadian Capital fill up the interval between its birth in 1793 and this recent stage of its growth in 1857.

Passing on, for example, to 1811, we find the clearing widening, roads extending, and houses multiplying; though the farmers complained still of the stumps, and swamps, and pitfalls through which they had to thread their way to the infant capital. Two actual *brick houses* are even on record prior to 1812, when war broke out. But in the following year the defenceless town was taken, the public buildings were burnt, and the fire-engine carried off as a trophy of such gallant deeds. This somewhat curious war-trophy, commemorative of the heroes who, on the 13th of October, 1813, fired the poor little village and ran away with its only fire-engine, is, it seems, "now kept by the United States Government in the Navy Yard." Our author thinks that the President of the United States should be respectfully requested to return the engine; but it is surely unreasonable to expect him to part with so glorious a prize.

The following extract will give an idea of our author's more ambitious style, when he escapes beyond the plodding details of statistics into the regions of poetical fancy, toned down with a dash of severe critical reflection. His subject is:

OUR SOCIAL STATE.

"It is perhaps as well to admit at the outset, that there is felt now and again the slightest possible deficiency in that geniality of disposition and temperament,—that hearty cordiality of manner,—which some older communities manifest. It is in point of fact often broadly stated that the people of Toronto are not by any means so social as they might be; with them the enjoyment of the social affections, that

'Mysterious cement of the soul,'

is cramped by formality and chilled by etiquette, and, even at its best estate, is very exclusive. We admit that, to the casual observer, this may be the case, and first impressions are not at all times easily erased, but that apparently ungenial temperament is undoubtedly the result of deeper and more sacred mental communings than those to which it is generally attributed. It may justly be ascribed, less to any inherent or acquired snobbishness of feeling which makes some men think that they are something

Above the common level of their kind,'

than to the fact that our population is not only but of yesterday,—it is also very fluctuating. True, genuine, perennial sociality is a plant of slow growth, and can only flourish in certain stages of society. The people who have snapped asunder all the ties of kindred, who have done violence to all the fond endearing associations which bound them with romantic enthusiasm to the place of their birth,—the hearths and the homes of their sires,—and have been rocked on the wide ocean that they might seek a home in the far west,—cannot again for years enjoy that elasticity of spirit, nor that sense of fixedness which form a basis for the cultivation of warm, lasting friendship. They have made one change, and they know not how soon they may make another; and any feelings of sociality with them is but a fitful, transient gleam of the sunshine of the soul bursting through those endearing memories which link them so inseparably to the joys, the sorrows, and the early associations of their Fatherland,—

> 'Tis evanescent, fleeting, transient,
> As the thin, fleecy clouds, which float around
> The setting sun's ethereal temple,
> As through the gorgeous golden peristyle,
> Paved with enamelled radiance, he retires
> Amidst the dazzling splendors of his own
> Refulgent beams.

Or if they succeed in business here, and have the prospect of permanency before them, the social feelings are too often kept subservient to the one grand aim of acquiring wealth and a name, in the land of their adoption. Whatever, therefore, does not either directly or incidentally conduce to this absorbing desire is left in abeyance until a more convenient season, and thus a state of mind is gradually superinduced, the very antithesis of sociality in its broad expansive sense."

Biographical notices of distinguished, singular, or notorious characters always constitute a piquant element in local histories, and such have not been entirely omitted here; though we doubt not our author has still more recherche materials in reserve for future editions. His slighter marginal sketches are meanwhile full of character. An analysis of the materials of which the Council of Public Instruction is composed occurs on page 128, and there we have such a sketch of a member, dressed in a little, but not *brief*, authority: his conduct being, in our author's estimation, one of the evils incident to a life-appointment to such a Board:—"It gives some members an opportunity to assume dictatorial airs, as if they alone were the wise, and wisdom would die with them;" as is accordingly exemplified in the Member's treatment of "a thoroughly educated and spirited young gentleman." The absence of specific individuality here is calculated to add an agreeable mystery to the portraiture; the reader having before him on the same page the list of Right Reverends, Reverends, Honorables, and Esquires, composing the Board which includes the embodiment of dictatorial airs and wisdom so flatteringly sketched off in this H.B. style. Which of all the Hon. and Rev. conclave can it possibly be?

Where it is better calculated, however, to add to the effect of the sketch, our author knows well how to give a more specific verisimilitude, as is shewn in another little penciling,—in this case of an editorial celebrity. Charles Lamb's odd tastes and sympathies put him in love with the Chimney Sweeps, and led to his penning his lament "On the Decay of Beggars" in the British Metropolis. An opposite grief, however, weighed down the heart of a Toronto Daily editor, who decries the beggar's calling with undisguised animosity as an intollerable nuisance; complains that in this our good city of Toronto beggary has assumed the dignity of a craft, and so proceeds thus: "To tolerate mendicancy is a false philanthrophy. It is to nurture the germs of every vice that ever adorned the gallows—it is to commit a sin against the youthful poor, and to neglect the duty we owe to our neighbor and to ourselves." Whereupon our author thus sketches off his brother of the Press: "This is putting the matter in a somewhat broad light, but it may be perfectly orthodox in so far as the personal experience of the editor of the 'Colonist' is concerned, for he is rather complaisant and benevolent looking, dresses well, and very tastefully, and is just such a person as that shrewd and wily class would be ready to pounce upon with a certainty of success."

But the most elaborate of the biographical sketches introduced into the "Hand Book of Toronto," is that of the Venerable Bishop of the Diocese, and in introducing this, one little paragraph occurs, which, from its richness in suggestions of what might have been, peculiarly tempts our fancy:

"We have already," says the author, "referred to the fact that Governor Simcoe, who seems to have been a prudent, self-reliant, liberal-minded gentleman, urged upon the Home Government in 1792 the propriety of establishing a University at the Seat of Government, that the youth of the province might enjoy the benefits of a sound education. With a view to prepare for such an institution, he gave authority to the Hon. Richard Cartwright and the Hon. Robert Hamilton to secure 'a gentleman from Scotland to organise and take charge of the College or University which he purposed to establish.' These gentlemen applied to their friends in Scotland to select a suitable person, and they fixed upon Mr. Thomas Chalmers, then completing his theological studies at St. Andrew's, but Mr. Chalmers having declined the offer, it was subsequently accepted by Mr. John Strachan, then parochial schoolmaster in the parish of King's Kettle, Fifeshire."

The distinguished position ultimately attained by the gentleman thus selected, and the enduring influence he has exercised over the Province, in some of the most important elements of its development, must give his name a very prominent place in the history, not only of Toronto, but of Canada. But we are more impressed in the above passage with the name of a college companion of him who subsequently became Bishop of Toronto. Our author, indeed, mentions *a Mr. Thomas Chalmers* here, without noticing that he was any one out of the common order of probationers or theological students at the ancient Scottish University. But is there any doubt that it is *the* Thomas Chalmers?—that Scotland actually ran this risk of losing the foremost among all the men of the first half of her nineteenth century; and that Canada missed this chance of gaining him? Had the young student of St. Andrew's undertaken the organization and charge of the Provincial University, Scotland's modern history would certainly have been different from what it is; nor, we imagine, would Canada's have been altogether the same. In glancing over the biography, to which the above paragraph is the introduction, we fancy to ourselves our Canadian Thomas Chalmers becoming Rector of York, and next Archdeacon Thomas, and then Thomas of the Executive Council, and finally Thomas Toronto, sole Bishop of the Province; and all things taking their shape from his vigorous intellect and indomitable energy, as they have done in many ways from the vigor and energy of him who accepted the important trust in 1778, and still survives in honored age among the Toronto citizens of 1858.

The histories of old cities are full of suggestive reminiscences and lively incidents of biography and character, and we thus see that the City of Toronto has also its incidents and reminiscences already gathering around a youth full of enterprise and promise for the future.

D. W.

The Canadian Almanac, and Repository of Useful Knowledge, for the year 1859. Toronto: Maclear & Co., 1858.

This highly useful work, which has now reached its twelfth year of publication, is more easy to turn to good practical use than to review. It abounds with valuable matter, presented to the reader in the most condensed form, and embraces, as its title sets forth, full and authentic commercial, statistical, astronomical, departmental, ecclesiastical, educational, financial, and general information. Having said so much, for itself, the reviewer is somewhat puzzled to say more. It is no slight commendation to say, that what it thus sets forth on its own account is no empty boast; but its careful digest of multifarious information is better suited for reference and consultation, than for extracting. One subject, however, of universal interest at present, is treated here in a style that invites, as well as admits of quotation, and that is the financial crisis of 1857-8. The recurrence of such panics at nearly regular intervals of eight or ten years for a century past, has naturally attracted the attention of political economists, and led to many attempts at solving the causes, and thereby discovering the cure for an evil, which involves so much suffering, and renders the progress of the world's trade and commerce so intermittent and uncertain. The writer, in the present instance, wisely deals with the evil historically, rather than theoretically, though; as it will be seen, with a reasonable freedom in the use of figures of speech, as well as figures of arithmetic :

"The crisis of 1857 fell like a 'thunderbolt' on the commercial world. The mania for speedy riches had so blinded the public mind, that the dangers which were accumulating on every side, were unperceived or uncared for, till our whole commercial and monetary systems were involved in one common chaos, from which they are only yet slowly emerging.

"Scarcely had the abundant harvest of the South and West been secured, when the failure of a large banking establishment in Ohio with its principal agency in New York alarmed the public mind. On the 24th of August, 1857, the Ohio Life and Trust Company closed its doors. The connection of this large Institution with other minor concerns soon brought these to a stand, and the alarm, aided and increased by the Electric Telegraph, soon became general. A feeling of universal insecurity created a desire to realize, and the best securities depreciated in value. Those *step children*, called Bank notes, which are never welcome to the paternal roof, flocked home in thousands, like unwelcome visitors at the most inopportune moment. Discounts were contracted, and merchants, manufacturers and business men generally who had large payments to make, yielded to the pressure. Stocks fell to an unprecedentedly low figure, and exchange became unsaleable. The loss of confidence so essential to commercial activity became after all the great cause of nine-tenths of the evils resulting from the crisis. Houses of undoubted standing were looked upon with distrust. Ample means was no security against failure. The Banker looked upon the merchant's paper with suspicion, and the merchant looked upon the Bank notes with equal distrust. The poorer classes surrounded the Banks, and in their eagerness to save themselves from loss, withdrew the precious metals, an act which was speedily to deprive them of their daily bread. Deprived of the basis of their circulation the Banks curtailed their discounts, workshops and factories were closed, and thousands of industrious workmen in the principal cities of the United States were thrown out of employment. Meantime the United States country Banks (of which there are over 1000) suspended in dozens, the Banks in Philadelphia followed suit, and on the thirteenth of October several New York Banks gave way. On the next day, by general agreement, the whole New York City Banks (except the Chemical) suspended specie payment. The turning point was now reached and men began to breathe freely. The notes of the great majority of the United States Banks being secured by stocks passed freely, and for nearly two months scarcely a Bank in the United States paid specie at its counter.

From the United States the panic passed to England and the continent of Europe. At first it was thought that England could stand the shock without serious difficulty, but the intimate relations which bind commercial nations together had not been accorded their due importance. Houses in the American trade began to give way and in their fall involved others in ruin. Banking houses of long standing toppled down side by side with the wild speculator or reckless adventurer. The fair fame of Scottish banking was stained by the failure of one of the principal Banking Institutions under circumstances so discreditable as to thrown even the *wild cat* banking of our western neighbors in the shade. An institution with seven and-a-half millions of dollars of paid up capital, and thirty millions of deposits became hopelessly insolvent, and caused, it is said, an amount of suffering in Scotland greater than that entailed upon the country by the Russian War."

Favoured as we have long been in many respects, in Canada, it was impossible that we could be mere idle or uninterested onlookers during a crisis which made itself felt throughout the whole civilized world. Nevertheless there have not been wanting just grounds for congratulation. When after reviewing the disasters and sufferings of other countries we turn to our own Province, we learn with feelings of pride and satisfaction, that while an universal suspension of specie payment existed in the neighbouring States, and even travelling was for a time clogged by the difficulty of obtaining change at one resting place, which would pass current beyond the next stage; and when the American Bankers were collecting our Bank notes over a frontier of a thousand miles, and demanding specie at every Bank counter: nevertheless our Canadian Banks conducted their issues as usual, paid specie on demand, and retained public confidence uninterruptedly to the close of the panic, and the resumption of specie payments by the United States Banks. How is this to be accounted for, and why is it that after thus triumphantly maintaining our credit before the world, we now suffer under a depression, worse to many than the crash which visited the neighbouring States?

"We must not [directly] attribute the prostration of business in 1858 to the panic of 1857. Canada lost comparatively little by the crisis. She was a debtor not a creditor, both as regards England and the United States. Her great difficulty arose from being pressed for payment at an inconvenient time. Her surplus productions on which she relied to meet her engagements had not only depreciated in value, but owing to the loss of banking facilities could not be brought to market. Under these circumstances it need not be wondered that the general business of the country was seriously interrupted. Three-fourths of the people of Upper Canada are engaged in agricultural pursuits, and the others are mainly dependent upon these. The fall in the price of wheat was clearly the great cause of our embarrassment. This article is the main element of the prosperity of Upper Canada. Its fall was not caused by the crisis, but was rather the cause of the crisis itself. England, through the full development of her manufacturing industry, is not so entirely dependent upon agriculture. The United States in their mines and manufactures have also sources of wealth apart from the products of the soil. Hence we see these countries speedily recover from the effects of the crisis. In Canada it is otherwise. The causes of our difficulties remain. Debts contracted in June, 1857, required double the quantity of produce to discharge them in June, 1858. The evil is incurred by our purchases being principally from abroad. The large importations send the gold out of the country and contract the Bank circulation. The scarcity of money prostrates internal trade, and the farmer's home market is destroyed. His returns are diminished on every side, while his liabilities remain the same. The purchase of an extra hundred acres of land, which under ordinary circumstances he could have easily met, becomes a source of embarrassment, and he is regarded as a speculator in real estate. The mechanic who in the bright day of prosperity had purchased a village lot, is thrown out of employment: he cannot meet his instalments and the savings of years fall into the hands of the sheriff. The suspension of home industry necessitates large importations of foreign goods, and the evil is increased. To show the disastrous results to Canada arising from the fall in the price of wheat and other causes; we have only to state the total exports from Canada for the last three years:

EXPORTS.

	1855.	1856.	1857.
Products of Agriculture..............	£3,656,395	4,384,083	2,747,516
" the Forest................	1,986,980	2,504,970	2,932,516
Other Products......................	587,486	562,979	682,492

It thus appears that the value of our exports of agricultural products fell nearly one-half between 1856 and 1857."

Following out the ideas thus indicated, the writer next analyses our Canadian imports, and shows by carefully prepared tables, that we have paid away, in 1857, £649,370 for imports, of which, considerably more than one-half, viz., £339,823, was paid for the items termed "*Animals*" and "*Meats*," while the remainder is chiefly taken up by such items as *Cheese*, *Butter*, *Poultry*, *Eggs*, *Lard*, and *Tallow*. For unmanufactured tobacco we payed last year £30,033; and for "vegetables" £16,477; and what seems still stranger, for *firewood* —which we should have fancied we were more likely to export than import,—£16,054. In an agricultural country, chiefly dependent for its prosperity on the labors of the farmer, such statistics seem to point to unexplored avenues of economy and ultimate wealth; and to these as well as other useful facts accumulated in the highly practical pages of the *Canadian Almanac* we invite the attention of Canadian readers. The impolicy of Canada placing its whole dependence on the products of agriculture is justly dwelt upon; but also, remembering how essentially Western Canada is an agricultural country,—may we not still more press the force of the statistics above referred to, and deduce therefrom the impolicy of the Canadian farmer neglecting stock, cheese, and butter; and the Canadian agriculturist leaving the market gardens of the neighbouring States to supply our markets with pot-herbs to the value of £16,477, and our gardens and grounds with plants and shrubs, stated among the imports of 1857 at £12,787. So that, while real estate has been acquiring an extravagant, fictitious value, on the faith of the permanent maintenance of the price of a grain, which the experience of a very few years suffices to show is exposed to greater risks, and to wider fluctuations in market value than almost any other commodity: our American neighbours have been driving a profitable trade in supplying us with the common necessaries of life. It, no doubt, requires some laborious industry to compete for the sum of £48,041, thus annually slipping into the pockets of our shrewd and industrious neighbours over the line, for the two simple articles of butter and cheese; but it can be little else than sheer indolence and folly in our farmers to allow £6,675 to slip annually through their fingers for poultry and eggs imported from the States.

One other annual department of our *Canadian Almanac* always interests us, and that is the section devoted to Canadian Patents. Curious it is, in an inland, and so strictly agricultural Province, to find such an annual expenditure of mechanical ingenuity, in the majority of cases, we fear, with no great practical results. It proves, however, the presence amongst us of elements which we may yet confidently hope to see turned to good account in developing the manufacturing resources of the country. We have here no less than four new solutions of the problem of a perfect steamboat paddle; also "a self-loading cart;" "an improved spark arrester, chimney, and peticoat pipe for locomotives;" and other patented inventions of the most varied kind, winding up with, "a head protector against heat, *coup de soleil*, &c."

It is not necessary that we should commend the *Canadian Almanac* to our readers, but we may say of it that in this twelfth appearance there is no diminution of the care, industry, and experience, which have secured for it its good credit in former years.

D. W.

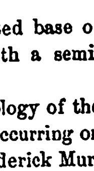
SCIENTIFIC AND LITERARY NOTES.

GEOLOGY AND MINERALOGY.

TRINUCLEUS CONCENTRICUS.

(T. Caractaci, Murch.; T. Goldfussi, Barr.)

The accompanying figure represents the glabella (enlarged) of an example of *Trinucleus concentricus*, obtained from the Trenton Limestone, in the neighbourhood of the Montmorenci Falls, near Quebec. It is deprived of its crust. In the elevated centre, two prominent tubercles occur, one a little in advance of the other in the direction of the axis. From the foremost of these run two series of very minute tubercles towards the anterior margin of the glabella, followed, on the outside, by a faintly-raised line. The latter, as shown in the figure, is continuous along the front edge of the glabella. Finally, at the contracted base of the glabella, two large tubercles are situated—one on each side, with a semicircular depression just in front of them.



In the figures of this species given by Professor Hall in his Palæontology of the State of New-York, there are no indications of the peculiar tubercles occurring on the glabella of the present specimen; nor are they noticed by Sir Roderick Murchison, in his original figures and description of *T. Caractaci* (= *T. Concentricus*) in the "Silurian system." They occur, however, more or less distinctly, on all the Canadian specimens that have come under our observation. Barrande, in his great work on the Silurian Basin of Bohemia, describes the basal tubercles and depressions (mentioned above) in his *Trinucleus Goldfussi*, a species evidently identical with *T. Concentricus*. Barrande figures also the two central tubercles as occurring, according to his observations, in certain examples of *T. Goldfussi;* but he does not appear to have remarked the series of smaller tubercles as shewn in our figure. He looks upon the central tubercles as mere ornaments, disappearing with age, and hence of no importance as specific characters. As, however, the supposed "eye-tubercles" present on the cheeks of some species of Trinucleus, also appear to be obliterated by age, we cannot look upon these glabella-tubercles as wholly unimportant—so far, at least, as regards our knowledge of the organization-characters of these extinct types. For this reason, we have ventured to allude to them in the present note.

GEOLOGY OF GASPE.

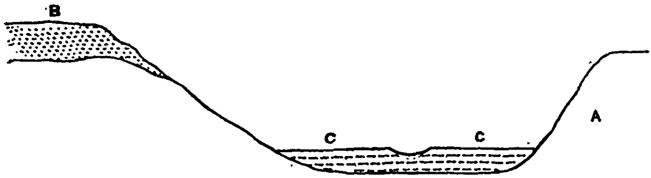
We cull the following extracts from a very interesting paper by Professor Dawson, of McGill College, Montreal. It is published in the October number of the *Canadian Naturalist*, and entitled, "A Week in Gaspé:"

"The peninsula of Gaspé, the land's-end of Canada toward the east, presents within itself an epitome of several of the leading geological formations of the Province; and, here as elsewhere, these impress with their own characters the surface and its capabilities. On that side which fronts the river St. Lawrence, it consists of an enormous thickness of shales and limestones, belonging to the upper part of the lower silurian series, and the lower part of the upper silurian. These beds, tilted in such a manner that they present their up-turned edges to the sea, and dip inland, form long ranges of beetling cliffs running down to a narrow strip of beach, and affording no resting-place even for the fishermen, except where they have been cut down by streams, and present little coves and bays opening back into deep glens affording a view of great rolling wooded ridges that stand rank after rank behind the steep sea-cliff, though, no doubt, with many fine valleys between...... Resting on the Upper Silurian beds that form Cape Gaspé, and, of course, newer in geological time, is a series of grey, red, and brown sandstones and shales. These rocks belong to the Devonian system, the equivalent of the older part of the Old Red Sandstone of Scotland, and probably of the Hamilton and Upper Helderburg groups of New-York. Doubled into a trough along the south side of Cape Gaspé, they form a low country in which Gaspé Bay stretches far inland, affording a noble harbour for shipping...... Southward of Gaspé Bay, the Devonian rocks are capped by a great mass of conglomerate, belonging to the Lower Carboniferous series, and made up of pebbles of all the rocks from the old Laurentian of the North Shore, to the Devonian. It is this bed which gives its picturesque character to the scenery of Percé, and which running onward with a slight dip to the southward, underlies the coal-formation of New-Brunswick."

The following observations, from the same paper, are also of much interest in their geological bearings. After some remarks on the different species of whales taken in the Gulf of the St. Lawrence, Professor Dawson continues: "On the long sand point that, stretching far into the bay, shelters the harbour, I observed an appearance new to me, and of some geological interest. Shoals of the American Sand Launce (*Ammodytes Americanus*) a little fish three or four inches in length had entered the Bay, and either seeking a place for spawning or sheltering themselves from their numerous enemies, had run into the shallow water near the point, and, according to their usual habit, had in part buried themselves in the sand which they had thrown up by means of their long pectoral fins. In this situation, countless multitudes had died or been thrown on shore by the surf, and the crows were fattening on them, and the fishermen collecting them in barrels for bait. Acres of them still remained whitening the bottom of the shallow water with their bodies. It was impossible not to be reminded by such a spectacle of the beds full of capelin in the post-pliocene clay of the Ottawa, and the similar beds filled with fossil fishes in other deposits as far back as the old red sandstone. Geologists have often sought to account for such phenomena, by supposing sudden changes of level, or irruptions of poisonous matter into the waters; but such catastrophes are evidently by no means necessary to produce the effect. Here in the quiet waters of Gaspé Bay, year by year immense quantities of the remains of the Sand Launce may be imbedded in the sand and mud without even a storm to destroy them. Similar accidents, I was told, happen to the shoals of capelin, so that there is nothing to prevent the accumulation here of beds, equally rich in the remains of fishes with those other deposits of ichthyolites that have excited so much interest and wonder."

ALLEGED DISCOVERY OF A FOSSIL CONUS IN THE DRIFT OF WESTERN CANADA.

One of our students, Mr. James Mitchell, of the Village of York on the Grand River, has placed in our hands a small and water-worn specimen of a cone, said to have been obtained from a gravel pit in that locality. Fearing some mistake, we paid a visit to the spot; and although we failed to procure another specimen, we obtained indirect evidence of the occurrence of this or a similar shell in the gravel pit in question. On asking a laborer engaged there, if he ever met with shells of any kind in the gravel, he replied: "Yes, sometimes; little kind o' shells like big at one end and pointed at the other!"—a homely, but perfectly intelligible description of a low-spired cone. The gravel deposit forms the capping of a high hill or portion of a ridge overlooking the valley of the Grand River. It contains rolled boulders of gneiss, limestone, &c., and is evidently a true drift accumulation, although (like many of our drift deposits) it is more or less coarsely stratified. The underlying rock of the country, is a greyish limestone, apparently poor in fossils, belonging to the Gypsiferous or Onondaga group. Large irregular masses of gypsum occur in it, in the immediate neighbourhood. The broad "flats" along the borders of the Grand River, belong to a period more recent than that of the true drift. They contain an immense number of specimens of *helix* (two species) *bulimus* (two species), *melania, limnea, planorbis, cyclas*, and perhaps other terrestrial and fresh-water genera. The occurrence of a species of *conus* in the drift, can scarcely be accounted for except on the supposition that a patch of Eocene or other Tertiary deposits existed during the Drift period, at no great distance from the spot in question. From these deposits (now entirely washed away) the fossil cones, with perhaps a portion of the accompanying drift materials, may then have been derived—the solid structure of the cone shells preventing their destruction. The crystalline boulders in this gravel are for the most part of small size, whilst all the larger stones belong to the rocks of the surrounding country. Amongst other, we collected a piece of brown ferruginous sandstone, with modiolopsis and tellinomya impressions, belonging to the Clinton group, of which there is an outcrop about fifteen miles to the north of the locality under consideration. But whatever may be the true explanation of this apparently paradoxical case, we have thought it advisable to call attention in the present notice to the alleged occurrence of these shells in our western drift, in the hope that further explorations, to substantiate the fact, may be set on foot by persons residing in the neighborhood. The accompanying sketch-section shews the position of the gravel-pit on the left bank of the Grand River, and its relations to the other deposits of the locality:



A is the (Upper Silurian) Gypsiferous Limestone rock of the district; B the drift gravel; and C the fresh-water deposits of the Grand River Flats. These latter deposits, as already stated, belong to a more recent period than that of the true Drift.

AUGITE AND HORNBLENDE.

Rammelsberg has published a very valuable paper on the relations of Augite and Hornblende, including the various species of these respective types. His analyses shew that the oxygen ratio in the Hornblende type, instead of being as 4 : 9, is actually, *as in the Augite type*, as 1 : 2—giving for each, the common formula 3 R O, 2 Si O^3. In the aluminous hornblendes, he places the alumina with the silica; or, in other words, makes the two vicarious, as suggested by Bonsdorff many years ago. When Fe^2 O^3 is present, as in acmite, &c., it is shewn to act the part of a base, and thus to replace the oxides R O. [There can be little doubt that acmite is to a certain extent an altered mineral; and, very probably, the Fe^2 O^3 in these minerals, existed originally, in all cases, as Fe O.]*

WITHERITE (CARBONATE OF BARYTA).

Our attention has been recently attracted to a peculiarity, not hitherto noticed in mineralogical works, in the blowpipe reactions of certain specimens of Witherite (Ba O, C O^2) from one of the Cumberland localities. These specimens (of a yellowish-white colour) became, after strong heating, pale greenish-blue. This arises from the presence of a very small amount of oxide of manganese. A coloration of this kind from the presence of manganese, can only occur—apart from the alkaline carbonates—with carbonate of baryta. A blowpipe test by the author of this note, founded on a similar reaction, is given in the fourth edition of Plattner's *Probirkunst mit dem Lothrohre*, p. 186. It is well known that if a manganese compound be fused with carbonate of soda, an opaque greenish-blue glass or so-called "turquoise enamel" will result. The fused bead is green whilst hot, and becomes blue on cooling. If to a bead thus coloured, baryta be added, and the whole be

* The author is guilty of a somewhat remarkable oversight, when he states, in reference to the crystallization of Wollastonite, that, "die selten deutlichen Krystalle dieses Minerals, welche Brooke, Phillips, und von Kobell beschrieben haben, lassen zum Theil keine ungezwungene Vergleichung zu, und man hat bisher nicht gut vermocht, ihre Form auf die des Augits zurückzuführen"—because, if the reader will refer to Dana's system of Mineralogy, (4th ed., vol. 2, page 157,) he will find the crystal-relations of Wollastonite to Augite most clearly pointed out; and exactly in the same manner, moreover, as now shewn by Rammelsberg. E. J. C.

fused together, no change of colour will ensue; whereas with strontia, &c., the colour is changed to dull grey or brown. And, in like manner, if a baryta salt in powder be simply heated with a drop of a manganese solution, the mass will be coloured bluish-green: the colour in this case, as in the cases mentioned above, arising from the formation of manganate of baryta.

Book received:—"*Figures and Descriptions of Canadian Organic Remains. Decade III.*" This important publication, issued by the Geological Survey of Canada, will be noticed in full, in the next number of our Journal.

E. J. C.

NATURAL HISTORY.

AGE OF TREES.

The following extract from the *Gardener's Chronicle,* edited by Dr. Lindley, is of considerable interest. If those who cut down large trees in Canada would note the number of rings, with the diameter, or circumference, and the kind of tree, we should soon possess valuable data for judging of the rate of growth of our trees, such as in a little time could not fail to be found practically useful.

"Is it possible to judge of the age of an old tree by its circumference? we do not mean precisely, but with any approach to exactness. Can we, for instance, ascertain the age of a very ancient oak within a century of the truth? This is a point which seems to us worth investigation. That a tolerably exact inference may be drawn from counting the rings of wood, even such as remain when a tree has become hollow, is well known. But questions constantly arise with reference to standing trees, whose wood-rings of course cannot be examined, and it is to them that we would direct enquiry.

The only way of arriving at a certain conclusion is evidently to determine the average rate of growth of trees of various kinds. Could we, for example, find the average of successive half centuries of growth, extending over any long period of time, the method of computation would be obvious. But it is precisely this which, as far as we know, remains in need of demonstration. Books, indeed, contain scarcely anything tangible on the subject. One writer estimates the age of an oak tree, 47 feet in circumference, to be not less than 1500 years; another (Marsham, writing of the Bentley Oak) gives the same age to a tree only 34 feet round; sufficient proof that no real guide to age was known to those writers. The late Prof. Zuccarini endeavoured to work out this problem (see *Lindley's Intr. to Botany*, 1, 204), but without success; for he found such enormous differences between the rate of growth of specimens of the same species of tree (Yews and Scotch Firs, the subject of his examination), as to be driven to the conclusion that the age and number of rings of a tree cannot be determined with any probability from the diameter, except when trees have grown under exactly similar conditions. But what constitutes exactly similar conditions in an enquiry like this? Exactitude, literally speaking, can never enter into such enquiries. No two trees ever existed under circumstances exactly similar. All that can be required is that conditions shall be tolerably similar, which was far from being the case with Zuccarini's specimens of Yews, obtained, as he tells us, from situations on the Bavarian Alps differing by 3000 feet of elevation above the sea.

Sufficiently similar conditions would, we think, in a case like this, be found in the comparison of old English Oaks with one another, and on that point we would for the present fix attention. Is there any tolerable uniformity of growth among English Oaks which remain to acquire anything like antiquity? in other words, among vigorous oaks, for all others would be felled in the ordinary operations of the forester. Perhaps that point is not altogether beyond the reach of inquiry, for many opportunities must occur of measuring the diameter and counting the rings of old oaks when felled; and there must also be many standing oaks of some considerable size, the age of which is ascertainable without felling. A collection of such data might be formed from which averages applicable to the inquiry before us might be easily drawn. Unfortunately they can hardly be said to exist at present; but some are on record, from which, by way of illustration, we have formed the following table. This evidence seems to show that on an average vigorous oaks grow at something like the following rate in England:—

In the 1st	50 years	they reach	12	inches	in diameter	[50]
" 2nd	"	"	19	"	"	[100]
" 3rd	"	"	26	"	"	[150]
" 4th	"	"	32	"	"	[200]
" 5th	"	"	36	"	"	[250]
" 6th	"	"	40	"	"	[300]

That is to say, a vigorous English oak will, on an average, be rather more than 26 inches in diameter when 150 years old, and 40 inches in diameter when 300 years old. In this computation it is assumed that after 100 years the rate of growth is reduced to seven inches for the next 50 years, to six inches for the succeeding 50 years, and then falls permanently to an increase of four inches in diameter for every half century.

We find that this mode of reckoning brings the age of the Berkley Oak, 34 feet in circumference, exactly to 1500 years, the period assigned to it by Marsham, and would carry the oak, 47 feet in circumference, mentioned by South, to 2150 years. In like manner the great Winfarthing Oak, said to have been called "The Old Oak" at the Conquest, and which in 1820 was about 14 feet in diameter, must have been at that time 1900 years.

We have been led into these calculations from a wish to ascertain the age of some superb old Spanish Chesnut trees growing on a terrace overlooking the valley of Sir William Middleton's most beautiful seat at Shrubland Park, near Ipswich. These trees vary in size, but all are venerable objects, twisted like colossal cables, and exemplifying on a gigantic scale the universal fact that the fibrous grain of trees is spiral. Of these one is 44 feet round at the ground, and 27 feet round at six feet higher up. If the foregoing scale of growth for the Oak is true, and if, as is believed, the Spanish Chesnut grows twice as fast as the oak, then the age of this monument of ancient times must be 575 years. In another place, far away in the park, is a still vigorous gigantic tree, 19 feet in circumference, to which the age of 375 years would have to be assigned.

Now what we want to know, and what we submit to the consideration of our readers, is how far our calculations are supported by reliable facts. Is it true that the oak grows at the rate assumed? Is it true that Spanish Chesnuts grow twice as fast? If not, what is their real rate of growth? and upon what evidence is that their supposed real rate founded? This seems a subject deserving the consideration of some of our experienced foresters."

MILDEW.

"We understand that there is great probability of an effectual remedy for mildew and red spider having been discovered, wholly free from the objections attaching to sulphur either in powder or in a volatile state. How valuable that agent is we all know; but it is troublesome to apply, uncertain in its action, and, if mismanaged, more mischievous than the evils it counteracts. As for example when it is fired, the effect of which is to charge the atmosphere with fumes of sulphurous acid, one of the most fatal to vegetation of all known substances.

At present our information amounts only to this: that Mr. Wilson, the very able and scientific manager of Price's Candle Company, has prepared a soap, which, being dissolved in water and applied with a syringe, does effectually and without the least risk all that flowers of sulphur can do. It is said that one of the principal nurserymen near London has been trying the soapy water, of different strengths, and is very favorably impressed with its efficacy. Six ounces of the soap in a gallon of water killed mildew for the time and continued to keep it down when applied weekly. Pot Roses, after three applications, became nearly clean, and were in fact saved; their soft young points indeed were killed, but that was of no importance; the rust of Moss-roses disappeared before its action. In other hands red spider was effectually kept down; one lb. of the soap dissolved in four gallons of water, completely cleaned even Peach trees after two or three applications, the trees having been well syringed a day or two afterwards.

The name of this new soap or substance is, we are informed, "The Gerhurst Compound," and if it is found in other hands to preserve the good qualities ascribed to it, Mr. Wilson will certainly have conferred one of the greatest possible benefits upon horticulture. A trial is about to be made of it in the garden of the Horticultural Society, at Bowood, Trentham, Chiswick House, and several other large establishments."

CHEMISTRY.

Synthesis of the Hydrocarbons.—The ingenious Berthelot, has published *in extenso* his experiments on the preparation of organic compounds from inorganic materials, a process of which, chemists possessed but few examples previous to his discoveries. The hydrocarbons which he has obtained, are marsh gas, olefiant gas, propylene, butylene, amylene, benzine, and napthaline, and in order to remove any objection that might be raised to the employment in his experiments of carbon derived from animals or vegetables, and which might therefore, be supposed to retain to a certain extent its organic structure, he prepared the carbonic oxide, which forms the starting point in his investigations, from carbonate of baryta and iron.

Water being made to act upon this gaseous oxide of carbon, at a temperature of 100° C, and in presence of potassa, formate of potassa was produced. From this formic acid and formate of baryta were prepared. By the action of heat, this salt was decomposed, and furnished among other products, marsh gas, C^2H^4, olefiant gas C^4H^4, and propylene C^6H^6.

The olefiant gas was combined with sulphuric acid, and from this sulphovinic acid, and by decomposition, alcohol were formed. From the alcohol, all the compounds of the Ethyle series could be obtained.

Marsh and olefiant gas may also be produced from bisulphide of carbon.

Butylene may be formed by the distillation of acetate of soda, the acetic acid produced by the oxidation of the alcohol generated in the manner described.

Napthaline has been formed by means of sulphide of carbon, and benzine by alcohol and acetic acid. Methylic alcohol can be produced from marsh gas C^2H^4, by replacing one equivalent of hydrogen by chlorine, whereby chloride of methyle is obtained C^2H^3, Cl, which by decomposition yields the alcohol.

Propylic alcohol from the sulphuric compound of propylene obtained as above.

From the hydrocarbons the hydracid ethers can be obtained by direct union, (? under pressure) and from these the alcohols.

Sulphate of Baryta.—Kuhlmann has succeeded in decomposing this native salt by acting on it with charcoal and the residue from the preparation of chlorine, viz: crude chloride of manganese.

From the chloride of barium so obtained, he prepares the artificial sulphate by precipitation, and this kept in a moist state possesses all the properties of white lead, and is not so objectionable, being unalterable by ordinary re-agents.

(The sulphate of baryta occurs in Canada in considerable quantities and apparently in a very pure state, associated with galena. H. C.)

Formation of Sugar.—As is well known, cellulose the most important constituent of vegetables is readily converted into sugar. The principle contained in the organic part of the skeleton of the invertebrata differs materially from that contained in the vertebrata, and has the same composition as cellulose. Although this substance strongly resists the action of the most powerful chemical re-agents, Berthelot has succeeded in producing sugar or glucose from it, similar to that produced from cellulose.

He operated upon the substance which he called tunicine, obtained from the envelopes of an ascidia, and also upon chitine prepared from the shell of the Spiny Lobster.

These results form a new and intimate bond, founded on a definite chemical transformation, between the immediate principles contained in the envelopes of the invertebrata, and those which form the tissues of vegetables. H. C.

THE ANNUAL YIELD OF NITROGEN PER ACRE IN DIFFERENT CROPS.

Those elaborate agricultural experimenters, scientific and practical, J. B. Lawes, F.R.S., and J. H. Gilbert, Ph. D., F.C.S., read, at the meeting of the British Association for the Advancement of Science, recently held in Leeds, an interesting and somewhat original paper on the above subject, of which the following is a very brief abstract. The extensive, accurate and costly investigations which the writers have been in the habit of pursuing for a number of years, on Mr. Lawes' estate at Rothamsted, in Hertfordshire, give great weight to the conclusions at which they may arrive, in reference to scientific and practical agriculture.

The assimilation of free nitrogen by plants, the authors had determined by carefully conducted experiments made in the field. The amount of nitrogen yielded per acre per annum, in different crops,—even when unmanured,—was considerably beyond that annually coming down in the forms of ammonia and nitric acid, in the yet measured and analysed aqueous deposits from the atmosphere. The annual produce of nitrogen per acre had been determined from various crops, grown consecutively for several years on the same land,—such as, wheat, fourteen years; barley, six years; meadow hay, three years; clover, three years out of four; beans, eleven years; and turnips, eight years. In most of these instances the yield of nitrogen had been estimated, both for the crop grown without manure of any kind, and for that with purely mineral manure, having no artificial supply of nitrogen.

Beans and clover were found to yield several times as much nitrogen per acre as wheat or barley, yet their crops were an excellent preparation for wheat. A year's *fallow*, and *adding nitrogenous manure*, had each been found similarly to increase the produce of the cereal crops. Other results obtained illustrated the fact, that four years of wheat, alternating with *fallow*, gave as much nitrogen in eight years as eight crops of wheat grown consecutively. Again, four crops of wheat, grown in alternation with *beans*, yielded nearly the same amount of nitrogen per acre as the four crops grown in alternation with fallow; consequently, also, much about the same as the eight crops of wheat grown consecutively. In the case of the alternation with *beans*, therefore, the whole of the nitrogen obtained in the beans themselves was over and above that which was obtained during the same series of years in wheat alone, whether it was grown consecutively or in alternation with fallow.

Interesting questions arose, therefore, as to the varying sources or powers of accumulation of nitrogen in crops so dissimilar. Leguminous crops, yielding a large amount of nitrogen, were found in practice to be not materially benefitted by the application of nitrogenous manures; while the cereals affording a comparatively small quantity of nitrogen, are found much benefitted by such manures. It was found that over a series of years only about four-tenths of the nitrogen annually supplied in manure for wheat or barley was recovered in the immediate crop. It was an interesting and, as yet, in part unsolved question, what became of this unrecovered amount of nitrogen. Has it been drained away and lost? or did a portion remain in a fixed and unavailable state of combination in the soil? Further elucidation is necessary before such enquiries, connected with agricultural theory and practice, can be satisfactorily explained. Chemistry has yet much light to throw upon these anomalous and difficult matters. G. B.

SALT AS A MANURE.

Some thirty years ago, Parkes, the author of the well known *Chemical Catechism*, published a pamphlet setting forth the extraordinary properties of common salt (chloride of sodium) as an agricultural fertilizer. At that time a heavy excise duty was imposed upon the article in England, so that only the merest refuse could be used for the purpose of manure. Subsequently, as the tax became diminished and at last totally repealed, salt was extensively tried in various parts of the British Islands, either by itself or in conjunction with farm-yard dung, as a dressing for several kinds of crops. The results, however, at that time do not appear to have been very encouraging, since the practice rapidly declined. Notwithstanding, the application of salt to manure heaps, and to hay and straw as fodder for cattle, has more or less extensively obtained in the best managed districts, particularly since the repeal of the duty; and we find, from more recent British agricultural periodicals, that the article is again claiming the serious attention of practical farmers.

A correspondent in a recent number of the *Agricultural Review and Journal of Rural Economy*, published in Dublin, details the results of his trials of the application of salt to different kinds of crops. Four Irish acres were prepared and sown with Swedish turnips, manured with thirty-five tons of farm-yard dung per acre. To one half of the field ten cwt. of salt was applied to the acre. In August mildew was found seriously affecting the turnips on the portion not salted, but where that article had been applied the disease was hardly perceptible, and the plants continued to grow vigorously to the end. It was found by weighing that the ultimate produce was seven tons per acre over the unsalted.

It has been commonly supposed that as the atmosphere of the British Islands must be largely impregnated with saline matter from the surrounding seas, the artificial application of salt to the cultivated crops was superfluous and attended with comparatively trifling benefit. Recent trials, however, carefully conducted, seem to strengthen an opposite conclusion. And from all we can learn of the effects produced by salt when applied as a manure, either to the cereals or root crops in Canada, there appears, upon the whole, substantial reasons in favor of its fertilizing and healthy influence upon vegetation in general. As a condiment, given directly to the domesticated animals of the farm, or sprinkled over hay and straw when gathered into the barn or rick, and intended for feeding purposes, its healthy influences are generally well known and appreciated on this continent.

G. B.

MAKING GRASS INTO HAY.

As a general rule, both grass and grain are allowed to stand too long before they are cut. The more nutrient portions of them,—starch and sugar,—by permitting the seed to become perfectly ripe before cutting, are in a great degree converted into woody fibre, a substance that is to animals comparatively innutritious. In the case of wheat, it has been demonstrated, by carefully repeated experiments and analyses, that the grain, as soon as it emerges from the milky state, and before the straw gets perfectly yellow, possesses the maximum amount of starch and gluten; in other words, has the largest amount of nourishing ingredients, and consequently the highest commercial value. In the process of perfect ripening, a portion of the nutrient qualities of the grain are changed into the woody fibre, forming the cuticle or bran, which invariably becomes rough and thick as the grain approaches perfect ripeness.

It is the same with many of the grasses, which are generally allowed to become too ripe before they are cut for hay. With what are termed the artificial or cultivated grasses this is especially the case. These are the most nutritious when in blossom, before the seed has commenced being formed. As the seed begins to be developed, the stems and leaves become less adapted for feeding purposes to animals, owing to the production of woody fibre in the stem, and of nutrient compounds in the seed. From recent remarks, however, this does not appear to be the case with all species of grass,—such, for example as are designated "natural." It is noted in *Morton's Cyclopædia of Agriculture*, the best recent authority on these matters in the English language, that Cock's-foot grass (*Dactylis Glomerata*) is more valuable when ripe than at the time of flowering, in the proportion of seven to five; Meadow Fox-tail or Timothy (*Phleum Pratense*) in the ratio of fourteen to five; and that of Crested Dog-tail (*Cynosurus Cristatus*) yields twice as much grass when the seed is ripe as when coming into flower, but that a given weight of it is only half as nutritious as when coming into flower. Meadow Fescue (*Festuca Pratensis*), again, is more valuable at the time of flowering than when ripe, in the ratio of three to one; and the tall oat-like grass (*Holcus Arenaceus*) in the ratio of five to two. The seed of the sweet-scented Vernal grass (*Anthroxanthum Odoratum*), Meadow Fox-tail (*Alopecurus Pratensis*), and Sheep's Fescue (*Festuca Ovina*) should be completely ripe before they are mown; and the Smooth-stalked Meadow Grass (*Poa Pratensis*), Hard Fescue (*Festuca duriuscula*), and Quaking Grass (*Briza media*), may be most profitably cut and made into hay when in full blossom. In Canada, Timothy and Clover form almost the whole of our meadow grasses, and they may be most advantageously converted into hay as soon as their flowers are fully matured. In meadows containing several species of grass, the best rule is to mow as soon as the later kinds get into flower. In practice it may very safely be affirmed that, as a general thing, people cut their grass *too late.*

Hay-making may be said to be a somewhat delicate art, requiring the strictest attention to the varying conditions of the weather. In this country, too much exposure is a common fault, and hence our hay looses much of the delightful aroma so generally characteristic of newly made hay at home. The great object in hay-making is to retain as much as possible of the soluble, especially of the organic compounds contained in the grasses. A gradual evaporation of the water contained in the grass is preferable to a rapid process. If hay contain too much moisture when put into ricks, the consequence will be that it will heat and decompose; that is it will become worthless for food to animals. Most hay in this climate, saved in the ordinary way, contains from fifteen to twenty per cent., by weight, of water. It takes, upon an average, about four tons of green grass to give a ton of hay, and it accords with experience that a variable portion of the nutriment of grass is lost in its conversion into hay. It has been found, from careful experiments, that every 100 lbs. of grass contains 7 lbs. of matter soluble in hot water, and 2 lbs. of matter soluble in cold water; while the hay produced therefrom contains only 4 lbs. and 1¼ lbs., the remainder having been dissipated in the conversion of the grass into hay.

G. B.

MONTHLY METEOROLOGICAL REGISTER, AT THE PROVINCIAL MAGNETICAL OBSERVATORY, TORONTO, CANADA WEST—AUGUST, 1858.

Latitude—43 deg. 39.4 min. North. Longitude—5 h. 17 min. 33 sec. West. Elevation above Lake Ontario, 108 feet.

Day.	Barom. at temp. of 32°.				Temp. of the Air.				Mean Temp. + or — of the Average	Tens. of Vapour.				Humidity of Air.				Direction of Wind.			Resultant 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.	Re-sul't.	ME'N		
					°	°	°	°	°												°							
1	29.595	29.609	—	—	62.4	75.1	—	—	—	.383	.466	—	—	.67	.54	—	—	N b W	S E	E b N	N 76 E	6.0	4.0	4.0	3.66	4.51	......	...
2	.579	.591	29.581	29.5795	65.7	71.8	68.9	69.60	+ 2.75	.490	.541	.555	.527	.77	.69	.78	.73	N E	E b N	E b S	N 83 E	7.5	14.5	10.0	10.98	11.17	1.010	...
3	.458	.345	.428	.4048	65.7	78.3	70.0	71.22	+ 4.37	.590	.650	.584	.603	.93	.67	.79	.80	E S E	S W b W	Calm.	S 26 W	12.3	18.5	0.0	4.94	7.75	0.330	...
4	.419	.402	.488	.4390	69.1	81.7	67.5	72.98	+ 6.18	.652	.498	.492	.546	.92	.46	.74	.70	S W b W	W b S	W	S 73 W	2.0	17.0	1.0	5.86	6.78	0.420	...
5	.555	.571	.607	.5825	66.9	81.4	66.6	72.47	+ 5.67	.500	.473	.465	.471	.76	.44	.71	.61	N W	W b N	N W b W	N 67 W	0.4	12.0	3.8	8.19	8.36	......	...
6	.635	.654	.683	.6520	68.1	82.1	68.9	73.75	+ 6.98	.445	.504	.396	.453	.65	.45	.56	.55	N W	N N W	N b W	N 26 W	11.3	15.5	7.2	10.51	10.76	......	...
7	.710	.729	.745	.7392	62.1	77.0	68.6	70.65	+ 3.97	.439	.590	.594	.543	.79	.63	.85	.73	Calm.	S b W	Calm.	S 9 W	0.0	3.0	0.0	1.17	1.38	......	...
8	.765	.745	—	—	68.2	77.8	—	—	—	.607	.640	—	—	.88	.67	—	—	Calm.	E S E	Calm.	S 64 E	0.0	2.0	0.0	1.32	1.51	......	...
9	.703	.639	.610	.6582	69.3	82.1	73.4	75.72	+ 9.17	.515	.702	.631	.631	.72	.64	.77	.71	Calm.	S S E	N	S 82 E	0.0	4.0	5.7	1.52	3.14	......	...
10	.642	.596	.556	.5903	68.0	81.6	78.0	77.07	+10.55	.581	.696	.673	.657	.85	.64	.70	.71	N	S	S	S 5 E	1.8	6.8	4.5	0.49	3.97	......	...
11	.547	.551	.620	.5770	66.7	78.1	71.1	72.18	+ 5.75	.543	.657	.639	.612	.83	.68	.84	.78	Calm.	N W b W	N	N 24 W	0.0	8.5	7.2	4.90	5.22	Inap	...
12	.719	.807	.873	.7093	68.6	77.2	68.6	72.20	+ 5.87	.572	.587	.497	.550	.82	.63	.71	.69	N b W	S E b S	N N E	N 74 E	10.0	8.8	3.5	2.69	5.39	......	...
13	.931	.933	.809	.9192	64.3	74.2	68.0	69.95	+ 3.72	.350	.532	.567	.493	.58	.63	.82	.67	N b E	E b S	S E b S	N 78 E	7.0	8.0	0.4	4.62	5.25	......	...
14	.859	.772	.639	.7465	64.6	79.8	72.5	73.00	+ 6.77	.511	.537	.577	.565	.83	.53	.73	.70	N E b E	S b E	E S E	S 38 E	3.2	5.0	1.5	2.56	3.92	......	...
15	.578	.538	—	—	64.2	80.3	—	—	—	.472	.547	—	—	.78	.62	—	—	Calm.	W N W	N W b N	N 52 W	0.0	5.2	5.0	4.46	6.35	Inap	...
16	.737	.752	.766	.7555	63.1	74.3	65.7	68.38	+ 2.35	.421	.597	.490	.509	.72	.70	.77	.73	N b W	S E b E	Calm.	S 75 E	1.0	4.0	0.0	1.82	1.90	......	...
17	.740	.618	.549	.6375	64.6	79.4	72.9	73.05	+ 7.08	.499	.558	.610	.564	.81	.55	.76	.70	Calm.	S S E	S b W	S 11 E	0.0	9.2	2.5	4.72	5.36	......	...
18	.447	.384	.565	.4762	66.8	69.6	57.4	65.47	— 0.37	.535	.602	.301	.459	.82	.83	.63	.71	W	N W	N N W	N 47 W	1.4	15.0	11.0	7.49	10.51	0.205	...
19	.625	.602	.523	.5782	53.7	61.0	54.5	56.60	— 9.17	.285	.254	.318	.283	.69	.47	.75	.62	N b E	N W	N W b N	N 25 W	1.5	8.5	3.0	4.15	4.28	......	...
20	.509	.446	.543	.4997	52.8	73.3	63.9	65.15	— 0.40	.319	.416	.318	.344	.70	.50	.54	.57	Calm.	W b S	W b N	S 80 W	0.0	19.0	4.5	7.84	8.65	......	...
21	.646	.618	.625	.6300	54.7	75.4	66.9	66.32	+ 0.88	.348	.310	.335	.335	.81	.34	.50	.54	W b N	W b N	N W b N	N 63 W	3.5	12.6	9.8	8.97	9.30	Inap	...
22	.653	.689	—	—	53.8	65.3	—	—	—	.308	.241	—	—	.73	.38	—	—	W b N	N W b N	N W b W	N 42 W	3.8	24.0	10.5	14.95	15.40	......	...
23	.870	.847	.807	.8347	48.9	63.5	56.3	55.90	— 9.23	.257	.176	.288	.251	.74	.29	.64	.58	N W b N	N W b W	W N W	N 54 W	10.3	12.1	4.0	5.86	7.83	......	...
24	.826	.736	.809	.7878	45.4	73.3	53.3	60.32	— 4.63	.215	.242	.332	.275	.70	.28	.73	.56	W N W	W	Calm.	N 84 W	3.2	11.2	0.0	6.06	6.47	......	...
25	.801	.886	.865	.8703	51.6	70.4	59.7	61.47	— 3.27	.293	.395	.400	.356	.77	.53	.78	.66	N N W	S S E	S E b S	S 50 E	1.4	9.5	2.8	2.28	5.49	......	...
26	.823	.696	.551	.6725	57.2	69.3	64.2	64.03	— 0.50	.401	.495	.530	.481	.86	.60	.89	.81	N b E	E b S	E b N	S 57 E	5.0	6.2	5.8	6.14	7.60	0.535	...
27	.333	.353	.380	.3635	65.7	72.5	65.1	67.93	+ 3.62	.510	.564	.565	.545	.80	.71	.91	.80	S b E	S b W	S b W	S 8 W	23.2	14.2	4.0	7.93	9.75	......	...
28	.363	.270	.263	.2907	61.7	66.7	57.7	61.50	— 2.63	.433	.598	.415	.487	.79	.91	.93	.89	N N W	N N E	W b S	N 60 W	7.2	2.5	5.5	3.69	8.32	1.015	...
29	.244	.300	—	—	56.8	57.5	—	—	—	.409	.429	—	—	.88	.91	—	—	S W b S	S W b S	S W b S	S 30 W	8.5	8.5	9.0	7.16	7.1[illegible]	.270	...
30	.342	.390	.470	.4157	58.1	62.6	59.3	60.02	— 3.60	.439	.515	.435	.467	.91	.90	.86	.90	Calm.	S	N W	N 70 W	0.0	4.5	5.6	2.44	4.0[illegible]	105	...
31	.536	.568	.622	.5857	58.8	66.7	57.7	61.07	— 2.25	.441	.410	.380	.412	.80	.66	.81	.76	N W	S b W	N N W	S 55 W	3.2	8.8	2.4	2.03	3.90	......	...
M	29.6325	29.6077	29.6199	29.6191	61.62	73.97	65.37	67.61	+ 1.85	.446	.505	.478	.478	.79	.59	.75	.70	......	......	......	N 69 W	4.35	9.76	4.33	......	6.50	3.890	...

REMARKS ON TORONTO METEOROLOGICAL REGISTER FOR AUGUST, 1858.

Highest Barometer . . . . 29.939 at 8 a.m. on 13th } Monthly range=
Lowest Barometer . . . . 29.231 at 4 p.m. on 28th } 0.708 inches.

Self-registering Ther.
- Maximum temperature . . . . 84°0 on p. m. of 9th } Monthly range=
- Minimum temperature . . . . 44.0 on a. m. of 24th } 40°0
- Mean maximum temperature . . 75°38 } Mean daily range = 16°17
- Mean minimum temperature . . 59°21 }
- Greatest daily range . . . . . . 31°2 from a. m. to p. m. on 24th.
- Least daily range . . . . 2.1 from a. m. to p. m. on 29th.

Warmest day . . 10th ... Mean Temperature . . . 77°07 } Difference=21°17.
Coldest day. . . . 23rd ... Mean Temperature . . . 55°90 }

Maximum Radiation { Solar . . . . 100°2 on p. m. of 9th } Monthly range=
{ Terrestrial . . . . . . 32.0 on a. m. of 24th } 68°2

Aurora observed on 6 nights, viz.: 13th, 15th, 16th, 25th, 30th, and 31st; possible to see Aurora on 22 nights; impossible on 9 nights.

Snowing on 0 days; depth, 0.0 inches; duration of fall 0.0 hours.

Raining on 11 days; depth, 3·890 inches; duration of fall, 56.4 hours.

Mean of cloudiness=0.42; most cloudy hour observed, 8 a. m., mean=0.49: least cloudy hour observed, midnight, mean=0.29.

Sums of the components of the Atmospheric Current, expressed in Miles.

North.	South.	East.	West.
1757.29	1310.00	972.12	2069.02

Resultant direction, N 69° W; Resultant Velocity, 1.57 miles per hour.
Mean velocity of the wind 6.50 miles per hour.
Maximum velocity . . . 32.7 miles per hour, from 3 to 4 p.m. on 18th.
Most windy day . . . . . . 22nd—Mean velocity, 15.40 miles per hour.
Least windy day . . . . 7th—Mean velocity, 1.38 do
Most windy hour, 3 to 4 p. m.—Mean velocity, 10·59 do } Difference
Least windy hour, midn't to 1 a.m.—Mean velocity, 3.81 do } 6.78 miles.

Thunderstorms occurred on the 4th from 2 to 4 a.m., and again from 8.40 to 10.40 a.m.

Distant Thunder heard on the 18th at 10.50 a.m., and on the 31st at 1.45 p.m.

Sheet and Forked Lightning observed on the 2nd at 10 p.m.; 3rd, 10 p.m. to midnight; 6th, 8 p.m. to midnight; 7th, 9 p.m. to midnight; 8th, at 10 p.m.; 9th, 8 p.m. o midnight; 10th, at 10 p.m.; 11th, at 10 p.m., and on 28th from 8 p.m. to midnight.

Heavy Dew recorded on 9 mornings during the month.

3rd. Dense fog from 6 to 8 a.m.
4th. Very beautiful sunset.
5th. and 6th. Meteors numerous at night.
7th. Halo round the sun from 2 to 4 p.m.
9th. Perfect rainbow from 6.30 to 7.10 a.m.

The Resultant Direction and Velocity of the Wind from 1848 to 1858 inclusive, were respectively N 63° W, and 0.76 miles.

COMPARATIVE TABLE FOR AUGUST.

YEAR	TEMPERATURE.					RAIN.		SNOW.		WIND.		
	Mean.	Difference from Average.	Maximum observed.	Minimum observed.	Range.	No. of days.	Inches.	No. of days.	Inches.	Resultant. Direction.	Resultant. Velocity.	Mean Velocity
	°	°	°	°	°							
1840	64.7	— 1.4	80.1	47.4	32.7	12	2.905	...	...	...	...	....
1841	64.4	— 1.7	83.5	46.7	36.8	9	6.170	...	...	...	...	0.191bs
1842	65.7	— 0.4	80.7	45.3	35.4	6	2.500	...	...	...	...	0.30 "
1843	66.4	+ 0.3	85.5	44.4	41.1	4	4.850	...	...	...	...	0.12 "
1844	64.3	— 1.8	82.5	44.3	38.2	17	Imp't	...	...	...	...	0.16 "
1845	67.9	+ 1.8	82.5	44.4	38.1	9	1.725	...	...	...	...	0.19 "
1846	68.4	+ 2.3	86.3	50.4	35.9	9	1.770	...	...	...	...	0.17 "
1847	65.1	— 1.0	83.1	44.9	38.2	10	2.140	...	...	...	...	0.19 "
1848	69.2	+ 3.1	87.5	49.3	38.2	8	0.855	...	...	S 21 E	0.98	4.55ms.
1849	66.3	+ 0.2	79.5	51.4	28.1	10	4.970	...	...	N 71 W	0.60	3.76 "
1850	66.8	+ 0.7	84.2	43.0	41.2	13	4.355	...	...	N 15 E	0.35	4.46 "
1851	63.6	— 2.5	79.8	43.6	36.2	10	1.360	...	...	N 63 W	0.40	4.63 "
1852	65.9	— 0.2	81.2	46.7	34.5	9	2.695	...	...	N 70 E	0.56	3.30 "
1853	68.6	+ 2.5	91.6	47.6	44.0	11	2.575	...	...	S 29 E	0.37	4.23 "
1854	68.0	+ 1.9	98.1	47.0	51.1	5	0.455	...	...	N 62 W	1.74	4.74 "
1855	64.1	— 2.0	82.1	44.9	37.2	7	1.455	...	...	N 63 W	1.04	6.97 "
1856	63.6	— 2.5	81.3	44.0	37.3	12	1.680	...	...	N 50 W	2.88	7.03 "
1857	65.3	— 0.8	85.3	50.1	35.2	13	5.265	...	...	N 77 W	1.51	6.36 "
1858	67.6	+ 1.5	83.4	45.4	38.0	11	3.890	...	...	N 69 W	1.57	6.5 "
Mean	66.10	...	84.12	46.36	37.76	9.7	2.867	...	...	...	...	5.1

MONTHLY METEOROLOGICAL REGISTER, AT THE PROVINCIAL MAGNETICAL OBSERVATORY, TORONTO, CANADA WEST,—SEPTEMBER, 1858.

Latitude—43 *deg.* 39.4 *min. North. Longitude*—5 *h.* 17 *m.* 33 *s. West. Elevation above Lake Ontario,* 108 *feet.*

Day.	Barom. at temp. of 32°.				Temp. of the Air.				Excess of mean above Average	Tens. of Vapour.				Humidity of Air.				Direction of Wind.			Resul't. 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.	Result'.	ME'N		
					°	°	°	°	°												°							
1	29.671	29.632	29.618	29.6390	54.1	69.6	58.1	61.42	− 1.62	.356	.518	.346	.430	.84	.72	.72	.79	Calm.	s b E	Calm.	s 12 E	0.0	8.4	0.0	2.05	3.44	...	...
2	.393	.473	.377	.4637	54.7	68.4	66.4	63.43	+ 0.70	403	521	621	496	94	75	80	85	N E	E b s	s E b s	s 70 E	1.8	9.8	2.8	3.50	3.89	0.025	...
3	.382	.350	.430	.3880	62.8	70.4	59.7	64.52	+ 2.08	523	578	348	487	92	77	67	79	s	s b E	s W	s 38 W	0.2	10.5	1.7	3.20	4.33	...	...
4	.355	.310	.350	.3545	58.3	69.1	62.4	63.77	+ 1.63	393	415	422	429	86	58	75	73	s W b s	s b W	s W b s	s 17 W	1.5	13.8	3.8	6.29	6.46	...	...
5	.374	.484	—	—	61.3	70.0	—	—	—	421	370	—	—	78	50	—	—	s W b s	W b s	W b N	s 78 W	5.2	17.2	5.0	7.32	7.79	...	...
6	.628	.769	.759	.7415	51.9	71.4	61.0	62.58	+ 1.15	336	521	419	433	87	67	84	77	W b N	s	s	s 1 E	2.2	6.0	0.5	2.84	3.65	...	...
7	.819	.715	.722	.7483	58.4	78.0	63.9	67.48	+ 6.33	435	517	488	436	89	54	82	73	s	s s E	s W b s	s 1 W	0.2	10.4	0.5	3.38	3.52	...	...
8	.718	.633	.653	.6680	59.5	79.0	66.6	70.23	+ 9.50	459	555	543	527	90	56	83	73	s s W	s s W	s W b s	s 23 W	0.2	14.5	0.5	5.63	5.65	...	...
9	.644	.617	.572	.6057	64.8	77.4	70.0	70.93	+10.03	542	664	596	593	88	71	81	79	Calm.	s b E	s W b s	s 17 W	0.0	5.5	3.2	3.95	4.16	...	...
10	.501	.389	.466	.4505	57.5	72.2	63.5	67.33	+ 7.23	595	640	403	549	88	82	69	81	s s W	s s W	W N W	s 42 W	6.0	11.2	18.4	7.33	9.58	0.060	...
11	.538	.497	.511	.5127	54.5	68.7	54.1	59.27	− 0.38	361	224	339	326	85	32	80	67	W b s	s W b W	N W	s 68 W	3.0	11.8	5.2	7.42	8.54	0.070	...
12	.603	.643	—	—	48.7	63.0	—	—	—	201	270	—	—	84	47	—	—	W	W b N	W N W	N 78 W	5.2	18.0	3.5	9.60	9.74	...	...
13	.857	.875	.871	.8685	50.9	63.5	53.2	55.83	− 3.02	271	293	324	298	73	51	80	67	W b N	s b E	s E b s	s 22 E	2.5	9.5	1.0	2.89	4.33	...	...
14	.849	.765	.685	.7533	48.0	60.0	60.3	59.35	+ 1.02	287	373	445	380	86	58	85	75	N E	E b s	E	s 78 E	5.8	6.2	3.8	4.05	5.02	...	...
15	.617	.501	.343	.4677	57.4	68.9	62.3	63.13	+ 5.22	378	449	484	445	80	63	86	77	s E b s	E b s	E	N 89 E	4.0	10.2	3.0	5.42	7.91	...	...
16	.258	.167	.314	.2470	58.1	64.4	52.7	57.88	+ 0.37	381	233	282	305	78	37	72	64	N W b N	N W b N	W b N	N 53 W	11.6	18.4	8.2	12.36	13.42	...	...
17	.507	.634	.831	.6757	46.9	59.9	47.6	52.52	− 4.48	232	260	282	260	78	52	85	67	W	W b N	W b N	N 74 W	8.4	10.5	2.2	10.38	10.67	0.015	...
18	.960	.922	.950	.9468	41.6	59.9	54.3	52.35	− 4.23	223	357	353	321	85	68	83	81	W b N	s b W	s b W	s 37 W	4.4	3.5	1.2	0.82	2.73	...	...
19	30.020	.993	—	—	51.8	65.0	—	—	—	326	384	—	—	83	61	—	—	N E b N	E s E	E b N	N 81 E	5.2	10.2	1.2	4.06	4.23	...	...
20	29.823	.723	.669	.7303	51.9	77.8	65.1	66.23	+10.63	341	519	550	481	88	55	89	76	Calm.	s s W	s W b s	s 24 W	0.0	6.4	1.2	3.86	3.95	...	...
21	.603	.667	.785	.6912	61.0	60.4	49.0	58.43	+ 1.33	477	305	256	344	89	53	75	73	s W b s	N W b N	N W	N 36 W	2.0	23.0	3.0	11.25	11.98	...	...
22	.847	.824	.878	.8550	42.2	53.7	43.3	46.32	− 8.32	187	134	216	173	69	31	77	57	N	N W b N	N b W	N 25 W	4.5	12.5	2.0	6.76	6.88	...	...
23	.903	.804	.653	.7750	38.8	57.0	50.1	49.03	− 5.18	170	215	312	247	77	46	86	71	N b W	s	W N W	s 11 W	1.2	10.5	0.8	3.32	3.90	0.315	...
24	.533	.631	.868	.7110	50.3	58.3	48.3	50.95	− 2.77	325	257	208	256	88	56	66	68	N	N b W	N	N 3 W	5.8	8.8	3.4	6.55	6.62	inap.	...
25	.972	.054	.963	.9652	40.4	55.9	44.7	47.58	− 5.65	179	257	225	221	71	58	76	67	N b E	s E	s E b s	N 61 E	4.0	7.8	0.2	1.46	2.85	...	...
26	30.023	30.010	—	—	40.7	58.1	—	—	—	196	274	—	—	77	56	—	—	N b W	s b E	s s E	N 87 E	0.8	3.8	2.5	0.97	3.00	...	...
27	30.052	30.024	.931	.9068	41.8	59.5	55.0	52.87	+ 0.65	217	307	354	302	81	59	82	75	N N E	E b s	E	s 87 E	5.2	7.0	1.4	2.60	2.78	...	...
28	29.878	29.762	.693	.7657	48.9	60.2	57.4	55.15	+ 3.35	294	370	402	367	91	71	85	84	Calm.	E b s	E b s	s 77 E	0.0	4.5	0.5	1.56	1.62	...	...
29	.528	.332	.400	.4233	57.4	63.2	65.3	64.37	+13.03	389	497	522	475	82	72	84	78	E s E	s s W	W s W	s 27 W	3.5	12.5	5.2	3.22	4.30	inap.	...
30	.511	.477	.408	.4303	51.6	58.8	53.7	55.65	+ 4.83	323	430	318	359	83	87	77	81	Calm.	s W b W	N b E	N 15 E	0.0	5.5	11.3	2.86	3.64	0.250	...
M	29.6785	29.6357	29.6415	29.6400	52.60	63.93	57.15	59.11	+ 1.62	.330	.401	.384	.384	.84	.60	.79	.74	......	......	......	......	3.15	10.26	3.24	......	5.69	0.735	...

REMARKS ON TORONTO METEOROLOGICAL REGISTER FOR SEPTEMBER.

Highest Barometer........................ 30.098 at 10 p. m., on 20th } Monthly range=
Lowest Barometer .... 29.167 at 2 p. m., on 16th } 0.931

Self-registering Thermom.
- Maximum Temperature............ 81°.4 on p. m. of 9th } Monthly range=
- Minimum Temperature............ 35°.6 on a. m., of 23rd } 45°.8
- Mean maximum Temperature .... 67°52 } Mean daily range=
- Mean minimum Temperature .... 50°79 } 16°.73
- Greatest daily range .... 29°.0 from a. m. to p. m. of 20th.
- Least daily range.................. 9°.4 from a. m. to p. m. of 16th.

Warmest day......... 9th ... Mean temperature......... 70.98 } Difference = 24°66.
Coldest day.......... 22nd ... Mean temperature......... 46°32 }

Maximum } Solar............................... 101° 4 on p. m. of 9th } Monthly range=
Radiation. } Terrestrial....................... 24°.2 on a. m. of 23rd } 77°2.

Aurora observed on 8 nights, viz., on 1st, 7th, 8th, 10th, 12th, 13th, 20th, and 22nd.
Possible to see Aurora on 23 nights; impossible on 7 nights.

Snowing on —— days,—depth —— inches; duration of fall —— hours.

Raining on 8 days,—depth 0.735 inches; duration of fall 21.9 hours.

Mean of cloudiness = 0.41.

Most cloudy hour observed, 2 p. m., mean = 0.50; least cloudy hour observed 10 p. m., mean, = 0.30.

Sums of the components of the Atmospheric Current, expressed in miles.

North.	South.	East.	West.
1147.03	1448.27	721.12	1780.97

Resultant direction S. 74° W.; Resultant Velocity 1.53 miles per hour.
Mean velocity.......................... 5.69 miles per hour.
Maximum velocity .... 24.8 miles from noon to 1 p. m. on 16th.
Most windy day......................... 16th...Mean velocity 13.42 miles per hour.
Least windy day .... 28th...Mean velocity 1.62 ditto.
Most windy hour ... 2 to 3 p.m.............Mean velocity 10.33 ditto. } Difference
Least windy hour...midnight to 1 a. m. ...Mean velocity 2.13 ditto. } 8.10 miles.

Thunderstorms occurred on 30th from 1 to 3 p. m.

Sheet Lightning recorded on 3rd at 10 p. m.; 5th, at 8 p. m.; 8th, 7 p. m. to mid. night; 11th, 7 to 10 p. m.; and 15th, from 7 to 8 p. m.

Corona round the moon on 22nd at 10 p. m.

Heavy Dew recorded on 13 mornings during the month.

First Frost of the season on 18th, at 5.30 a. m., and noted also on the 23rd, 25th, and 26th.

Dense Fog on the 2nd at 5 to 8 a. m.; and on 28th, 7 to 9 p. m.

Brilliant Meteor observed in the W. at 9.15 p. m. on the 27th.

The Resultant Direction and Velocity of the Wind for the month of September, from 1848 to 1858, inclusive, were, respectively, N. 61° W. and 0.94 miles.

The month of September, 1858, was warm, clear, and dry—the depth of rain which fell being less than one-fifth of the average of the last 18 years.

COMPARATIVE TABLE FOR SEPTEMBER.

Year.	Temperature.					Rain.		Snow.		Wind.		
	M'n.	Diff. from Aver.	Max. ob'd.	Min. ob'd.	Range.	No. of days.	Inch's.	No. of days.	Inch's.	Resultant Direction.	Resultant V'y.	Mean Force or Velocity.
1840	54.0°	−4.1°	70.2°	29.4°	40.8°	4	1.380	...	...	...	...	....
1841	61.3	+3.2	79.9	37.5	42.4	9	3.340	...	...	...	...	0.26 lbs.
1842	55.7	−2.4	83.5	28.3	55.2	12	6.160	...	...	...	...	0.45
1843	59.1	+1.0	87.8	33.1	54.7	10	9.760	...	...	...	...	0.57
1844	58.6	+0.5	81.5	29.6	51.9	4	impft	...	...	...	...	0.26
1845	56.0	−2.1	78.8	35.3	43.5	16	6.215	...	...	...	...	0.34
1846	63.6	+5.5	84.0	39.0	45.0	11	4.595	...	...	...	...	0.33
1847	55.6	−2.5	74.8	38.1	36.7	15	6.665	...	...	...	...	0.33
1848	54.2	−3.9	80.9	29.5	51.4	11	3.115	...	...	N 71° W	2.38	5.81 mls.
1849	58.2	+0.1	80.6	33.5	47.1	9	1.480	...	...	N 75° W	0.69	4.23
1850	56.5	−1.6	76.0	31.7	44.3	11	1.735	...	...	S 65° W	1.02	4.78
1851	60.0	+1.9	86.3	33.4	52.9	9	2.665	...	...	N 14° E	1.03	5.45
1852	57.5	−0.6	81.8	36.1	45.7	10	3.630	...	...	N 77° W	0.53	4.60
1853	58.8	+0.7	85.4	36.1	49.3	12	5.140	...	...	North.	1.06	4.33
1854	61.0	+2.9	93.1	36.3	56.8	14	5.375	...	...	N 23° W	1.42	4.31
1855	59.5	+1.4	81.7	36.1	45.6	12	5.585	...	...	N 20° E	1.29	7.61
1856	57.1	−1.0	77.3	37.4	39.9	13	4.105	...	...	S 79° W	1.98	6.53
1857	58.6	+0.5	81.4	34.1	47.3	11	2.640	...	...	N 68° W	1.61	5.55
1858	59.1	+1.0	80.1	36.8	43.3	8	0.735	...	...	S 74° W	1.53	5.69
M	58.13	...	81.32	34.28	47.04	10.6	4.131	...	...	....	...	5.35 Mls.

MONTHLY METEOROLOGICAL REGISTER, ST. MARTIN, ISLE JESUS, CANADA EAST—AUGUST, 1858.

(NINE MILES WEST OF MONTREAL.)

BY CHARLES SMALLWOOD, M. D., LL. 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 and reduced to 32° Fahr.			Temp. of the Air.			Tension of Vapor.			Humidity of Air.			Direction of Wind.			Velocity in miles per hour.			Mean direction of Wind.	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	29.564	29.746	29.842	63.0	80.3	62.1	.466	.677	.495	.85	.66	.91	N N E	E b N	N E	2.36	1.60	0.85	...	...	...	Clear.	C. St. 6.	Clear.
2	.817	.996	.951	56.7	74.0	62.4	.420	.469	.517	.90	.57	.91	NE b E	NE b E	NE b E	3.77	12.16	4.36	...	...	...	C. St. 9.	Cirr. 4.	Do. Aur. Bor.
3	.922	.818	.892	55.2	69.1	59.6	.398	.549	.464	.90	.75	.91	NE b E	SE b E	S E	1.80	1.18	0.71	...	0.070	...	Do, 6.	C. St. 10.	Rain.
4	.647	.668	.654	60.4	67.0	64.3	.487	.556	.556	.94	.84	.92	W N W	S b E	S b W	7.17	16.76	12.23	...	0.860	...	Rain.	Dist. Thun.	Th. C. St. 6.
5	.626	.629	.685	61.0	77.0	69.0	.480	.646	.671	.91	.71	.95	W b S	W	W S W	6.06	3.67	8.55	...	...	...	C. C. St. 8.	Cirr. 4.	C. St. 4.
6	.671	.693	.672	65.4	74.7	64.7	.570	.614	.556	.80	.68	.92	N W	N N W	S S W	2.77	9.62	0.87	...	0.200	...	St. 9.	C. St, 9.	Clear.
7	.806	.842	.963	60.2	78.1	65.6	.486	.550	.570	.88	.58	.92	S E b E	W b S	S E b S	6.45	1.08	0.95	...	...	...	Clear.	Clear.	Do.
8	.977	.980	.925	57.0	87.8	72.3	.436	.902	.745	.94	.74	.92	S E b E	S b E	S S E	0.00	1.33	0.11	...	...	...	Cir. Str. 2.	Do.	C. St. 8.
9	.896	.795	.814	67.1	88.3	74.9	.563	.915	.751	.87	.69	.89	SE b S	S b E	S S E	0.00	0.08	0.10	...	...	...	C St. 8.	C. C. St. 6.	Do. 10.
10	.871	.812	.763	69.0	93.0	74.2	.623	.942	.751	.88	.61	.88	S E	SE b S	S E	0.20	0.06	0.01	...	...	...	Str. 10.	Clear.	Do. 4.
11	.711	.713	.750	66.9	69.0	68.1	.570	.665	.655	.89	.92	.97	S E	E b S	S b E	0.17	2.10	0.98	...	0.490	...	C. C. St. 4.	Rain.	Ni. 10. Dist. Th.
12	.867	.840	30.095	67.2	83.0	62.8	.522	.558	.429	.79	.80	77	N b E	N b E	N N E	1.65	12.20	0.70	...	...	...	Clear.	Clear.	Clear. Aur. Bor.
13	30.138	30.119	.113	60.7	83.5	63.0	.426	.897	.549	.82	.53	.97	N E	E N E	E N E	0.11	1.33	0.00	...	...	...	Do.	Do.	Do. do.
14	.070	29.875	29.832	56.6	93.6	70.4	.413	.992	.624	.90	.64	.85	NE b E	SE b S	S E	0.00	0.02	0.00	...	...	...	Do.	Do.	Clear.
15	29.868	.842	.853	67.0	87.7	68.2	.619	.785	.577	.92	.60	.85	S E	S S W	W N W	0.00	0.00	0.00	...	Inp.	...	C. C. St. 9.	Cirr. 4	C. St. 10.
16	.881	.861	.948	60.0	79.0	59.8	.374	.574	.469	.73	.58	.94	W	W S W	S S W	1.01	0.01	0.73	...	...	...	Clear.	Clear.	Clear. Aur. Bor.
17	.914	.783	.723	56.8	88.3	68.9	.391	.778	.606	.87	.59	.88	S S W	S W	S S W	0.00	0.46	0.83	...	...	...	Do.	Do.	Do.
18	.621	.559	.491	62.0	87.6	60.1	.491	.741	.473	.88	.57	.88	S W	SW b S	N b W	0.11	6.23	5.45	...	...	...	Do.	C. C. St. 6.	C. St. 10.
19	.577	.672	.700	45.0	57.6	50.9	.251	.322	.309	.84	.69	.85	N N W	W b S	W S W	0.70	0.12	0.02	...	0.160	...	St. 4.	C. C. St. 10.	Do. 8.
20	.630	.600	.592	54.7	70.6	57.0	.328	.551	.443	.80	.78	.97	S W	S b E	SE b E	0.00	0.00	0.00	...	0.630	...	C. St. 9.	Do. 6.	Nimb. 10. Rain.
21	.693	.687	.648	50.7	71.0	62.4	.384	.537	.523	.96	.71	.94	W S W	W S W	S b W	0.00	0.00	5.12	...	0.100	...	Rain.	Do. 6.	Do. do.
22	.707	.485	.880	56.9	66.1	55.0	.443	.470	.295	.97	.73	.68	W	W	W N W	0.53	7.23	7.00	...	0.416	...	C. St. 10.	C. St. 10.	C. C. Str. 9.
23	.851	.830	.883	49.4	68.0	49.9	.240	.411	.272	.68	.60	.78	W N W	W N W	SW b W	9.07	11.81	3.40	...	...	...	Do. 4.	Do. 3.	Clear.
24	.907	.882	.887	49.0	60.4	56.1	.278	.480	.443	.71	.91	.97	W S W	W b S	SW b W	0.62	14.06	1.40	...	Inp.	...	Clear:	Do. 4.	Str. 2.
25	30.081	30.020	30.117	50.0	76.6	55.3	.304	.646	.348	89	.71	.86	N N E	S S W	S b W	0.00	0.08	0.02	...	...	...	Do.	Clear.	Clear.
26	.078	29.948	29.936	45.0	80.0	64.1	.258	.644	.503	.88	.84	.86	NE b E	NE b E	S	0.20	1.17	1.27	...	...	...	Do.	Do.	Do. Aur. Bor.
27	29.852	.783	.801	60.3	71.6	63.5	.426	.503	.569	82	.66	.97	SE b S	SE b S	SE b S	0.78	6.21	1.30	...	0.076	...	C. St. 10.	C. St. 10.	C. St. 10.
28	.704	.614	.533	64.6	80.1	69.0	.590	.677	.642	.97	.60	.92	SE b S	SE b S	E S E	0.00	0.00	0.06	...	...	...	Do. 10.	C. C. St. 6.	Nimb. 10. Rain.
29	.471	.424	.581	59.5	75.0	63.0	.469	.673	.517	94	.79	.90	S W b W	W S W	W S W	0.42	4.02	5.03	...	1.100	...	Do. 10.	Do. 4.	C. St. 9.
30	.439	.545	.651	60.4	73.2	61.0	.511	.648	.511	.97	.79	.97	S W	S b W	S E b S	0.00	0.00	0.00	...	0.101	...	Rain.	C. Cum. 4	Do, 9.
31	.787	.719	.754	55.9	79.4	65.0	.420	.651	.549	.94	.66	.96	E	E	S b W	6.03	0.05	0.18	...	...	...	C. St. 10.	C. St. 6.	Do. 6. A. Bor

MONTHLY METEOROLOGICAL REGISTER, ST. MARTIN, ISLE JESUS, CANADA EAST—SEPTEMBER, 1858.

(NINE MILES WEST OF MONTREAL.)

BY CHARLES SMALLWOOD, M. D., LL.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 and reduced to 32°			Temp. of the Air.			Tension of Vapor.			Humidity of Air.			Direction of Wind.			Velocity in miles per hour.			Mean direction of Wind.	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	29.737	29.797	24.827	64.0	71.0	60.6	.523	.572	.511	.86	.76	.97	s w	s w	s w	0.02	1.67	0.31	...	0.220	...	C. Str. 6.	C. Str. 6.	C. St. 2. A. B.
2	.872	.863	.600	60.0	84.4	65.7	.456	.623	.549	.88	.53	.89	s w b s	s b w	s b w	0.03	0.51	0.67	...	...	...	Clear.	Clear.	Clear.
3	.554	.523	.592	63.5	69.3	61.8	.543	.671	.557	.97	.93	.97	s b w	s w	s s w	2.73	0.27	1.43	...	0.300	...	C. St. 10.	C. St. 10.	Do.
4	.603	.532	.598	59.0	79.5	63.0	.446	.631	.503	.91	.66	.86	s w	s w b s	s b w	0.22	0.86	0.90	...	...	...	Clear.	Do. 4.	C. St. 6.
5	.585	.578	.634	55.9	66.1	58.1	.420	.536	.452	.94	.84	.94	s s w	N w b w	w b s	0.09	6.73	3.01	...	0.310	...	Do.	Do. 4.	Clear. Thun.
6	.740	.815	.956	56.1	73.7	58.0	.413	.476	.452	.90	.59	.91	w s w	N N w	w s w	1.73	0.20	1.86	...	0.201	...	Do.	Do. 6.	Do.
7	.947	.849	.883	52.0	83.0	63.2	.334	.643	.577	.86	.58	.85	s w	w s w	s w	0.00	0.51	3.77	...	...	...	Do.	Light Cirr.	Do. Au. Bor.
8	.839	.815	.852	64.0	89.1	74.2	.529	.721	.614	.89	.53	.68	s w	s w	s w	7.50	0.52	6.08	...	...	...	Do.	C. St. 4.	C. St. 4.
9	.813	.823	.814	70.7	67.6	60.1	.621	.584	.511	.85	.87	.96	w s w	N E b E	N E b E	0.70	2.98	4.75	...	Inp.	...	C. St. 10.	Do. 8.	Do. 8.
10	.734	.614	.529	63.0	89.0	76.2	.549	.721	.731	.97	.53	.8	E s E	E s E	s s E	0.00	0.00	0.00	...	0.017	...	Do. 10.	Do. 4.	Clear. Dis. Lt.
11	.749	.638	.679	61.1	69.1	60.4	.480	.437	.426	.91	.63	.82	w s w	w s w	w s w	0.01	2.74	1.92	...	0.066	...	Do. 3.	Do. 6.	Cr. St. 2. A.B.
12	.787	.674	.519	50.0	70.2	51.1	.341	.516	.321	.98	.70	.86	w	w	w	0.08	1.23	19.01	...	0.200	...	Rain.	C. C. St. 4.	St. 4. Do.
13	.860	.885	30.092	40.7	66.4	50.0	.219	.316	.302	.87	.49	.82	w b s	w s w	s w	0.26	0.77	0.81	...	...	...	Clear.	Do. 3.	Clear.
14	30.075	30.047	.017	40.1	76.4	56.0	.221	.614	.413	.01	.68	.89	E s E	s E	s	0.00	0.10	0.62	...	...	...	Do.	Clear.	C. St. 6.
15	29.934	29.815	29.782	54.0	72.6	62.7	.369	.483	.399	.89	.61	.72	s	s	s	0.00	6.43	6.51	...	...	...	C. C. St. 6.	Cir. Str. 4.	Do. 7.
16	.557	.129	.033	52.0	53.4	53.7	.384	.470	.427	90	.97	.97	N E	N E b E	w b N	3.60	11.77	1.05	...	2.799	...	Ni. 10.	Do. 6.	Do. 6.
17	.433	.562	.783	54.2	58.1	49.7	.362	.309	.290	.87	.64	.82	w b N	w b N	s w b w	5.40	6.75	3.61	...	0.636	...	Rain.	C. C. St. 6.	Do. 10
18	30.024	30.097	30.118	40.0	59.7	49.6	.219	.583	.272	.87	.73	.78	w	w	w	0.09	4.00	0.00	...	...	...	Clear.	Clear.	Clear. Au. B.
19	.204	.161	.153	49.0	67.0	52.0	.238	.522	.334	75	.79	.80	N E b N	s b w	s b w	0.00	0.04	0.08	...	...	...	Do.	Cir. Cum. 3.	C. Str. 10.
20	29.918	29.750	29.720	48.3	83.5	71.0	.23	.630	.644	.85	.54	.80	s w b w	w s w	s w	3.67	2.60	1.26	...	...	...	Do.	C. C. St. 4.	Do. 2. Au. B.
21	.731	.707	.652	60.1	68.1	48.0	.426	.658	.316	.82	90	.95	N E b E	N E b N	w	8.50	4.96	5.31	...	0.680	...	C. St. 10.	Rain.	Rain.
22	.864	.924	.907	42.2	44.6	40.0	.303	.100	.182	.79	.56	.73	N w	N w	w N w	1.06	0.12	0.03	...	Inp.	...	Clear.	C. C. St. 10.	Clear. Au. B
23	.976	.910	.871	31.0	70.1	40.0	.161	.580	.265	.95	.80	.75	w	w s w	w s w	2.90	2.16	0.87	...	...	...	Do.	Ci. Str. 6.	C. St. 6.
24	.698	30.034	30.001	47.4	60.3	43.2	.292	.285	.209	.92	.54	.75	s w b w	s w b w	N w	2.11	1.62	0.00	...	Inp.	...	ir. Str. 10.	Clear.	Clear.
25	30.132	29.885	.163	52.4	57.8	45.2	.168	.236	.269	89	.50	.88	w b s	...	s s w	2.22	0.01	0.20	...	...	...	Clear.	Cirr. 3.	Do.
26	.187	30.211	.246	37.7	65.1	50.1	.193	.411	.335	.86	.60	.93	w s w	...	...	0.00	0.01	0.00	...	...	...	C. St. 4.	Do. 4.	C. Str. 2.
27	.234	.194	.189	40.7	69.7	48.7	.219	.423	.303	87	.59	.89	w b s	s E	s E	0.00	0.05	0.00	...	...	...	Do. 8.	Do. 2.	Clear.
28	.126	.015	29.934	41.8	69.9	54.3	.235	.391	.362	.91	.54	.87	E b N	s E	s E b E	0.01	0.25	0.61	...	...	...	C. C. Str. 8.	Cir. Str. 4.	C. St. 10.
29	29.785	29.611	.595	47.1	69.8	58.0	.254	.456	.416	.81	63	.85	s b E	s s E	s E b E	0.42	2.22	1.22	...	0.410	...	C. Str. 6.	Do. 8.	Do. 10. Th.
30	.594	.579	.624	54.6	63.0	52.9	.390	.392	.321	93	.69	.86	w b s	w b N	...	0.61	2.35	0.00	...	...	...	Do. 4.	Do. 2.	Do. 10.

REMARKS ON THE ST. MARTIN, ISLE JESUS, METEORCLOGICAL REGISTER FOR AUGUST.

Barometer	Highest, the 13th day	30.138
	Lowest, the 29th day	29.424
	Monthly Mean	29.789
	Monthly Range	0.714
Thermometer	Highest, the 14th day	93°7
	Lowest, the 19th day	38°8
	Monthly Mean	66°12
	Monthly Range	54°9
Mean of Humidity		.818
Greatest Intensity of the Sun's Rays		117°0
Lowest point of Terrestrial Radiation		37°9
Amount of Evaporation in inches		2.68

Rain fell on 14 days, amounting to 4.023 inches; it was raining 34 hours 59 minutes, and was accompanied by thunder on 5 days.
The most prevalent wind was S.E. by E.
The least prevalent wind was S.
The most windy day was the 4th; mean miles per hour, 12.05.
The least windy day was the 20th; mean miles per hour, 0.00.
Aurora Borealis visible on six nights.
The electrical state of the atmosphere has indicated moderate intensity.
Ozone was present in moderate quantity.

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

Barometer	Highest, the 27th day	30.254
	Lowest, the 16th day	29.033
	Monthly Mean	29.830
	Monthly Range	1.221
Thermometer	Highest, the 10th day	90°.2
	Lowest, the 23rd day	30°.5
	Monthly Mean	59°13
	Monthly Range	59°7
Greatest intensity of the Sun's Rays		104°.1
Lowest point of Terrestrial Radiation		30.1
Amount of Evaporation (in inches)		2.34
Mean of Humidity		.804

Rain fell on 14 days amounting to 5.839 inches; it was raining 43 hours 25 minutes, and was accompanied by thunder on 3 days.
The most prevalent wind was S. W.
The least prevalent wind S. E.
The most windy day the 21st; mean miles per hour 6.19.
Least windy day the 10th; mean miles per hour 0.00.
Aurora Borealis was visible on 7 nights.
The electrical state of the Atmosphere has indicated feeble intensity.
Ozone was present in moderate quantity.
First frost 14th day.
Comet first seen on 5th September.

METEOROLOGICAL REGISTER, UNIVERSITY OF QUEEN'S COLLEGE, KINGSTON, CANADA WEST, FOR 1857.

Latitude, 44° 13′ 30″ *North.* *Longitude,* 76° 30′ 6″ *West.* *Height above Sea,* 294 *Feet.*

MONTH.	Barometer at 32° Corrected.		Thermometer.		Thermometer during 24 hours.		Tension of Vapor.		Humidity.		Clouds.		Direction of Wind.		Pressure in lbs avoirdup.		Rain in inches.	Snow in inches.
	9½ A. M.	3½ P. M.	9½ A. M.	3½ P. M.	Max.	Min.	9½ A. M	3½ P. M.	9½ A. M.	3½ P. M.	9½ A. M.	3½ P. M.	9½ A. M.	3½ A. M.	9½ A. M.	3½ P. M.		
January	29.798	29.766	10.5	14.7	19.0	2.8	.084	.064	.711	.786	5.6	4.6	W	W	0.60	0.50	0.00	20.0
February	29.704	29.694	26.8	31.5	35.9	21.4	.153	.184	.907	.872	7.8	7.4	W b S	W S W	.30	.58	1.09	8.0
March	29.644	29.559	25.6	30.9	33.9	19.9	.145	.174	.875	.883	6.8	7.4	N W	W b S	.10	.09	0.50	12.5
April	29.601	29.549	36.7	39.7	42.3	31.3	.210	.237	.917	.936	6.0	6.7	W S W	S W	.08	.07	2.53	6.0
May	29.542	29.527	49.3	52.4	56.8	38.9	.317	.360	.834	.853	5.0	5.0	S W	S W	.04	.59	2.47	...
June	29.474	29.445	59.3	61.1	64.4	49.8	.451	.483	.884	.891	7.0	6.0	S S W	S W	.08	.25	2.33	...
July	29.674	29.630	71.3	74.7	76.3	62.6	.665	.680	.868	.848	3.8	3.8	S S W	S S W	.00	.00	2.38	...
August	29.633	29.616	66.4	70.4	72.0	59.4	.568	.606	.883	.822	5.3	5.6	S b W	S	.27	.20	6.00	...
September	29.776	29.693	59.1	63.4	66.2	55.4	.443	.498	.826	.813	4.5	4.5	S W b W	S W	.36	.25	1.66	...
October	29.754	29.757	45.6	48 7	51.3	39.9	.268	.298	.809	.785	6.6	6.7	S E	N E	.55	.28	1.98	...
November	29.595	29.598	36.1	38 0	42.2	29.6	.208	.224	.835	.851	6.5	9.0	W S W	W S W	.76	.91	3.36	...
December	29.716	29.694	29.7	30.8	35.6	22.7	.151	.163	.797	.817	7.0	6.5	W	N E	.36	.26	1.89	5.0
Total	355.911	355.528	516.4	556.9	595.9	433.7	3.663	3.971	10.146	10.157	71.9	73.2	......	......	3.59	3.98	26.19	51.5
Means	29.659	29.627	43.03	46.41	49.66	36.14	.305	.332	.845	.846	5.99	6.10	......	......	0.30	0.33		

Mean annual height of Barometer, ... 29.643. Reduced to level of the sea, ... 29.979
Mean annual height of Thermometer at 9½ A. M. and 3½ P. M., ... 44° 69
Mean temperature of the year .... 42° 67
Barometer, Maximum observed 12th February, 9h 30′ A. M. 30.430
Do do 19th Novem'r, 3h 30′ P. M. 28.684
Thermometer do 15th July, ... 85° 5
Do do 23rd January, ... —29°0 Minus.
Maximum in sun's rays, with unblackened bulb, 15th July, ... 104°
Wind Maximum 21st November, 9.25 lbs per square foot; velocity per hour, 29 miles.
Total amount of rain and snow, in inches of water, 34.69 inches.
Thunder and lightning on 11 days.
The greatest cold known for many years, occurred in January.

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ERRATA.

Page 357, line 20, *for* "New Orleans," *read* "New Mexico."
" 359, two lines from bottom, *for* "Buchton," *read* "Buckton."
" 360, twenty lines from top, *for* "Nichel," *read* "Nickel."
" 360, six lines from bottom, *for* "bismuths," *read* "bismutho."
" 360, two lines from bottom, *for* "Bi'," *read* "Bi."