THE CANADIAN JOURNAL.

No. XXXIX.—MAY, 1862.

NEW SERIES.

NOTES ON ANCHOR ICE.

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Read before the Canadian Institute, February 1st, 1862.

Those who visit Montreal for the first time during the season of navigation, will be struck with the absence of warehouses upon or near the wharves; and—unless previously informed of the fact—will be surprised to learn that those wharves, at which transatlantic vessels are loading and discharging, are, for four months in the year, invisible,—being submerged from the middle of December until the middle of April:—that the Sault Normand, opposite the city, is obliterated, and that, over the track of that swift current which can now only be stemmed by the most powerful steamers, winter roads for the heaviest description of traffic are regularly *balizéed* out, and maintained, for one-third or one-fourth of the year.

The average winter level of the St. Lawrence, opposite Montreal, is about fifteen feet above the summer one, but the extreme range from the lowest summer level has, at the taking or departure of the ice, sometimes attained a maximum of twenty-five feet.

A full and graphic description of the causes which bring about this winter elevation of a mighty river, where it is beyond the tidal influence, and while its volume is daily diminishing, will be found in a paper "On the Packing of Ice in the River St. Lawrence," by Sir William Logan, published in the Transactions of the Geological Society of London for 1842.

This rise of the river—at least so far as to secure the formation of a winter road in front of the city—has always been viewed with satisfaction rather than alarm, and is confined to the section *below* the Lachine Rapids. Above the Rapids the level is uninfluenced by the annual icepacks below it; and as the current is very strong,—the fall between Lake St. Louis and the head of the rapids being about three feet per mile average—the river is open throughout the winter, and is navigated by a steam ferry-boat between Lachine and Caughnawaga. But, in the latter part of January, 1857, after a cold "term" of unexampled severity and duration—long after the ice had taken opposite the city, and when, according to all previous experience, no farther rise was to be apprehended, either above or below the rapids, until the "break up" in the spring—the River, above the Lachine Rapids (where it is always unfrozen,) rose suddenly four to five feet, pouring an Arctic current down the aqueduct of the new Water Works. A few feet more of elevation would have sent the river over its banks, and the consequences might have been most serious.

Such intense cold was followed, as is usnal, by a rapid rise of temperature, whereupon the water fell about two feet, but thereafter remained for weeks at least two feet above its ordinary level.

There is a tradition of something similar having occurred about seventy years ago, but this was not heard of until after the irruption; all recent experience and inquiry going to shew that after the ice has taken, the water in this reach lowers gradually with slight fluctuations until the spring.

This flashing above the rapids was independent of any movement of the fixed ice below, either opposite Montreal or in the Laprarie Basin; the levels of which remained undisturbed. Another peculiarity was—the absence of any visible cause; no ice had descended or was descending, and on the surface nothing but blue water was to be seen. The continuous descent, for days and weeks before the river is frozen over above the city, of large masses of ice which being arrested below would dam back the water, is sufficient to account for the rise at Montreal; but in this case there was no descending ice, the Lake St. Louis being frozen over just above Lachine, and the narrow bordages, in the intervening distance of about four miles to the rapids, remaining *in situ*. What then caused this mysterious and alarming elevation of the river in the dead of winter when there had been no rain or thaw, and while all its tributaries were sealed by intense frost?

The St. Lawrence was undoubtedly raised in its bed by the deposition of "anchor" or "ground" ice upon its rocky and stony bottom.

While the weather continues cold, no matter how intense that cold may be, nothing but a surface of clear water is visible in that stretch of rapid river between the Lachine Rapids and Lake St. Louis; but upon the first mild day after very cold weather, the whole surface of this open water is covered with white-capped cakes and floes of "sludge" or "brash" ice, which continue to descend for a day or two, when all is clear again. By watching the river closely, changes will be observed in the number and form of the ice-cakes in any given area: this is caused by new accessions which rise above the surface with a slight spring, a dark-coloured mass like snow saturated with water, but which rolling round and settling back speedily assume a snow-white cap—by the drainage of those parts above the water level.

This spongy ice which has thus left its anchorage is carried down the river and stowed away under the field ice,—upon the shoals and in every nook and crevice where the current is weak,—and is also tucked by the eddies under the bordages until it rests upon the bottom.

Anchor ice is formed only in open-running water. It never forms where the surface is covered with stationary ice, although it is often found in banks under the solid ice below rapids or currents of open water. In consequence of the difficulty and danger of sounding in such situations, and in such severe weather, the limit to the depth of water under which it will form is not easily ascertained: but there is no reason to doubt that it forms upon the whole bed of the St. Lawrence, wherever there is open water.

It does not appear that great or continued cold is necessary to its formation in all situations, as it has been found in brooks immediately after the first frost and before lake ice has become safe for travel: it is also one of the earliest formations upon those portions of shoals and rapids barely covered with water. But in the deeper water above the head of rapids its abundant formation (as indicated by its rising and covering the surface) occurs only after several days of a temperature considerably below zero.

It also appears that anchor ice does not melt as readily as solid ice, because it is found in banks under the field ice, during the whole winter, even after the current has cut through the surface ice; and in the rapids where it has grown above the surface of the water, or encroached upon the sides of the channel so as to dam back and raise the water, it appears to yield upon the advent of milder weather chiefly by losing its hold upon the bottom, and then only to the main body of the current the lateral spread of which is disputed, inch by inch, by this saturated "snow-ice."

This ice is drawn into mill-races at the head of rapids wherever there is too much current, or a lack of depth, and coming down to the racks is sucked against the grating, completely stopping the water like so much wool. At tail-races, where the same faults of construction exist, it "grows" upon the bottom, setting back the water and stopping the wheels. Many mills are rendered useless during the winter months from one or both of these causes.

Although a sounding pole will pass readily through a bank of anchor ice, it cannot be easily penetrated or displaced by bodies having any considerable base. In order to sink a crib for a bridge pier, below one of the rapids in the Little River, the site was cut out upon the surface ice, the crib framed in its place and filled with stones; after sinking a certain distance its progress was arrested,—although the sounding pole shewed that it was still about ten feet above the bed of the river. No additional weight which could conveniently be placed upon it would force it any lower, for it was found to be resting upon a bank of "frozee" (*frasil, fr.*) or anchor ice. The obstruction was only got rid of by the tedious process of detaching, by means of long poles, small pieces at a time from the lower side, which floated down the stream.

In the little which has been written upon the subject of anchor ice, it has been doubted both that it is formed upon the bottom, and that ice so formed rises to the surface; or whether the anchor ice seen upon the surface, was either formed or had rested upon the bottom. Among practical men, millwrights and lumbermen who have been puzzled by the phenomena attendant upon it, there is similar diversity of opinion. It has, however, been observed in situations where it would seem impossible that it could have been deposited unless formed where found. It has been found upon smooth rock in rapid water ten feet in depth; and it has been seen to burst up from the flat rock bed of the St. Lawrence, at the head of the Longue Sault rapids, where there is a depth of twelve feet. I have seen it rising to a surface already nearly covered with it, and at the same time, have felt it with a pole upon the stony bottom in upwards of twelve feet of water.

A remarkable instance of the formation of ice under a considerable depth of water occurred in the winter of '56–'57, at New York. The gutta-percha pipe—about $2\frac{1}{2}$ inches diameter—which supplies "Blackwell's Island" with Croton water, was frozen solid while resting on the bottom in a tide way at a depth of at least twenty-five feet below the surface. The flow in the pipe had been arrested by an obstruction, and the East River was at the time covered with floating ice. As the water within the pipe was fresh and very pure it could become solid while the surrounding salt water remained liquid, but it *may* have been over-grown with anchor ice.

The temperature of running water falls considerably below 32° without congealing, and therefore anchor ice is not melted. It is probably often formed in water at a temperature as low as 28° or 29°, which is not impossible if the air is 30° below zero; and although no anchor ice is formed under the solid surface ice, that which has been carried there does not melt,—shewing that the water in motion under the surface ice below rapids does not soon recover the warmth it has lost in traversing the shallow open reaches above.

The appearance of the open water above the Lachine Rapids, after a cold period, seems to prove both the place of origin and the fact of rising of anchor ice; but *how* it is formed, and *why* it rises, are questions of interest which I have never seen explained, and to obtain answers to which is the object of these notes.

With respect to the mode of formation, it is analagous to that by which dew or hoar frost is formed on the surface of the earth, and is probably due to radiation from the warmer bed of the stream to the colder surface current, and still colder atmosphere. When the temperature of the air rises above 40°, the surface of the snow covered ground remains colder than the atmosphere, and radiation ceases. When it ceases the power which kept anchor ice at the bottom is suspended; and from this circumstance, and the regular rising of the ice, there is reason to suppose that radiation is but another term for magnetism in some of its varied forms.

With respect to the still more subtle question of its rising only when a change of temperature takes place to a certain extent, this is analagous to the fact that very cold metal adheres to the hand, lips or tongue with force sufficient to remove the skin, until the relative temperatures are altered, whereupon it loosens its hold. Here again change of temperature is another name for the cessation of an active force.

Whether the specific gravity of anchor ice, while it remains upon the bottom, is greater or less than that of the water above it or whether it is retained there by pressure or frost, may be questioned; but if this ice be more ærated than surface ice, the combined effects of increased and maximum density of water between 39° and 40° fahrt. (at about which temperature anchor ice leaves the bottom), and of the expansion of the contained air, with possibly some diminution of barometric pressure, may have something to do with its rising.

When water is at the temperature of about 40° Farenheit, its density is greatest; when colder or warmer than this, it is lighter. In summer it is always above 40°, and then surface water is lighter because warmer than that below; but in winter this is often reversed: the surface water is lighter because colder than that below, and this cold stratum of water in rapid motion acts on the bed of the river like a cold wind on the human body, producing such rapid radiation and extraction of heat as to cause the peculiar form of congelation known as anchor ice. This process must be accompanied by some decomposition, or by a rearrangement of the air evolved,—as anchor ice when at the bottom, if stirred, sends up numerous air bubbles of considerable size, and it is perhaps owing to the presence of this and its expansion that it rises so rapidly. When by an atmospheric temperature above 40°, the upper and lower strata of water change places, the current of electricity between the earth and the atmosphere is reversed,—the magnetic tide ebbs—radiation ceases, and the relative specific gravities of the anchor ice and its water envelope being altered it is detached from the bottom.

Anchor ice seems to bear about the same relation to solid ice which muscovado or granulated sugar does to that in the lump or cake. There is also a certain degree of similarity in the conditions under which the processes of solidification are in both cases carried on. The compact masses are formed by cooling in a state of comparative repose,

—the granular ones by agitation and consequent æration. If we refer to the effect of friction upon the sides and bottom of the channel—giving the least velocity to the current at those points, we have the retarding cause *where* the ice formation takes place, and yet a disturbing cause which independent of its submerged position may be sufficient to produce the granular formation. If the cold superstratum of the flowing water (which from its specific gravity at the temperature under which anchor ice is formed, confines the substratum *in sitû*) may be supposed to act upon the bottom in the same manner as the colder atmosphere upon the surface water,—the principal point of difference would be whether the air disengaged in the process of freezing would pass off, or enter into any new combination and form anchor ice as snow is formed in the atmosphere. There is much similarity between saturated snow and anchor ice. Heavy snowstorms, when the water is very cold, produce the same effect upon the river as anchor ice: the snow does not melt but, descending the current, passes under the solid ice and clogs up the channel. The specific gravity of saturated snow and anchor ice appear to be equal and almost identical with that of the water.

One consequence of this peculiar form of congelation may be briefly referred to. The great rivers of Canada, the St. Lawrence and the Ottawa, with the large majority of their tributaries, are terrace-like in their profile, as contrasted with the easy and almost uniform slopes of the Mississippi and its branches. At the outlets of all our lakes, large and small, there are rapids with open water in winter to a greater or less extent. During the most intense cold—20° to 30° below zero —this open surface is covered with white fog or mist, like frost rime, completely hiding the dark water which is beyond the snow-covered bordage and appears to extend across the river—a deception which has lured many an unwary traveller to a frightful death.

While the surface of these lakes and rivers is covered with ice, and the earth with snow, with the sun almost powerless, the amount of latent heat disengaged in the formation of anchor ice and sent up from these numberless breathing holes may give a powerful check to the duration of that severe temperature under which this peculiar description of ice is so abundantly formed.

The unexpected rise of the St. Lawrence above the Lachine Rapids in January, 1857, suggests some questions of moment. Suppose the cold term had continued another day, would the growth of anchor ice have continued at the same rate? if so, it would have driven the river out of its bed—and many an unfortunate dweller on its banks out of their beds also. There is every reason to fear that the growth is more rapid after it can be measured by feet than while it is confined to inches; and then the question comes, could such a state of things continue for another day? or is there, either in the intensity of the frost or in the volume of icy moss produced by it, an antidote to the evils threatened by them? An all wise and merciful Power prevents our rivers from becoming solid masses of ice by the apparently paradoxical law, that in winter the bottom waters shall not rise to the surface to be cooled, although in summer the great lakes thus temper the intense heat; and may there not be the same beneficent and self-regulating provision by which intense frost—which is but the result of magnetic activity—produces its own antidote? If there is not, the day may possibly come when the St. Lawrence will, for a time, take the direct railway route from Lachine to Montreal, a valley it once occupied, but whether as a winter channel or otherwise geologists must decide.

AN INQUIRY INTO THE NATURAL LAWS WHICH REGULATE THE INTERCHANGE OF COMMODITIES BETWEEN INDIVIDUALS AND NATIONS, AND THE EFFECTS OF INTERFERENCE WITH THEM.

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Read before the Canadian Institute, March 29th, 1862.

The subject I have undertaken to discuss this evening, is somewhat too extensive for the time I can presume to occupy, and is one upon which I cannot pretend to throw any new light; but it is one of great and general interest, any doubts and difficulties relating to which may certainly be settled by reasonable inquiry; and having a strong conviction myself, which is not, I may safely say, a mere acceptance of the authority of others, however high in public estimation, but the result of personal inquiry and examination of evidence, knowing also how many around me take different views, which they doubtless think important, I have judged that a correct summary of what seems to me the real state of the case might not be useless, or, as a discussion of a controverted point in science, altogether out of place, and if I should influence those who think me mistaken, to express and defend their sentiments, I shall, as seeking only what is true and consequently useful, be pleased to listen to their remarks, and to contribute, through them, to your satisfaction.

I begin, then, by observing that man is naturally disposed to barter or exchange objects which by his exertions he has produced or appropriated. Other animals quietly use what comes in their way, or obtain what they want by violence or artifice: few accumulate, and those few are among the less intelligent; and only under the guidance of mere instinct, prepare for changes of the seasons. Animals will fight for the possession of a desired object: they will seize or steal from others what they want; but the voluntary giving up of anything in order to obtain another thing, is unknown amongst them, and is above their comprehension. Man, in a rude state, imitates the violence; in a corrupt and degraded state, the fraud of the brute,—both of which civilization, knowledge, and moral improvement lead him, for his own good as well as that of others, to abandon; but with the reason God has given him, it requires but small progress for him also to seek advantages by barter. He is sometimes successful in obtaining more of a desirable object than he can immediately consume; and he perhaps finds, when labouring for any product, a very slight additional exertion will greatly increase the quantity obtained. In these circumstances, to a reasoning animal, the idea of barter, as a means of increasing his advantages, naturally suggests itself; nor can the principle have been long applied before it was found out that each one doing what he liked best, or was most skilled in, would produce a much larger amount altogether of all desirable things, and a better share to each, than every one providing as nearly as possible all things for himself. Thus intimately is the tendency to barter connected with the division of labour. The earliest exchanges would of course be conducted with very imperfect approximations to accuracy in valuing—inexperience and the force of desire rendering the terms arbitrary and unequal; but it would soon be found that objects are valuable in proportion to the time and labour required for obtaining them; and not only the immediate time and labour, but that which had been employed in acquiring knowledge, skill, and quickness, so as to do most and in the best manner, as well as that accumulation of the results of previous labour which enables a man to live whilst working at an object, and to obtain whatever he needs for its completion. It is evident that no one would give a price for what he could as easily take without it: but if social order will not permit the stronger to take from others against their will, what is not to be had everywhere and without exertion, must be obtained either by our own labour directly employed upon it, or by an exchange for it of the produce of our labour otherwise employed; and the natural measure of price is, that results of equal amounts of labour and skill have the same value.

Such slight disturbing causes need hardly be mentioned in this connection as that needful labours which are peculiarly disagreeable, and which almost everybody would gladly avoid, must be paid for somewhat more highly, to induce some to undertake them; whilst those which are most liked, and which great numbers are very willing to perform, meet with a smaller return; or that he, whose skill and industry can produce most of a desired article in a given time, will have the full benefit of his superiority,—since equal quantities of the same thing will have equal value, by whomsoever or in whatever time prepared. Hence, also, when the quantity of the return for labour depends on situation, the weather, or any cause not easily calculated before-hand, the peculiar success is like all advantages unequally scattered by Providence, and the amount of gain is disconnected from the amount of labour, price here obviously depending on the labour others must undergo to secure the same products, or if they are scarcely attainable by labour, on what others will give rather than do without them. Whenever, from any cause, more people want to obtain any article than the producers of it can supply, its value, compared with other things, must rise. Whenever, on the other hand, more of the article is offered for exchange than is wanted, its comparative value must fall. When in any community the quantity of an article wanted is within, or at least does not exceed, what some members of the community can supply in return for things which they want, price will be regulated by the amount of labour expended on each article; but any limit to the supply, or difference in the quantity of labour different individuals must bestow in order to maintain it, will immediately and necessarily affect price. If only a certain quantity of a product can possibly be procured, and a greater quantity is sought for, the price is what a sufficient number of persons to take the whole supply are willing to give rather than not have the article. If a *certain* supply can be procured at any given cost of labour, but the quantity can only be increased by a greater expenditure of labour, then all that is consumed will have for its price the amount of labou expended on that portion, however small, which requires the greatest cost to produce it; for it is clear that no one would exchange the article for less than *the labour he had expended* in producing it; and whilst *one* who assists in supplying the market requires a certain price, all the others feel themselves equally entitled to it,—their power of producing their share of the supply at less cost, is a natural advantage of which they of course avail themselves.

Two remarks may be needed to guard what has been stated from misapprehension. 1st. That capital being nothing else than accumulated results of labour employed for further production, the degree in which it has contributed to the production of the article does not affect what has been affirmed. Capital contributes to the goodness and cheapness of very many things, but does not alter the natural laws which determine price. It is indeed quite true that the price of commodities produced by the union in various proportions of capital and labour, will be, according to those proportions, affected by the changes separately produced by competition or otherwise in the value of each; and these circumstances would explain peculiar changes of price in certain commodities, and afford reasons for probable success or failure in certain kinds of production in particular situations, but they would not withdraw these commodities from the dominion of the general laws respecting exchange, and what belongs to the special cases does not require investigation in reference to our present subject.

2nd. The exchange being direct of products themselves, or being accomplished by the intermediation of what we call *money*, cannot any otherwise than nominally affect price. What we call money is itself a commodity. Paper can have no value worth speaking of but as a convenient mode of handing about a right to a certain quantity of gold; and the gold itself is appropriated and brought to market by human industry, and finds its value like all other things. Because it is eminently suited for the purpose, portions of it are used in exchange; but we know when price varies, that gold growing cheaper or dearer may be the cause, as well as other articles of produce altering their comparative value.

We may now rest in the conclusions:

1st. That the natural tendency of price is towards the equivalence of products of equal amounts of labour.

2nd. That what may be called the natural price is modified by the abundance or deficiency of supply in relation to the wants of a particular community at a given time, *i.e.* in proportion to the *demand.*

3rd. That a special power of producing some object of desire which others cannot produce, or of producing it better and at less cost of labour than others can, enables an individual or class of persons to secure an increased price—the measure of which is the price at which others can afford to sell the same article, if there is a full demand; or otherwise, just as much below it as will attract all the custom: whilst when the power is exclusive, the price will be the most that a sufficient number of persons to take all that is produced will pay, rather than go without the product.

The cases under the last head may very properly be termed *natural monopolies.* They are unavoidable, and involve no grievance; but they manifestly raise the cost of gratifying some desires and give advantages to some individuals; and we see that their action on prices is the same as that of what really constitutes a monopoly, which is an interference of power to limit to one individual or to a certain class the sale of any particular commodity. It is very important that we should see clearly what happens in this case. It cannot be accounted a doubtful matter; but it may, notwithstanding, be worth while to illustrate it by applying the principle on a small scale where its operation cannot escape us.

Let there be a small community,—say of two hundred individuals,—all desiring a certain product of industry, the natural price of which for a given quantity we will express by (*p.*) Some authority interferes, and gives to the man A. B. the exclusive right to deal in the article. Before this event it must have been sold for something about the natural price which would afford the usual return, such as would be obtained in other employments, for the labour required in bringing it to the market; and if A. B. had demanded a higher price, others would have found the usual return for labour sufficient to induce them to enter into competition, and his trade would have speedily come to an end. But as soon as a sufficient authority has given him the exclusive privilege of sale, A. B. adds a quantity (x) to the price, raising its amount until he finds the utmost which will be given for all that he can offer. Some who would have paid the natural price are thus deprived of the article. We will estimate them at 20, and the remaining 179 pay for its use $(p + x)$, where they need only have paid (p); whilst A. B., in addition to the fair and just reward of his industry, has extorted from the little community 179 (x), the amount of (x) being only limited by the desire felt for the article, and this excessive charge on those who could bear it being accompanied by the total privation of the rest of the community. The essence of monopoly is obtaining from every consumer something more than the just price of the article, as settled by competition in a free market, whilst the number of consumers is more or less reduced by this rise of price. You will all at once apprehend that besides the simple and somewhat rude method employed by arbitrary sovereigns, of bestowing on individuals exclusive privileges, there are other ways by which the same ends can be obtained. Let a government lay a heavy import duty on an article desired by many, which can be most cheaply brought from another country. Something more than the duty is of necessity added to the price, and this rise may be sufficient to enable a home producer to supply the article at a trifle below what it now costs when imported. The hasty conclusion is, that you have encouraged home industry. The fact is, you make all the community, which may be a very large one, pay $(p+x)$; which latter may be a not inconsiderable proportion of the whole, for what had before only cost them (p); and you give the home producers possibly some million times (x), which is positively stolen from the rest of the community, who would be at least as well served at the price (p).

No one can, I think, attempt to establish any difference between the case of nations, which are but collections of individuals, and that of individual members of one nation. It is even evident that from the various natural productions and resources of different regions, which commerce is the benevolently provided means of interchanging and equalising for the general good, the freedom of commercial intercourse between different nations is more important than that between members of the same community, which nevertheless cannot be restrained without the most obvious evil and injustice. The character of all commercial restrictions seems then to be pretty clearly made out, as in effect amounting to a robbery of the multitude for the benefit of a few; and a thwarting, as far as our power goes, of the great providential plan for the free diffusion by human industry of all the bounties of nature and the conveniences of art over the whole world.

But it is thought by some, that the excessive payment (for the moment we will abstain from calling it by its proper name *plunder*, which it deserves, as being forcibly extorted by the agency of power) made for home products, is more than compensated by the advantages derived from their being produced at home; and also, that allowing the principle of restriction not to be good in itself, it may be made desirable and almost necessary by the conduct of other nations towards us. It may also be said—and we all know that it is maintained—that the requirements of a country in the way of revenue, may justify high duties on imported products, and that if these duties encourage home production, this benefit repays us for the evil they inflict. To these points, then, we will in conclusion direct our attention.

As to the first point, I believe there can be no question raised in relation to the facts to be considered. On the one hand, no one denies or doubts that increase in the quantity and variety of the products of industry in a country, is a blessing to its inhabitants, provided it is not extravagantly paid for; and it is evident that an artificial raising by commercial restriction or a heavy import tax of the price of an article, will afford an opportunity to home producers, who before could not compete with the countries already advantageously engaged in this particular branch of industry. On the other hand, this very statement of the way in which benefit is sought, admits, and it is indeed undeniable, that we pay more for the new production than we need do for a similar or better article imported. We should pay to the importer the natural price, depending only on the labour, immediate or capitalized, which has been employed, and on the usual rate of return for it. We pay to the home producer that price—the (p) of our previous statement) with the addition of a quantity (x), expressing the amount that the price is raised by the duty imposed. The whole body of consumers,—probably many thousands,—are taxed to this extent for the sake of having the article produced at home instead of abroad.

It is said that the benefit consists in employing a greater quantity of the labour of our own people, and in avoiding sending money out of the country. Our inquiry may then be confined to the questions, Whether a greater amount of home labour is really permanently employed? Whether our money going out of the country is really the evil supposed? And whether the advantage gained, if any, is worth the sacrifice required? The employment of labour necessarily depends on there being work which wants doing, and the means of paying for it. In most countries, and above all in new countries, there is plenty of work which wants doing; its execution only awaits there being means of paying for it. It is work which would be profitable, but means in advance must be first acquired. The amount of labour employed depends, then, on the amount of capital that exists in the country, or can be drawn in from other countries. Some occupations, indeed, can only be carried on advantageously with very cheap labour; and where the rate of wages is ordinarily high, can hardly exist. But a higher rate of wages is on the whole a public benefit; it is an advantage to the great body of society, and shows progress, because it could not possibly be sustained without demand for labour. Where the employment of capital is attended with such profit that the returns for it are usually high, it is manifest that the present capital of the country is not equal to the means of advantageously employing it, and consequently that new employments for it are not urgently wanted. Where the rate of wages is on the average, and, as compared with many countries, high, new demands for labour tend to raise it yet higher,—thus increasing the cost of every product; and it must be cheaper to import than to make many things that are wanted, in all countries not greatly advanced in their career, even independently of natural facilities for particular pursuits enjoyed by other nations. Where they can be advantageously conducted, manufactures rise of themselves, or with that degree of fostering which consists in giving information. First come those which are required in the neighbourhood, and are sufficiently occupied in supplying its wants; then those which diffuse their products over a wider field; and last of all, and only under peculiarly favourable circumstances, those great enterprises which aim at supplying the markets of the world. The latter require for success cheap capital, cheap labour, the most perfect machinery, the best power on the best term and easy access to the best markets. They grow; but they are not hot-house plants, and cannot be forced. Profitable manufactures are a general benefit, increasing national wealth. But if a very rich man resolved to have manufactures, and maintained some great undertaking at an annual loss, he would not benefit his country,—since he would annually diminish the capital possessed within it, and would create expectations of employment which must ultimately be disappointed. But in protected manufactures, the real loss is divided amongst all the consumers in the form of increased price above what they need pay. It may be left to any man of sense to judge whether a country profits by such means.

The evil of money going out of a country is the merest fancy. Men produce that they may enjoy or accumulate. In producing, they increase national wealth; in enjoying, they of necessity employ the industry of others; in accumulating, they increase the capital which is the grand means of national progress. What they want, they should get where they please, which will generally be where it is best and cheapest. They exchange their own produce either for what they want or for something which will purchase what they want; and to the country it matters not which—the saving made by the cheapness of a foreign production being employed at home, and whether what the individual produces or what he obtains in exchange for it, called money or not, is sent to purchase what he wants, being perfectly indifferent. The proper estimate of national wealth has nothing to do with money brought into or sent out of a country. If our industry produces something which many persons want, at least as cheaply as it can be supplied by others, then we are increasing our own wealth and our country's; and the latter addition is not a mere verbal one, for the presence of our wealth in our country is naturally a means of employing its labour, and promoting, with advantage to us personally, improvements which benefit all our neighbours. What we produce is intended to be exchanged either for what we immediately want, or what we find it expedient to hold as a means of satisfying future wants, or promoting further production. If we were compelled to exchange only for what is produced near us, our enjoyments and means of profit would be greatly limited, and consequently we should have much less inducement to industry in producing, to the great diminution of national wealth. Some countries can, from their climate, produce what we could not obtain at any cost: some can produce things which we want, from natural or incidentally acquired facilities, much more cheaply than they could possibly be obtained by us at home. We exchange a portion of our produce for these things;

thereby making the most of our industry. Whether we send out the actual commodities we have produced, or the gold we have bought with those commodities, is of no consequence whatever to national prosperity, which is advanced by all our successful industry, and could only be retarded by artificial checks on our freedom to try and benefit ourselves.

Now let us suppose that some protected manufacture does find out and employ possible labour, which was otherwise lost; and let us admit this to be a benefit—though perhaps it is chiefly labour of young persons who would be better at school, and whose parents, with industry and economy, could afford to keep them there—the benefit, such as it is, has been obtained at the cost to the country of the whole difference between the natural and the protected price of the article; which sum, if not thus paid, would either have been spent in employing labour, or, which is nearly the same and even still more useful, would have become capital. Now will any one explain how much is gained, or venture to affirm that the good is worth its cost?

The next question for our consideration is, assuming restriction on the freedom of exchange of all commodities to be an evil, but supposing another nation with which we might deal to have ignorantly adopted it, what effect should that circumstance have upon us? The restriction shuts us out of a market, and is thus a real evil to us. But in consequence, we shall either give our industry some other direction or find out some other market, and the evil may not be great: whilst to the people at large, which lays on the restriction, the loss from it must be a very heavy one—a general tax for the benefit of a class, blindly and unwisely submitted to. There is something which that country has to sell which we want; if we buy it, we do so because we want it, and can get it best there. If as a nation we shut it out, we tax our own people to spite our neighbours, or to show them that we approve what they do, and can be quite as unwise as they. What other benefit we gain by refusing to buy in a convenient market, I confess passes my comprehension.

Our third and last inquiry is, whether the duties on imports required for revenue can be so managed as to stimulate home production, and thus diminish at least their unavoidable evils. It ought surely to be sufficient to observe that, in the supposed case, the country requires the revenue; so soon, therefore, as the duties become protective, that is, that they cause the article to be supplied in the country without paying duty, additional taxation must be laid on to supply the deficiency. Protection and revenue are in this case directly opposed. Where a duty begins to encourage home production, it has already ceased to yield revenue. Revenue depends on free consumption. Tax as many things as you can, but always moderately, so as to interfere as little as possible with the use and enjoyment of the article,—and the revenue flourishes, not indeed without a certain amount of evil, yet without causing any suffering which is greatly felt, and probably at the least expense of injury which is attainable, except through that grand resource which can only be employed by an eminently enlightened and virtuous nation—direct taxation on the whole property of the country.

I know well in what various lights this subject might be put, and in how many forms the prevalent fallacies might be arranged,—each of which might, without much difficulty, be exposed in its weakness or selfishness; but I believe I have essentially proved that restrictions on commerce have the effect of monopoly, in enabling a class to live by a tax on the rest of the community, added to the fair natural price of the commodity, which is to prove that common justice, as well as wise policy, requires the utmost attainable freedom of trade; and that the natural laws, according to which the products of industry exchange, are essential and irreversible: hence if we understand them, and act in conformity with them, we derive the benefit of our knowledge; if we ignorantly or obstinately resist them, we invariably suffer the consequences,—the whole body being injured excepting the few who fatten on the plunder of their fellow-citizens, and would gladly confound their own with general prosperity.

AGE OF THE ORISKANY SANDSTONE.

To the Editor of the Canadian Journal.

Dear Sir,—To determine the relative age of a formation may appear to some persons a small matter and easily accomplished; such is the case in most instances. When the agencies which have been at work during any period are well understood, and where the flora and faunæ are clearly defined, it is generally easy to determine the horizon which separates the group of rocks to which they belong from others either above or below. But there are cases in which this line of separation is very obscure, so that whether a formation belongs to this or that group becomes a question not so easily decided. Such you are aware is the case with respect to the Trenton Limestone in Canada, which, in the United States, the New York Geologists divide into three formations, each characterised with good natural horizons of separation. This is the question at issue respecting a primordial zone in America; and the same difficulty is experienced in fixing the age of the Oriskany Sandstone formation.

This formation, though of little thickness, has a very wide range—extending from the Peninsula of Gaspé to Lake Huron. It is generally regarded as belonging to the Devonian, and forming the base of that system, while some authors think that it should be classed with the Upper Silurian. These gentlemen base their conclusion upon pæleontological evidence. It is not my intention to discuss that evidence, but simply to furnish a few facts which appear to bear upon the subject, and lead to an inference quite contrary to that come to by those who class it with the Silurian.

Beneath the Oriskany Sandstone in Western Canada occurs a group of rocks, known as the Onondaga Salt or Gypsiferous group. The following ascending section of a few of the upper beds will be sufficient to explain their character:—

	ft.	in.
Brownish grey shaly limestone	5	0
Water lime containing Euryptersus (?)	2	6
Hard grey shaly limestone weathering brown	1	0
Hard porous brownish drab crystalline limestone, in beds of from 1 to 3 feet in thickness	5	0
Thick-seamed conglomerate limestone composed of a light grey paste, holding small angular masses of a more compact, hard, dark grey coloured lime with a brownish tint, the whole yellowish on weathered surface	4	0
Porous grey limestone, containing numerous irregular bluish bands, lighter coloured on weathered surface,		

	ft.	in.
interstratified with thin seams of finer grained lime, holding light yellowish nodules weathering almost white, and thin seams of dark coloured shale with a bituminous odour..	20	6

Chert occurs in the light grey limestone which forms the summit of these rocks, in the form of nodules, seams, and miniature dykes. The nodules are found in a few instances only, while the seams and dykes are of frequent occurrence. The upper beds of this rock are also cut by dykes of sandstone. One of these, nearly a foot in width, is stretched across the bed of a creek, and is hidden on both sides by the bank. From 12 to 15 feet of it may be seen. They are, however, usually much smaller.

Above the Oriskany Sandstone occurs the Corniferous Limestone. This consists of beds of limestone containing vast numbers of cherty nodules, or beds of limestone interspersed with seams of chert.

Nodules of chert every way similar to those of the Corniferous, are found in the Oriskany Sandstone.

From these facts we think the following inferences may be very naturally drawn: 1st. That after the Onondaga rocks had been deposited they emerged from the ocean, and the exposure to the weather produced the fissures which are now filled with chert and sandstone forming dykes.—2nd. That at the time of the submergence, there was ushered in a condition favourable to the deposition of chert. The inference that the Onondaga rocks were hardened before the deposition of the sandstone, is also supported by the fact that in some places large quantities of pebbles of Onondaga rock are found in the sandstone.

The inference that the same state of things existed during the Oriskany Sandstone period that prevailed during the Corniferous age is supported by the fact, that nearly all the Oriskany fossils are found in the Corniferous, and many Corniferous forms are found in the sand. Mr. Billings has described the following species as belonging alike to both formations:—*Atrypa reticularis* (Linn); *Stricklandia elongata* (Billings); *Pentacrinus aratus* (Conrad); *Centronella glansfagea* (Hall); *C. tumida* (Billings); *C. Hecate* (Billings); *Septocelia concava* (Hall); *S. flabellites* (Conrad); *Chonetes hemispherica* (Hall); *Strophomena ampla* (Hall); *S. perplana* (Conrad); *S. Patersona* (Hall); *S. Inequistriata* (Conrad); *S. rhomboidalis* (Wahlenburg). I have also found the following Corniferous species in the Oriskany:—*Zaphrentis spatiosa* (Billings); *Z. prolifica* (Billings); *Michelinia convexa* (Dorb); *Favosites hemispherica* (Yandell and Shumard).

It is plain from the facts above stated, that a considerable time elapsed between the deposition of the Onondaga and the Oriskany Sandstone formations; and it is clearly shewn that the condition favourable to the deposition of chert commenced previous to the deposition of the sand. If, then, there is no doubt that the succeeding strata belong to the Devonian, it must seem reasonable to place the Oriskany in that system to which in so many ways it stands the more closely related.

JOHN DECEW,
P. L. S.

CAYUGA, June, 1862.

METEORIC STONES IN INDIA.

The following documents relating to a fall of Meteoric stones in India, afford a pleasing proof of the interest felt by Her Majesty's representatives in all parts of the world in collecting and making known facts bearing on scientific inquiries, and they possess a special value from the authentic character of the information communicated. We lay the whole before our readers, with a thankful acknowledgement of the attention of the late Governor General in communicating the papers to the Canadian Institute.

GOVERNOR'S SECRETARY'S OFFICE,
Quebec, September 21, 1861.

SIR,—I have the honor, by command of His Excellency the Governor General, to enclose a copy of a letter from the Under Secretary to the Government of India, and a printed paper and specimen of a Meteoric stone therein referred to; and to request you to present them to the Canadian Institute.

I have the honor to be, Sir,
Your obedient servant,
FRANCIS RETALLACK,
Acting Governor's Secretary.

Professor Wilson, LL.D., &c., &c., &c.,
President Canadian Institute, Toronto.

Copy.

No. 3506.

From C. U. Aitchison, Esquire,
Under Secretary to the Government of India,
To the Right Honorable
Sir Edmund Walker Head, Bart.,
Governor General North American Colonies, Canada.

Foreign Department,
Fort William, 1st July, 1861.

Sir,—I am directed by His Excellency the Governor General of India in Council, to forward to you a packet containing a specimen of a Meteoric stone that fell at Dhurmsalla on the 14th July, 1860, and to request that you will be so good as to present it to the Canadian Institute.

A printed paper giving an account of the fall of the Meteorites is enclosed.

I have, &c.,

(Signed,) C. AITCHISON,
Under Secretary to the Government of India.

Fort William, 1st July, 1861.

Copy of a letter from the Deputy Commissioner, Dhurmsalla, to R. H. Davies, Esquire, Secretary to Government Punjab, No. 927, *dated the* 30*th July,* 1860.

I have the honor to submit for the information of the Hon'ble the Lieutenant Governor a full account of a Meteorite that fell at Dhurmsalla on the 14th instant.

2. In the afternoon between the hours of 2 and 2.30 p. m., the Station of Dhurmsalla was startled by a terrific bursting noise, which was supposed first to proceed from a succession of loud blastings, or from the explosion of a mine in the upper part of the Station, others imagining it to be an earthquake or very large landslip, rushed from their houses in the firm belief that they must fall upon them.

3. It soon became apparent that this was not the case. The first report, which was far louder in its discharge than any volley of artillery, was quickly followed by another and another to the number of 14 or 16, most of the latter reports grew gradually less and less loud. These were probably but the reverberations of the former, not among

the hills but amongst the clouds, just as is the case with thunder. It was difficult to say which were the reports, and which the echoes. There certainly could not have been fewer than four or five actual reports. During the time that the sound lasted, the ground trembled and shook convulsively.

4. From the different accounts of three distinct eye-witnesses, there appears to have been observed a flame of fire described as about two feet in depth and nine feet in length, darting in an oblique direction above the Station after the first explosion had taken place. The meteoric flash was said to be N. N. W. to S. S. E. Fragments of ærolite fell in the same direction at the following places :—

In the ravine below the Dhurmsalla Kotwallee at the Village Sadeir.

On the Barrack hill close to the Convalescent Depôt.

At the River Guj four miles from the Kotwallee.

On the Parade ground of the Sheredil Police Battalion between the graveyard and the Native Distillery.

In the Village of Kerayree on the hill to the right of the Station looking towards the plains and at the Bowarna Thannah.

It must be noted that Kerayree, the Barrack hill, the Kotwallee Kudd, the Graveyard and Bowarna are in one direct line from N.N.W. to S. S. E.

5. Specimens from each of the above localities have been brought into the station.

6. It is said that meteoric stones fell likewise in the following places, but no specimens have been received from them. At Kunhiya near the slate quarries, at Madhopore, and at Bissowlee on the Ravee, and in parts of Chumba and Rhilloo. I am making further enquiries with regard to these places.

7. The stones as they fell burried themselves from a foot to a foot and a half in the ground, sending up a cloud of dust in all directions.

8. Most providentially no loss of life or property has occurred.

9. Some Coolies passing close to where one fell, ran to the spot, to pick up the pieces. Before they had held them in their hands half a minute they had to drop them owing to the intensity of the cold which quite benumbed their fingers.

10. This, considering the fact that they were apparently, but a

moment before, in a state of ignition, is very remarkable; each stone that fell bore unmistakeable marks of partial fusion.

11. The morning and afternoon preceding the occurrence had been particularly dull and cloudy. The temperature was close, sultry, and oppressive. The Thermometer was above 80 degrees of Fahrenheit, and no rain had fallen. I had no Barometer by me at the time, I am therefore unable to state what was the precise pressure of the atmosphere. The clouds which were of the form technically called cumulus and cirrus were hanging low at the time, and the atmosphere was heavily charged with electricity.

12. Such are simply the facts of the case as they occurred.

13. There are of course all sorts of conjectures as to the probable cause of the occurrence: some state the stones to be of volcanic origin, others that they were hurled from the heights about the Station, or projected from the moon, but I am inclined to regard them as real *boná fide* Meteorolites. Their weight seems to indicate that they are semi-metallic substances, composed probably of Meteoric iron alloyed with nickel, and mixed with silica and magnesia, or some other earthy substance. They are nearly double the weight of a piece of ordinary stone of similar dimensions.

14. Such a phenomenon is not without precedent. It is on record that in Siberia a mass of iron once fell weighing 1,680 lbs., and in Brazil another weighing 14,000 lbs. In Peru a piece fell weighing 15 tons, and it is said that some knives of iron alloyed with nickel were found by Officers connected with the Arctic expedition among the Esquimaux in Greenland, which must have been made of metal taken from Meteoric masses, for these two metals are not found together as a mineral product anywhere.

15. I have sent specimens of the Aerolite to the Museums at Lahore and Umritsur, and to Scientific institutions in America. I am about also to send others to the Academy of Sciences in France, to the Asiatic Society in Calcutta, and to Monsr. H. Schlagentweit at Berlin in Prussia, for examination and report.

16. One fact if true is curious, *viz.*, that the report preceded the flash instead of followed it; this I cannot at all account for.

17. The common theory with regard to such phenomena is that they are fragments of some planetary body of our system which has been destroyed, and these portions as projected into space, have acci-

dently come within the sphere of the earth's attraction, which extends to about 45 miles above the surface, and consequently fallen on it. Some believe that the tail of a Comet coming in contact with one of the minor Planets, or asteroids annihilates it instantaneously. Indeed in England when the Comet which was predicted to appear next month was discussed, some said that if the length of the tail were to extend over half the area of the heavens, the safety of our own Planet would be in jeopardy.

18. I believe that I was the first at Dhurmsalla to discover the new Comet now visible in the heavens. I saw it first on the evening of the 4th July, and I have met no one yet who will allow that there is a Comet; subsequent accounts in the papers prove that I was correct.

19. Another very singular phenomenon was witnessed at Dhurmsalla on the evening of the same day that the aerolite fell. This appears to have been a succession of igneous meteors such as fire-balls or falling and shooting-stars.

This singular sight did not attract the attention of most people. I quote the account (from the writer who describes it) verbatim: "I think it was on the evening of the same day that the Meteor fell, that I observed lights in the air, they commenced to appear about 7 p. m., and lasted about three hours till 10, they appeared for about one minute, some for longer, then went out again, other lights appeared in the same place, some times three or four lights appeared in the same place together, and one or two moved off, the others remaining stationary, they looked like fire balloons, but appeared in places where it was impossible for there to have been any houses, or any roads where people could have been, some were high up in the air moving like fire balloons, but the greater part of them were in the distance in the direction of the lower hills in front of my house, others were closer to the house and between Sir Alexander Lawrence's and the Barracks. I am sure from some which I observed closely that they were neither fire baloons, lanterns, nor bonfires, or any other thing of that sort, but *bonâ fide* lights in the heavens. Though I made enquiries amongst the Natives the next day, I have never been able to find out what they were or the cause of their appearance."

20. Verily this has been an extraordinary season in more ways than one.

21. In different newspapers I have read accounts of other very extraordinary phenomena all occurring within the last few months,

for instance an aërial meteor or water-spout in the neighbourhood of Bhurtpore where aerolite is said also to have fallen. A luminous meteor or something which from the newspaper account reads like an Aurora Borealis at Delhi. This was on the night before the Meteorolite. A shower of live fish at Benares unaccompanied by rain. A similar shower but accompanied by rain fell some years before at Agra. A shower of blood at Furruckabad, and likewise at Meerut previously.*

Also a dark spot observable on the disc of the Sun.

22. Besides the recent shock of an earthquake slightly felt here, there was an unnatural yellow darkness of some duration, followed by a violent wind storm from 3 p. m. to 5 p. m. on one afternoon early in the present month. These were all more or less strange phenomena.

22. Two descriptions of aerolite fell in this district, that sent in a wooden box (of which but a small fragment was found) fell at Bowarna, and that resembling granite or limestone fell at the places named, in much larger quantities.

24. The largest piece that was found of the latter weighed about four maunds pucka.

25. As the piece I have examined will not answer to the test of acetic acid, I am of opinion that it does not contain carbonate of lime. I should be glad to ascertain the exact chemical constitution, for I am firmly of opinion that it differs from all other stones or metals of terrestrial origin.†

26. The accompanying extracts of the more remarkable phenomena may be read with some interest by the Hon'ble the Lieutenant-Governor.

Copy of a letter from Officiating Deputy Commissioner of Dhurmsalla, to R. H. Davies, Esquire, Secretary to the Government of Punjab, No. 512, *dated* 25*th April,* 1861.

With reference to your letter No. 683, dated 4th instant, I have the honor to state that I have been making further enquiries with regard to the meteorolite that fell at Dhurmsalla.

* It will of course be understood by all readers that the so-called showers of blood, the occurrence of which has been frequently recorded, consist of rain discolored by the mixture of a red substance.—*Ed. C. J.*

† *P. S.*—Probably there are grains of chrysolite in it, and perhaps cobalt or chrome as well, but I have no means of ascertaining this. It certainly is not magnetic, but it may be chromic iron.

2. No fresh information can however be obtained beyond that contained in my No. 927, dated 30th July, to the address of the Punjab Government

3. I beg to append a copy of a letter received from Monsr. Haidinger, Director General of the Imperial Geological Institute of Austria, dated Vienna, 14th November, 1860, on the subject of these meteoric stones.

4 In reply to this letter I forwarded a copy in extenso of my account of the fall of Aerolite referred to above, and begged the favour of their furnishing copies to each of the Institutions for which specimens were requested

5. I packed a box with 14 specimens of the Aerolite, and despatched this to the Private Secretary of His Excellency the Governor General, with a request that he would, after taking out certain specimens which were intended for His Excellency the Governor General, forward the box to Vienna in the manner directed.

6. One of the specimens was, as will be observed from the letter, intended for the British Museum:

7. I have, however, now sent the only remaining two specimens* I could procure to Lahore for transmission to the Secretary of State for India, either for presentation to the British Museum, or the Museum attached to the late India House, or for the acceptance of Her Most Gracious Majesty Queen Victoria.

8. The specimen now sent is the largest of any that has been despatched from Dhurmsalla, and being beyond the weight authorized for banghy parcels, I was under the necessity of forwarding it to Jullunder by coolies, and thence by Government Bullock-train to Lahore.

9. When worked up into handles for walking sticks or riding whips, the metallic substance is clearly visible.

10. As to the precise form of the Aerolite no positive information could be obtained, for it was found in fragments, and its intense coldness has been mentioned in the report before submitted.

11. The original of the letter from Vienna, together with a printed paper giving the falls of former Meteorolites, and an account of them

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* No. 1, of the fragment that fell at Bowarna. No. 2, of the large stone that fell at Dhurmsalla.

has been already forwarded to His Excellency the Governor General of India.

12. The specimens for Lahore have been forwarded under separate covers.

REVIEWS.

A Sketch of an Overland Route to British Columbia. By Henry Youle Hind, M.A., F.R.G.S., Professor of Chemistry and Geology in the University of Trinity College, Toronto. Toronto: W. C. Chewett & Co. 1862.

Professor Hind has here brought together, from his own previous writings and personal knowledge of the country, and from the best authorities relating to that portion which lies beyond the limits of his own travels, an amount of useful information scarcely to be obtained elsewhere, and of the greatest importance to emigrants who are inclined to prefer the overland route. He has chosen what is really valuable, and given it in the most concise form, thus making his work at once portable and generally accessible. To the matter furnished by Professor Hind is added a letter of five and thirty pages, addressed to the author at his request, by Sandford Fleming, Esq., C.E., Engineer to the Northern Railway of Canada, containing "Practical Observations on the Construction of a Continuous Line of Railway from Canada to the Pacific Ocean, on British Territory." This is a subject of peculiar interest. It may seem to be specially pressed upon our attention at the present moment by the wants of emigrants seeking the Columbian gold regions, but its interest is really far higher in connection with the future course of an important part of the world's commerce, and with the settlement of a vast fertile region lying in the interior along and for some distance about the proposed line. Already the Red River settlement is becoming well known, and exciting no small attention. Its future is indeed not only most important to its inhabitants, present and prospective, but is eminently important to Canada and to the whole British Empire. It is so because the colony is sure to extend and increase in wealth, in products, and in wants; it is so also because upon it depends the continuity of the British Empire in North America, the communication within our own dominions between the Atlantic coast and the important and rapidly rising colony of British Columbia, and the prospect of a future intercourse, by the same route, with Japan, China, Australia, and India. If a good road from Canada to Rupert's Land is not speedily opened who can tell the effect on the minds of the inhabitants of seeming neglect on the part of the mother country and the great and advanced intervening colony, joined with habitual dependence on the United States for means of intercourse with the outer world and for all which they most want? We have no enmity against the United States. We admire much in their institutions, though, very naturally, we do not like them so much as our own. We esteem their people highly as friendly neighbours, and when some among them abuse and threaten us, we give the great majority credit for more just and reasonable sentiments. But there are those in the States who are ambitious of territorial extension, and who would not only offer to, but force upon others the institutions they themselves value, and if the affections of our countrymen were cooled by supposed neglect, or their interests be involved in a change of allegiance, it is not difficult to foresee that influences might be brought to bear upon them which we are convinced would not really favour their own welfare and progress, and which would most seriously affect the prosperity of the great empire of which the ignorant and thoughtless might account them an insignificant part. With these views, we cannot but feel how much is involved in the question of a practicable and not too difficult route from Canada to the Red River and thence to British Columbia, and accordingly we looked to the opinions of an experienced and able engineer like Mr. Fleming with more than curiosity. We were not surprised to find Mr. Fleming begin by pointing out the impossibility of proceeding at once with the construction of the great railway line, which he justly regards as the only really satisfactory means of communication across the continent. As this decision may cause disappointment to many, and might possibly lessen the public interest in what may be speedily accomplished, we first give our author's statement of the magnitude and cost of an undertaking, the importance of which he estimates so highly, that we cannot suppose any attempt to frighten us by an exaggeration of the difficulties:—

"Having determined the character of the means of communication most desirable to be established, it may be well now to glance at the comparative dimensions of the proposed work, and to consider the cost of its construction, as well as the annual expense of maintaining it for ever afterwards.

"Measuring on the map along the general route of the proposed line from the mouth of Frazer's River, through one of the best passes yet discovered in the Rocky Mountains, along the general direction of 'the Fertile Belt,' keeping south of the North Saskatchewan, crossing the Red River near the settlement, bridging the Winnipeg River at the north end of the Lake of the Woods, striking through the country to the most northerly bend of the shore of Lake Superior, thence in a direct line to a crossing on the French River west of Lake Nipissing, and from this point connecting with the existing railway system of Canada, either at the Town of Barrie, or at Peterboro, or at the City of Ottawa. The distance thus measured will be found to be in round numbers about 2000 miles; and although a railway between the two oceans on British territory cannot be considered perfect without the completion of the road between Halifax and the most easterly extension of the Grand Trunk in Lower Canada, yet as there is some prospect of this section being made independently, it does not appear necessary to embrace its length in the present consideration.

"That a just conception may be formed of the real magnitude of the project under discussion, and the means necessary to its attainment, attention may for a moment be drawn to a few leading details. The construction of 2000 miles of railway, measured by the average standard of similar works existing in this country, implies the performance of labourers' work sufficient to give employment to 1000 men for fifty or sixty years; it involves the delivery of 5,000,000 cross-ties or sleepers, and over 200,000 tons of iron rails for the 'permanent way;' it comprises the erection of 60,000 poles, hung with 1000 tons of wire, for the telegraph; it necessitates the creation of motive power equivalent to over 50,000 horses, which power would be concentrated in 400 locomotives; it involves the production of from 5000 to 6000 cars of all kinds, which, coupled with the locomotives, would make a single train over thirty miles in length; and lastly, it implies a gross expenditure on construction and equipment of not less than $100,000,000.*

"It will likewise serve as a salutary check on hasty conclusions, to weigh beforehand the cost of operating a truly gigantic establishment of the kind after its perfect completion. A few figures derived from actual results will shew that the first construction of a railway through the interior of British North America is even a less formidable undertaking than that of keeping it afterwards open, in the present condition of the country. For operating the line successfully, the fuel alone required in each year, and estimated as wood, would considerably exceed 200,000 cords; for keeping the road in repair, a regiment of 2000 trackmen would constantly be employed, in small gangs, throughout its

"* Major Carmichael-Smyth estimated the cost of building a line of railway from Halifax to the Pacific at £150,000,000 sterling,—equal to over $700,000,000; but then he computes the expenditure as on English railways, where more money has been wasted in preliminary expenses, and lavished on architectural monuments at stations, than would suffice to build an equal length of road in this or any new country."

entire length. For the same purpose there would on an average be annually required 600,000 new cross-ties, as well as nearly 30,000 tons of new or re-rolled iron rails. The annual repairs of rolling-stock would not cost less than $1,000,000. Over 5000 employées of all kinds would constantly be under pay; and as these men would usually represent each a family, there would not be far short of 20,000 souls subsisting by the operation of the road. The aggregate amount of wages in each year, after the road was in operation, would swell out to nearly $2,000,000; while the gross expenditure for operating and maintaining works would annually exceed $8,000,000.

"Again, if to this last sum be added the interest on first cost, it becomes evident that until the gross earnings of the railway in each year come up to the enormous sum of $14,000,000, it could not pay interest on the capital invested."

Formidable as this statement may appear, and strongly as it brings home to us the absurdity of an immediate attempt by Provincial or even Imperial funds, and still more obviously by private enterprise, which for a considerable time could obtain no return, to carry out such plans, we think it may be well established that without any impracticable or pernicious expenditure a portion of the advantages sought—well worth great exertions to obtain—may be secured within a very moderate time, and (which deserves special attention) that the immediate benefit thus gained is not derived from a mere temporary substitute for what alone can fully satisfy our wishes, but results from preparations for and progress towards the grand scheme which should ever be kept in view as essential for our national development.

Mr. Fleming's peculiar idea, and it is one which deserves much consideration, is that whilst vast works must necessarily be carried on gradually and completed as the several parts can be brought into profitable use, it is possible and most desirable in opening a new country to employ skill and foresight in determining the best positions for the main thoroughfares and giving them the direction which must ultimately be most advantageous. When a new country is gradually occupied without order or preparation, under the guidance only of individual fancy, roads as they come to be formed will represent the nearest available paths from one point to another, where a few people have collected together. Where the settlement of a country proceeds under the control of a government, the land is generally divided into suitable portions or lots, which are given or sold to settlers, road allowances being left according to a definite plan. This plan, in order to save expense and trouble, is a formal one, producing equal sized lots bounded by straight lines independent of the natural features of the country, with roads left at regular intervals which may be improved as they are wanted, but which are liable to pass through swamps or over steep hills and which have no reference to any particular place to be reached by them. Mr. Fleming contends that in laying out for occupation a country which is as yet a wilderness, it is of great importance to consider well the natural features of the country, the parts best fitted for immediate occupation and its relations with other neighbouring or connected countries, and to open roads and lay out lots in reference to these circumstances. He divides the roads required into three classes—the great leading roads, which ought to become railways, and which he would call "Territorial Roads;" the gravel or stone road, going through important parts of the country, and around which the first settlements would be made, which he proposes to name "Colonization Roads;" and the earth roads, formed by a mere clearing of the forest, offering access to farms, but not needing any special efforts for their improvement, which may be denominated "Concession Roads." The following extract shews how these several kinds of roads should be formed:—

"In pre-arranging a system of internal communications for a new territory, it would be necessary to take a prospective view of the character of the traffic which might exist when, after a lapse of years, the district becomes populated. In this we might be guided by drawing a comparison between the natural advantages of soil, climate, and position of the section of the country to be colonized, with those of any similar section which has become occupied, and, to to some extent, developed. In this manner we could form some idea of the nature of the future commerce of the country, and consequently of all the classes of roads which would ultimately be required to accommodate it. The leading direction which traffic may seek, or the direction which, in a national or political sense, it may appear expedient to guide it, would prescribe the general direction of the main line of road through the territory, and the other consideration would determine its character. This is the first thing to be established, as upon it the direction and character of all minor lines mainly depend.

"Assuming the tract of country to be colonized is such as to justify us in the belief that in due time a railway may be constructed through it, the first step would be to lay out a 'Territorial Road' between the more important points in the general direction of traffic previously determined. The territorial road ought to be located with the utmost care, and in all that relates to curvatures and levels, the best railway location in an *engineering aspect alone* which the country traversed could afford. In this respect there would doubtless be less than usual difficulty, as there would be neither right-of-way obstacles to guard against nor local interests to serve, and consequently no undue influences to twist or warp the intended line out of the most advantageous location. The main artery of traffic for the future service of the country might thus be determined upon under the most favourable circumstances.

"It would next be necessary to select, at proper intervals, the most suitable points for stations and villages; and from these, as diverging points, 'Colonization Roads' might then be laid out to the right and left, with as much care as the location of gravel or macadamized roads generally requires. These colonization roads thus laid out and adapted to the peculiar features of the locality, avoiding steep hills, ravines, lakes, or unnecessary river crossings, might form centre or governing lines upon which the townships may be projected; these townships to be sub-divided in the usual way into blocks of farm lots, with concession roads between, drawn so as to unite with the colonization roads."

Mr. Fleming having made a calculation as to the amount of timber required for fuel and repairs in a country where, for some time at least, wood must be looked to as the main supply of fuel, proposes as the easiest plan to reserve a sufficient space on each side of the territorial road for the necessary supplies, and this, he ingeniously contends, would in a great degree guard the railway, which is as speedily as possible to occupy the territorial road, from the evil of snow drifts. He points out other advantages arising from this kind of reserve along the line of road, and shows that, the principal stations being chosen with reference to fitness for settlement, and made the centres of colonization roads, around which the blocks for farming purposes, with concession roads giving access to them, would be laid out, no serious inconvenience could arise from the sides of the territorial road not being immediately occupied. It remains for us to give in his own words, Mr. Fleming's ideas as to the modes in which the work of forming a highway to the Pacific should be carried forward, and the time which may be expected to be required for its completion; the latter, of course, depending much on the number of settlers that can be introduced into a country which, independently of its own great advantages, will by means of this work afford them great assistance in overcoming the first difficulties of a new settlement. The following is our author's summary of the points he has endeavoured to establish:—

"1st. That the project of a highway to the Pacific is as old as the first settlement in Canada, and that recent events show its increasing importance.

"2nd. That a continuous line of railway, with electric telegraph, is better calculated to meet the permanent wants of the country and serve the interests of the colonial empire, than any other means of communication between the two oceans.

"3rd. That although the magnitude of the scheme for a railway across the Continent is very great, yet the vast importance of the work,—in a commercial, military, and national view,—would demand its construction were the resources of the country and the traffic sufficiently developed.

"4th. That the immediate completion of this work cannot be seriously entertained in the present condition of the country, the cost of maintenance, without sufficient traffic, being so very great; and that therefore, to be constructed at all, the railway must be a work of time.

"5th. That the Canadian road and railway system has illustrated the advantages which may be derived from the adoption of a comprehensive road scheme in laying open new districts for settlement.

"6th. That a scheme which embraces the ultimate completion of railways and less perfect lines of communication, by a progressive system of construction, possesses many features favourable to the first settlement as well as the future requirements of the traffic of new territories.

"7th. That the system proposed for the development of the highways of a new country, by progressive stages corresponding with the progress made by the country itself in general advancement, is one peculiarly applicable to the case under discussion; and while it might be expedient, in the first instance, to employ some of the natural water channels as a means of introducing settlers and labourers along the line of road, until the latter became in some degree serviceable, it would not be advisable to incur any great expenditure on works beyond the limits of the great thoroughfare ultimately in view. That the first effort should be made to construct an electric telegraph along the precise line of the future railway; that the telegraph should be the precursor of other means of communication, beginning, it may be, with a bridle path or Indian trail from post to post, and ending with a perfect line of railway when the traffic of the country or the interests of the nation required the most rapid means of steam communication."

We select also a few paragraphs respecting the mode of proceeding with the work:—

"The first step required is the location of what has been designated a 'territorial road' between all the more important or governing points on the line of route. Commencing at the western terminus, these points would probably be: the mouth of the Frazer River, or the best harbour on the Pacific coast north of the 49th parallel; the best pass which has been or may be discovered across the Rocky Mountains contiguous to a line which would run along the general direction of the 'Fertile Belt' of the interior; the most southerly bend of the North Saskatchewan River; the best crossing of Red River between its confluence with the Assiniboine and the southerly end of Lake Winnipeg; the best crossing of the River Winnipeg near the north end of the Lake of the Woods; the most northerly bend of the shore of Lake Superior; the best crossing of the French

River between its junction with Lake Huron and Lake Nippissing; and, lastly, the most desirable point of connection with the existing railway system of Canada, either at Ottawa, at Peterboro, or at Barrie—all of which points are directly connected with the Grand Trunk Railway by means of the branch lines running southerly to it. On the location of the 'territorial road,' which could only be done on a careful survey of the country, the next step would be the determination of station points from whence to lay out colonization roads to the right and left, wherever the soil was favourable for setttlement. Upon the colonization roads the townships would next be projected.

"So soon as any section of the road was finally located, together with its branches, the introduction of settlers might commence. The road should be cleared through the wooded districts to a width of two chains, or 150 feet, in order chiefly to preserve the telegraph when erected from being injured by trees falling. The clearing would at once give employment to settlers, and with subsequent work in improving the road, greatly aid them in paying for their land and in supporting their families until their farms produced sufficient crops. Throughout the open prairie country, which is more than one-third the whole distance, the trouble and expense of clearing would be avoided; but as the great natural obstacles which isolate the interior, and prevent the possibility of establishing a continuous telegraphic communication through the country, are the wooded and broken districts at both extremities, it becomes indispensable to force a way of communication through them. This is doubtless a work of considerable labour and corresponding expenditure, but without it no satisfactory progress can be made. This preliminary step is especially requisite to the east of the Red River valley, so that settlers might obtain access to the central plains; and in view of the construction of a continuous line of telegraph at an early day, to be followed by a waggon-road as soon as circumstances would allow, the 'territorial line' should be cleared through the western division likewise."

"To begin at one end of the road, and gradually extend the settlements northward and westward, would perhaps be too tedious an operation, in view of the importance of opening an early connection with the interior. It would, therefore, doubtless be advisable to begin at several intermediate points accessible by water from Lakes Huron and Superior, and proceed with simultaneous operations. On referring to the map, it appears that such points exist at distances ranging from 50 miles to 90 miles apart; and from these, as bases, the clearing of the road could proceed in both directions at the same time, while settlements could be formed wherever the soil proved favourable. In due time the clearings, penetrating the forest to the right and left along the line of road previously located, would pierce the country from one end to the other; and the same being accomplished in a similar manner in the western division, a continuous line of electric telegraph might then be constructed.

"The extreme importance of the telegraphic communication extending from colony to colony across the country, even during the earliest stages of settlement, is too apparent to need comment; and being constructed on the precise line of the intended waggon-road and of the ultimate railway, it would always be in the position where its services would be called into requisition.

"While the territorial line through the eastern division gradually became developed into a good waggon-road, by the labour of the settlers and such grants of money as its importance appeared to warrant, it is probable that the canoe routes from Lake Superior to Red River might, by partial improvement, be made serviceable for ingress and egress during summer to the interior; and with the object of promoting emigration to the central plains, as well as to other points along the line of road, it would probably be expedient to improve these routes by a limited outlay; but, for the reasons I have already given, I cannot help thinking that it would be the wisest policy to concentrate the chief expenditure on that line which must be, sooner or later, the leading highway through the country."

In order to give an idea of the time required, we add the following extract, not without observing that the annual emigration here supposed is greater than, for some time at least, could at all be expected:—

"It has already been shown that the success of a railway to the Pacific would mainly depend on the possibility of introducing a sufficient number of inhabitants into the country to be traversed. If the population of the country is to govern the period when a railway is to be set in operation, we may likewise take it as the basis of annual expenditure on the preliminary stages of the work. Suppose the average annual increase could be reckoned at 100,000 souls, and that it be determined to expend annually on the works a sum equal to one dollar per head of the whole population in each respective year, the following results in the development of the undertaking might be obtained:

"1st. In from three to four years, besides the expense of surveys, a territorial road line might be located throughout; the wooded districts, which extend over a length of over 1,400 miles, might be cleared to a width of two chains, and a continuous line of telegraph constructed from Canada to Frazer's River.

"2nd. Within a further period of two years, a road passable for wheeled vehicles might be formed along the whole line of route.

"3rd. Macadamized roads of the very best description might be completed in addition to the foregoing, in the following order:

"(1) From Lake Superior to Red River, a distance of 400 miles, in nine years from the present time.

"(2) From the mouth of Frazer's River to the Rocky Mountains, a distance of 400 miles, in eleven years from the present time.

"(3) From the settlements of Canada to Lake Superior, a distance of 650 miles, within fourteen years from the present time.

"(4) From Red River to the Rocky Mountains, a distance of 800 miles, within seventeen years from the present time.

"And thus, by the comparatively trifling annual outlay of one dollar per head of the assumed gradually increasing population, we could secure, in less than four years, a line of telegraph; and in thirteen years more, a substantially constructed macadamized road throughout the whole length of the line. The next and final stage of progress would be the completion of the railway on the line thus in a great measure prepared for it; and in view of the traffic then created, as well as the comparative economy in construction, it might be undertaken in sections by private enterprise, or in such other way as might then appear most expedient.

"I am not prepared to say that the foregoing is the best order of sequence in which the several sections and stages of the work should be constructed; it is simply presented for the purpose of showing what might be accomplished by a small annual expenditure. It is not at all unlikely that the peculiar nature of the traffic might warrant the conversion of some section of route into a railway at an early period; possibly that section between Lake Superior and Red River would be the first to require the change, which of course could be made without difficulty at any time, so soon as it appeared that the trade of the country was sufficient to maintain it.. The order of sequence is not important; but it is an essential part of the system proposed for opening up this vast and roadless country, that every portion of work done should form a component part of a perfect whole, and that whatever expenditure is made,—whether it be one thousand or one hundred thousand dollars,—should be laid out in the right place, in accordance with a thoroughly digested and well matured plan, the great object in view being to obtain the maximum result of good from the minimum amount of outlay."

We have no hesitation in ascribing to Mr. Fleming's letter a high degree of practical importance, and considering it as greatly increasing the value of Professor Hind's very useful work. We recommend not intending emigrants only, who would like in seeking the Gold Mines to take the most direct route, and who think it prudent to train themselves for their proposed work by the labours and hardships of their journey, but thinking men and patriots generally to study this little book, and consider how far it is fitted to guide their efforts in a great and noble national enterprise. We confess to a feeling of impatience at finding that more speedy action seems hardly possible; yet we know that this is a weakness, and if we could only see our way to the speedy attainment of a good communication between Canada and the Red River Settlement by such improvement of the canoe line as should make it really available for commercial purposes, together with a commencement at laying out the grand roadway, and promoting settlements at suitable stations, we could be content to leave the work to those who come after us, confident that the accumulating proofs of its importance would prevent any danger of its being abandoned, and that it must, in due time, contribute its full share to the glory and prosperity of Canada and the British Empire.

W. H.

LAST POEMS, *by Elizabeth Barrett Browning, with a Memorial, by Theodore Tilton.* New York: James Miller. 1862.

An American reprint of the sad memorial of England's greatest poetess makes its appearance under this title; and the interests of English survivors in the rights of her last gift of song, are thus committed, by Robert Browning, her widowed heir, to the invoked courtesy of those with whom the pirating of English authorship is their bread of life:—"The right of publishing this book in the United States having been liberally purchased by Mr. James Miller, it is hoped that there will be no interference with the same." The very title of the volume: "Last Poems," is full of tenderest pathos, which repeats itself in "The Last Translation," and the "Last Poem." This last poem tells of the home of the songstress's latest dreams and aspirations. Its theme is "*The North and the South,*" and the poet exclaims:—

"Oh for the skies that are softer and higher!"
    Sighed the North to the South;
"For the flowers that blaze, and the trees that aspire,
And the insects made of a song or a fire!"
    Sighed the North to the South.

"And oh, for a seer to discern the same!"
    Sighed the South to the North;
"For a poet's tongue of baptismal flame,
To call the tree or the flower by its name!"
    Sighed the South to the North.

The North sent therefore a man of men
    As a grace to the South:———

And who was he? Abraham Lincoln perhaps; or "the Young Napoleon;" or as the special Grace, the man of men sent by the North to the South, shall we guess the chivalrous General Butler?—It is in Rome, not Washington, that the poet penned her latest poem; it is Florence and Naples,—not New York and New Orleans,—that exchange their greetings in her song, in words fitter for a united Italy than for the New World States now seeking for lost brotherhood by fire and sword, as they again exclaim:—

"Give strenuous souls for belief and prayer,"
    Said the South to the North,

"That stand in the dark on the lowest stair,
While affirming of God, 'He is certainly there,'"
Said the South to the North.

It is with Italy in its aspirations for unity and freedom that all the poet's later thoughts were. It was there that her wedded life was past, with her strong, vigorous, if not seldom roughly felicitous poet-husband, Robert Browning. There her Tuscan boy, the son of so illustrious a lineage, saw the light, under sunnier skies than England knows: though England will not the less lovingly watch the future of this child of hope. It is a pleasant story told of the Italian street-beggars who walk through Via Maggio under the windows of Casa Guidi, that they always spoke of our English poetess, while living in that house, the name of which she has linked with her prophetic song, not by her well-known English name, nor by any softer Italaian word, but simply and touchingly as "the mother of the beautiful child." This, as Tilton says, was pleasanter to that woman's ears than to

Hear the nations praising her far off.

Elizabeth Barrett, as is well known to every reader of her earlier verse, was a delicate, fragile, invalid, with a keenly sensitive poetic temperament, strung to acuter intensity of feeling by physical suffering; and this gives a certain tinge to all her verse. In her "Vision of the Poets," she beholds the

Poets true
Who died for beauty, as martyrs do
For truth—the ends being scarcely two;

and a favourite sentiment of Shelley's reappears in many forms in her verse, that poets

learn in suffering
What they teach in song.

To her dog Flush, after contrasting the sportive graces of others of his race, she exclaims:—

But of thee it shall be said,
This dog watched beside a bed
Day and night unweary,—
Watched within a curtained room,
Where no sunbeam brake the gloom
Round the sick and dreary.

And again, tenderly and touchingly, in her "Sleeping and Watching," she apostrophises the child just fallen asleep with his playthings in his tiny hands:—

And God knows, who sees us twain,
Child at childish leisure,
I am near as tired of pain,
As you seem of pleasure.

This union of the suffering woman and the agonising poet-seer, gives a tone to all her verse; and though her fond aspirations were mingled with bright anticipations in her Italian sympathies, when the happy wife and mother looked forth from a sunny present into a more hopeful future, yet her latest Italian poems still thrill from the same treble chord; and she seems ever to have felt what finds expression in one of her latest snatches, where she asks and answers:—

What's the best thing in the world?
—Something out of it, I think.

In "The Forced Recruit," the poetess sings in sad tenderness of the nameless Venetian conscript forced into the Austrian ranks, and perishing by his own Italian brothers' hands at Solferino, his unloaded musket dropping from his dead grasp: and all the mother and the poet blend in the verses she puts into the mouth of Laura Savio, of Turin, an Italian poetess and patriot, whose two sons perished at Ancona and Gæta. It is from such mingling elements of the woman and the poet that we trace the vein of thought which runs through the following fine allegory of the making of such a songstress:—

"A MUSICAL INSTRUMENT.

"What was he doing, the great god Pan,
Down in the reeds by the river?
Spreading ruin and scattering ban,
Splashing and paddling with hoofs of a goat,
And breaking the golden lilies afloat
With the dragon-fly on the river.

"He tore out a reed, the great god Pan,
From the deep cool bed of the river:
The limpid water turbidly ran,
And the broken lilies a-dying lay,
And the dragon-fly had fled away,
Ere he brought it out of the river.

"High on the shore sat the great god Pan,
While turbidly flowed the river;
And hacked and hewed, as a great god can,
With his hard bleak steel at the patient reed,
Till there was not a sign of a leaf indeed
To prove it fresh from the river.

"He cut it short, did the great god Pan,
(How tall it stood in the river!)
Then drew the pith, like the heart of a man,
Steadily from the outside ring,
And notched the poor, dry, empty thing
In holes, as he sate by the river.

"'This is the way, laughed the great god Pan,
(Laughed while he sat by the river),
The only way, since gods began
To make sweet music, they could succeed.'
Then, dropping his mouth to a hole in the reed,
He blew in power by the river.

"Sweet, sweet, sweet, O Pan!
Piercing sweet by the river!
Blinding sweet, O great god Pan!
The sun on the hill forgot to die,
And the lilies revived, and the dragon-fly
Came back to dream on the river.

"Yet half a beast is the great god Pan,
To laugh as he sits by the river,
Making a poet out of a man:
The true gods sigh for the cost and pain,
For the reed which grows never more again
As a reed with the reeds in the river."

For fourteen years our tender yet masculine English poetess has dwelt by the banks of the Arno, under bluer, sunnier skies than smile above her earlier English home. From Casa Guidi's Florentine windows she looked forth on a new world; and from Casa Guidi's portal she has at length been borne forth to her grave: another English poet to mingle her ashes with the classic soil, which Chaucer and Milton trod; where Byron lingered, and the veteran Landor still courts the shade under southern vines; where the graves of Keats and Shelley give repose to the once o'erburdened tenements of clay; and where Robert Browning, the strange, vigorous poet of "Men and Women," has found himself more at home, than in the land to which he turned for his poet-bride, and for which still he writes in mother tongue his English verse. D. W.

A Manual of Botanic Terms. By M. C. Cooke, author of "A Manual of Structural Botany," &c. London: Robert Hardwicke, 192, Piccadilly.

We can see the utility of a complete dictionary of botanical terms, which should explain as to its meaning and derivation every term employed by every writer deserving of notice, and should at the same time attempt to pronounce judgment as to the necessity of each, its fitness for its purpose, and the proper selection to be made amongst equivalent terms; but we can hardly admit the usefulness of such a work as that before us, all terms—the understanding of which is required for ordinary purposes—being explained in nearly every introductory botanical book; and the most natural effect of such an attempt as our author's being to bring before beginners in the study, to their no small discouragement, a mass of needless (often repulsive) terms which would, with great benefit to science, be consigned to oblivion.

Mr. Cooke considers his manual as fitted for the use of such of the operative classes as are cultivating the study of botany. Certainly he has avoided frightening those who have not had a classical education by the sight of Greek letters, having printed his Greek words in English characters, which may be a small assistance to some; but he has made no attempt to simplify the terminology, and we take the mere bringing together in an elementary work of so many harsh and useless terms, to be no small evil. We observe instances in which the explanations given are erroneous or unsatisfactory, as where *actinenchyma* (a needless term) is said to mean "the cellular tissue of medullary rays," to which it would be improperly applied,—the true meaning, "stellate cellular tissue" being added as if equivalent; and *pistil,* of which the explanation given, "the female organ of flowering plants," is utterly vague; and again, *Gynoecium,* which is said to mean "the pistil and its appendages." We refer to *carpel,* and find it explained, "one of the modified leaves composing a pistil." Differing from some recent authorities, we hold it to be very certain that Linnæus did not employ *pistil* as a general term for all the parts (modified leaves) which form the inner circle of the flower, and are called female organs; but either not recognizing, or not thinking it necessary to notice, the composite character of a syncarpous fruit, he equally called the whole of such fruit, and the separate carpels of the apocarpous fruit, pistils; in case of partial coherence counting one or several pistils, accordingly as the styles were separate or combined. With this view, we conclude that the term "pistil" should now only be used in connection with the Linnæan artificial system. Gynoecium we take to be the proper collective term for the whole of the carpels, one or many, as the case may be,—just as corolla expresses the whole of the petals, and androecium the whole of the stamens; but we believe no correct botanical writer would employ gynoecium to include any part occasionally connected with the carpels, but really not belonging to their circle; nor is it correct to describe a carpel as part of a pistil, which so often means a single carpel: it should have been explained, "one of the modified leaves composing the gynoecium;" or better, perhaps, "an organ formed from a modified leaf in the interior of a flower, of which the lower portion is ovuliferous, the middle portion (when distinctly present called the *style*), serves to elevate the glandular extremity, called the *stigma*, through which the pollen acts upon the ovules."

The useless terms which Mr. Cooke has preserved are in our opinion very numerous. Thus we take from the few first pages, *alabastrus*, *amphisarca*, *angienchyma*, *anthocarpous*, *anthodium*, *atractenchyma*. What these words mean could be better expressed in plain ordinary English. They are only a burden to the science; and it is doing an injury to press them on the attention of ordinary students, amongst whom may be found those who will think it a sign of knowledge and skill to use them.

Mr. Cooke's book is prettily got up, and the illustrations are good and useful of their kind; but we cannot say that we think it judicious, or that it supplies a real want of any class of students. We cannot, therefore, bestow upon it any strong recommendation.

W. H.

Descriptive Catalogue of a Collection of the Economic Minerals of Canada, and of its Crystalline Rocks. Sent to the London International Exhibition for 1862.

This catalogue is an admirable work, not merely serving the purpose of a guide of the most useful kind to the collection in the exhibition, but being also a most convenient permanent record of the economic minerals of Canada, and the principal and best known stations in which they occur. The arrangement has reference to the uses of the objects, and is exceedingly well-fitted to enable practical men to ascertain where what they may want is to be found. The following are the heads under which the mineral products are arranged; and the notes, of which we shall give a specimen or two, give information scientific as well as practical, useful, and precisely of the kind, we should suppose, which would be found most valuable.

1. Metals and their Ores.
2. Minerals applicable to Chemical Manufactures.
3. Refractory Minerals (for resisting fire).
4. Minerals applicable to Common and Decorative Construction.
5. Grinding and Polishing Minerals.
6. Mineral Manures.
7. Mineral Paints.
8. Minerals applicable to the Fine Arts.
9. Minerals applicable to Jewellery.
10. Miscellaneous Minerals.

The following is the note on the Bruce mines, Lake Huron:—

"2. Bruce Mines, Lake Huron............. *Montreal Mining Co., Montreal.*
"*a.* Yellow and variegated sulphuretes of copper, from the lode.
"*b.* " " " rough dressed.
"*c.* " " " jigged.
"*d.* Rough waste from jigging on copper bottom sleeves.
"*e.* Plans of the mine, by Mr. C. H. Davie.

"At the Bruce mines, a group of lodes traverses the location in a north-westward direction, intersecting a thick mass of interstratified greenstone trap. The strata here present an anticlinal form, the lodes running along the crown of it. All of the lodes contain more or less copper ore, which is disseminated in a gangue of quartz. The main lode, which is worked with another of about the same thickness, is, on an average, from two to four feet wide. In a careful examination made in 1848, about 3000 square fathoms of these lodes were computed to contain about 6½ per cent. of copper. The quantity of ore obtained from the mine, since its opening in 1847, is stated to be about 9000 tons of eighteen per cent. The quantity obtained in 1861 was 472 tons of seventeen per cent. The deepest working is fifty fathoms from the surface. The number of men employed is thirty-four. Smelting furnaces, on the reverberatory principle, were erected at the mine in 1853; the fuel used in these was bituminous coal imported from Cleveland; but after a trial of three years, the Company themselves ceased smelting, and subsequently leased their smelting works to Mr. H. R. Fletcher. At present, the ores are in part sent to the Baltimore market, and in part to the United Kingdom.—*Huronian.*"

We next give a few notes on marbles, a subject of great and increasing interest:—

" 1. Arnprior........... .... *Geological Survey.*

" *a*. Striped light and dark grey marble, large pattern.
" *b*. " " " " small patern.
" *c*. " " " " cut across the beds.

" At the mouth of the Madawaska, in McNab, a great extent of crystalline limestone is marked by grey bands, sometimes narrower, and sometimes wider, running in the direction of the original bedding, and producing, where there are no corrugations in the layers, a regularly barred or striped pattern. When the beds are wrinkled, there results a pattern something like that of a curly grained wood. The colours are various shades of dark and light grey, intermingled with white. These arise from a greater or less amount of graphite, which is intimately mixed with the limestone. The granular texture of the stone is somewhat coarse, but it takes a good polish, and gives a pleasing marble. Mr. W. Knowles has opened a quarry in limestone of this description at Arnprior, and erected a mill for the purpose of sawing and polishing it for chimney pieces, monuments and other objects. A monument of it has been erected in the Mount Royal cemetery.—*Laurentian.*

" 5. St. Armand.......................... *C. R. Cheeseman, Phillipsburg.*

" *a*. White marble.
" *b*. White "
" *c*. White " clouded with pale green.
" *d*. Dove-grey marble, marked with white.

" The marbles, of which Mr. Cheeseman exhibits specimens, occur in great abundance in the immediate vicinity of Phillipsburg, on Lake Champlain. They are all easily cut, and take a good polish. Should a railway, which is projected between St. Johns and St. Albans, be carried into operation, it is probable there would be some demand for the stone. No quarries have been opened on any of the beds, and these specimens are taken from surfaces that have long been exposed to the influence of the weather.—*Quebec group, Lower Silurian.*

" 6. St. Armand...................... .... *Geological Survey.*

" *a*. Black marble.

" About a mile and-a-half south-eastward from Phillipsburgh, there occurs a black marble, similar to this specimen. The beds dip to the eastward at an angle of about twelve degrees; a quarry was many years ago opened on one of them, which has a considerable thickness. The stone was exported to the United States, and much esteemed in New York, but the opening of quarries of black marble at Glen's Falls, where there is a great water-power, interfered with the demand, and caused the enterprise to be abandoned.—*Quebec group, Lower Silurian.*"

Another most important product is roofing slate. What follows relates to the Walton Quarry. Specimens from other localities are exhibited by the geological survey.

"1. Walton Quarry, Melbourne, lot 22, range 6.... *Benjamin Walton, Montreal.*

"*a.* Specimens of roofing slate.

"This band of slate is in immediate contact with the summit of the serpentine. It has a breadth of one-third of a mile, and dips about S. E.<80°. Mr. Walton commenced opening a quarry upon it in 1860, and found it necessary, in order to gain access to the slate, to make a tunnel through a part of the serpentine. To complete this, and to expose a sufficient face in the slate to pursue profitable working, has required two years of time, and $30,000 of expenditure The face now exposed has a height of seventy-five feet; but the band of slate crosses the St. Francis and the fall from the position where the quarry is now worked, to the level of the stream, is upwards of 400 feet, the distance being one and-a-half miles, so that by commencing an open cutting on the slate, at the level of the stream, a much greater exposure can be ultimately attained. Up to a comparatively recent period, the usual coverings of houses in Canada have been wooden shingles, galvanized iron or tin-plate, but so many destructive fires have occurred from the use of the first of these, that they are now interdicted in all large towns. Slate, as a covering, costs about one-third more than shingles, but one-half less than tin, and one-third less than galvanized iron.

"The quarry has now been in operation since the spring of 1861; 2000 squares have been sold, and some of the slates have been sent to a distance of 550 miles from the quarry; a quantity of them having been purchased for Sarnia on the River St. Clair. To show that slate, as a covering, is well adapted to resist the influences of a Canadian climate, it may be here stated that slates from Angers in France, have been exposed on the roof of the Seminary building on the corner of Notre Dame and St. François Xavier Streets, in Montreal, for upwards of 100 years, without any perceptible deterioration. The strong resemblance between these and the slates of Melbourne, as well as those from Bangor in Wales, may be seen in the following comparative analyses by Mr. T. Sterry Hunt:—

	Welsh.	French.	Melbourne.
Silica	60.50	57.00	64.20
Alumina	19.70	20.10	16.80
Protoxyd of Iron	7.83	10.98	4.23
Lime	1.12	1.23	0.73
Magnesia	2.20	3.39	3.94
Potash	3.18	1.73	3.26
Soda	2.20	1.30	3.07
Water	3.30	4.40	3.40
	100.03	100.13	99.63

The proximity of the serpentine leaves no doubt as to the geological horizon of these slates.—*Quebec Group, Lower Silurian.*

These quotations will sufficiently illustrate the character of the information afforded. Its extent and variety can only be understood by an examination of the work itself. The descriptive catalogue of a collection of the crystalline rocks of Canada is the work of T. Sterry Hunt, F.R.S. They are arranged as belonging—1st, to the Laurentian system; 2ndly, to the Huronian series; 3rdly, to the Silurian series; and 4thly, intrusive rocks—under each of which heads the particular substances are enumerated, with their localities and very valuable remarks. The whole work is a credit to the country, and a model in its class, as the fine collection of which it gives an account has secured universal admiration amidst the wonders of the Great Exhibition, and will direct the thoughts of many intelligent men to one portion of the varied riches of our country.

W. H.

TRANSLATIONS AND SELECTED ARTICLES.

RESEARCHES RESPECTING THE AFFINITIES OF STRUCTURE IN THE STEMS OF PLANTS BELONGING TO THE GROUP "CYCLOSPERMEÆ."

BY M. REGNAULT.

Translated from "Annales des Sciences Naturalles," IVeme Serie, Botanique, Tome xiv. *No.* 2, *p.* 73.*

The knowledge of the principles upon which the classification of vegetables must be founded, obtained up to the close of the last century, has not merely led to a more methodical and more natural arrangement, but has given to all parts of the science a vigorous impulse, by clearly indicating the road which must be followed in further researches.

In truth, as the system was understood by its author, the natural classification of vegetables should be founded on the consideration of all the characters they furnish. Hence it might be justly said, that a perfect classification would in a manner represent the whole science,

* Our translation includes only the introductory remarks of the learned author, which contain important general principles. His detailed observations, though highly interesting and valuable, our space will at present only permit us to refer to.

since it must have, as its indispensable foundation, a complete knowledge of the relations which unite plants one to another. Consequently, classification must connect itself with all the branches of botanical science. Organography, or the description of the external characters of the parts of plants, without doubt supplies it with the distinctive marks most easily determinable, and on that account most frequently employed; but Teratology [the description and explanation of abnormal developments], Organogeny [the account of the origin and earliest condition of organs], and Vegetable anatomy, should also come to its aid, and supply it with useful materials.*

In 1810, at the commencement of the present century, Mirbel proclaimed anew this great principle, which seemed to have been already forgotten, in making an application of it to the study of the natural family of the Labiatæ [*Ord.* Lamiaceæ].

This botanist at that time thus expressed himself (*Annales du Museum d'Histoire Naturalle*, vol. xv.): "The only means of perfecting our knowledge of natural families, is to unite with the study of botanical characters that of all anatomical and physiological facts. I have said that the importance of characters depends much less on their constancy than on the necessity of their co-existence. I have affirmed that the greater number of botanists, after having too long much neglected the organs of reproduction, have committed an error almost equally great, in pretending that these organs should alone furnish the principal bases of a natural classification."

We should, then, apply ourselves to gain a knowledge of vegetables at once, in every part of their organization: and on this view it may be truly said, that among the vast labours undertaken during the present century, by the eminent men who have devoted themselves to the study of plants, there is not one which does not directly assist classification; ; which, however, can never be absolutely perfect until we know all plants, or at least some types of each family, as well viewed in respect to the organogeny of the flower and fruit, and the anatomical structure, as in respect to a merely organographic description.

Science is as yet very far from having reached this result. Great labours have, however, been accomplished during the present century,

* It would perhaps be more correct to regard Teratology and Organogeny as only auxiliary departments of Organography, assisting us to form a juster view of the real nature, origin, and position of certain parts.—*Translator.*

and already they have borne their fruits. They have especially promoted the advancement of two branches of botany, which the imperfection of optical instruments had previously left in a great comparative inferiority: organogeny and anatomy. Researches in organogeny have been numerous and important. Pursued with ardour and perseverance by such botanists as Mirbel, Robert Brown, Payer, Hugo Mohl, Brongniart, Schleiden, and Duchartres, they have caused to be recognised much more clearly than before, the general symmetry of the flower; that is to say, the disposition in relation to each other of the different parts that compose it. They have given the key to a crowd of apparent anomalies, bringing back, for example, to the ordinary type of monocotyledonous vegetables, the flowers, at first view so singular, of the Canneæ [Marantaceæ and Zingiberacene] orchidaceæ, &c. They have shown the real resemblance of plants, which their strikingly different forms seemed to separate widely; and have confirmed, in a very great number of cases, divisions previously established by botanists, as well as justified modifications of a number of others, by exhibiting natural affinities more perfectly. And finally, they have completely justified the celebrated saying which Gœthe had placed at the head of his works: "*To see the origin of things is the best means of explaining them.*"

Anatomy ought also to afford precious assistance to natural classification. It is already very long since Mirbel expressed the opinion that the study of the comparative structure of vegetables might afford sufficient characters for limiting natural groups. He even believed that this truth might be generalised and applied to the vegetable kingdom as a whole. Such a conclusion was then, and would still be at this time, at least premature. Further researches can alone inform us to what extent we can rely on the constancy of anatomical characters, and on their value in respect to classification. Nevertheless we may well wonder, as M. Chatin expressed it in 1840 (*Appl. de l'anatomie Comp. Vegetale a la classification, these* 1840), "at the feeble progress made by vegetable comparative anatomy, and the small amount of utility hitherto derived from it in respect to natural arrangement; whilst in Zoology, anatomy serves as the solid basis of the labours of all classifiers."

However, if the degree of importance which ought to be attributed to comparative anatomy is not yet well settled, numerous researches on the subject already exist; and we may affirm, that hitherto nothing has occurred which tends to prove that the structure of vegetables has not a general correspondence with their natural affinities. Of this kind we find clear characters for the three great sub-kingdoms. In each of them the plants have an internal structure very different from that which belongs to the adjoining sub-kingdom, and are sufficiently distinguishable by their anatomical construction.

One of these sub-kingdoms, that which occupies the lowest place, has been examined with great care in reference to this matter. All inquiries have confirmed the principle of the importance of anatomy. It is by a character exclusively anatomical that the great group of the Acotyledones [flowerless plants, or Cryptogamia] has been divided into two secondary groups—Vascular and cellular plants.*

The importance of anatomy by no means appears less, if in each of these sub-divisions we examine the mutual relations of classes and families. The structure of the Horse-tails, Ferns, Lycopodiaceæ, and Marsiliaceæ, does not less certainly than characters drawn from their vegetation and reproduction distinguish these orders one from another.

The same may be said still more decisively of the entirely cellular plants whose extreme simplicity causes the essential characters upon which their most important groups are founded, to be often no more than anotomical characters, implying important modifications of organic functions.

In the sub-kingdom Monocotyledoneæ, it is a very long time since Daubenton and Desfontaines (*Memoires de l'Ist.* an vii.), as the result of numerous examinations of different palms, pointed out as common to the whole sub-kingdom, an anatomical disposition of parts alogether peculiar, and contrary to the internal structure of Dicotyledoneæ. According to these writers the stem of a woody Monocotyledonous plant is of less close texture towards its centre, because at

* Many of our readers are probably more accustomed to see the cryptogamic sub-kingdom of plants divided at once, as we ourselves recommend, into three classes, which may be named *Acrogens*, *Anogens*, and *Thallogens*. In the first there is always more or less approach to a vascular system, though never either all the kinds of vessels, or any similar arrangement of them, which are found in higher plants, and the true reproductive organs are found in a prothallus. In the second, with a structure entirely cellular, there is always more or less distinction of stem and foliage, the green colour of vegetation is retained, and the archegonia are produced on some point of the plant itself—not on a prothallus. In the third the stem and leaves are more or less completely confounded together, other colours are substituted for the usual vegetable green, and lower reproductive types prevail. It is obvious that this difference of method does not affect the author's argument.

that part are maintained constantly vegetation and the formation of new fibres [vascular bundles], which push outwards continually the previously existing fibres, "hence these latter are at length so closely packed against each other that they appear no longer to yield to the effort of vegetation which would press them out to the circumference." Adopted by botanists in general, this theory received an important consecration when De Candolle founded on this character his division of [the higher] vegetables into Endogens and Exogens. Notwithstanding that the labours of MM. Mohl, Unger, Mirbel, &c., have since more than sufficiently demonstrated that these plants are not really Endogenous, there remains a fundamental difference between the structure of the stems of the two sub-kingdoms of Cotyledonous plants.

The anatomical researches in relation to Monocotyledonous plants, although already very numerous, have not extended to a sufficient variety of families to enable us to form a precise judgment on the assistance which anatomical knowledge might afford in respect to the division of the sub-kingdom into classes and families. We know, however, that in this view the Liliaceæ, especially *Dracaena* and *Cordyline*, differ from the Palms, which have generally been assumed as the type. We also know that the fistulose culm of Graminaceæ offers remarkable peculiarities in the disposition of its fibres, especially in respect to their crossing one another at the knot. Finally, it has been more recently ascertained that the Orchidaceæ, especially in their appendicular parts, have anatomical elements exhibiting a special structure.

The immense sub-kingdom of Dicotyledonous plants has given occasion to a much greater number of researches, of which we can already, to a certain extent, appreciate the results. It is no longer permitted to a botanist to consider all the plants as having identical interior arrangements, and to give, for example, the stems of certain Amentaceæ as a type to which they all conform. It is, on the contrary, extremely probable that these stems, whilst preserving something of a common type, and presenting some characters which belong to the whole sub-kingdom, display in their structure, according to the families to which they belong, extensive variations both in the intimate structure of the constituent elements taken separately, and in the arrangement in relation to each other of these elements so as to constitute the complete vegetable.

But, however numerous, the researches of this kind made up to the present time still amount to very little, if we compare them with the immensity of the field which remains to be explored; and yet they already tend to shew an evident and remarkable relation between anatomical structure and classification.

[The author then enters upon the peculiarities of internal structure belonging to the Gymnosperms, and points out the error of those who have supposed the same peculiarities to occur in any other tribes. He goes on to sketch the history of anatomical research in relation to the particular families, concluding with a reference to the important work, still in progress, of M. Chatin. We conclude our extract with a few paragraphs through which M. Regnault approaches his own special investigations, upon the particulars of which it is out of our power now to enter.]

The structure of stems may vary much, not only according to the position of the plant in a natural classification, but also according to the conditions of vegetation in which it lives, the medium in which it grows, &c. Those stems which unite with a ligneous substance the property of climbing, have in general a structure modified in reference to this particular function; and if some families, as that of Lardisabalaceæ, long since studied by M. Decaisne (*Archives du Museum d' Histoire Naturelle*, 1839) are made up entirely of climbers, there are many others, such as Bignoniaceæ, Sapindaceæ, Malpighiaceæ, Convolvulaceæ, which, whilst they have woody climbing genera, contain also plants capable of supporting themselves independently. Long since, Adrien de Jussieu drew attention to the fact (*Dict. d'histoire Naturelle*, xii. 432), that in these variously constructed plants belonging to the same family, the essential anatomical characters remain unchanged, equally in the climbing species and the others; only in the former they unite themselves with other characters common to all climbers, and a practical eye will always recognise to which of the above-named families a section of a trunk belongs which is brought under his notice. Comparative anatomy must here, then, according to A. de Jussieu, have a double value, being able at the same time to make us acquainted with the natural group to which the plant belongs, and to indicate to a certain extent the mode of growth of the species. Numerous observations are evidently necessary before the facts of vegetable anatomy are sufficiently known for us to be able to give them so precise a signification. It is even probable that the facts so positively affirmed by A. de Jussieu, would need, from a reasonable regard to the interest attaching to them, to be confirmed by new observations; but it is possible that the rapid progress made may enable science to bring forward other similar results.

Such progress can only be the fruit of prolonged study, carried out with care and patience, and applied to a great number of distinct plants. The life of a single botanist would doubtless be insufficient to conduct such inquiries to a satisfactory conclusion; but the united efforts of many labourers may hasten the solution of the problem. I have desired by these researches to bring my stone to the common edifice. I have no doubt whatever that complementary studies, which can only be the work of time, will succeed in demonstrating in this purely anatomical portion of the history of vegetables, the same principle of which the application to external forms, and to the general constitution of all organised bodies, is the just subject of our admiration :—*Variety within unity*, not a blind and unregulated variety, but a variety controlled by laws, following in general in respect to the appearance of the different forms which it originates, the natural relations of objects.

There is a group of vegetables, which, whilst sufficiently differing among themselves in the arrangement of the flower and fruit, in the vegetative organs, and in a great number of important characters, nevertheless present certain points of agreement which have caused them to be brought together by a great number of botanists. They are Dicotyledonous plants, whose seed generally contains a copious farinaceous albumen, and an embryo, in most cases considerably developed, surrounding the albumen, contrary to the more usual arrangement: in consequence of which singular structure, botanists have united them under the name of *Cyclospermeæ*.

The knowledge of the internal structure of these plants cannot fail to be very precious for the determination of the value of anatomy as an element of classification. Will all these plants be found to offer some general anatomical characters corresponding with their union in a natural group, along with certain special characters belonging to the plants which constitute each family? Answered in the affirmative, this question, besides the interest directly attaching to the knowledge of these facts, would tend to confirm the opinion of Mirbel on the relations of internal structure with other botanical characters. . . . .

W. H.

SCIENTIFIC AND LITERARY NOTES.

ZOOLOGY.

The following note, taken from the "Proceedings of the Zoological Society, December 10th, 1861," and published in the "Annals and Magazine of Natural History for April, 1862," has a peculiar interest for Canadian Zoologists at the present time. During last winter, several specimens of *Anas glocitans* or *Anas bimaculata* were procured at the St. Clair flats. One of these is in the possession of Geo. W. Allan, Esq., M.L.C.; another was presented to the Museum of the University of Toronto, by Mr. Barber, from whom a communication on the subject to the Canadian Institute was also expected. From several characters of the birds examined by us; from the amount of variation in the invividual specimens; and from the strongly expressed opinion of several experienced sportsmen, who had on various occasions seen examples, we were inclined to conclude that the supposed species is a hybrid, one of the parents being the *Anas boschas*. This view is supported by Mr. Newton's note; yet for our complete satisfaction, further information on the subject is desirable.

ON A HYBRID DUCK.—BY ALFRED NEWTON, M.A., F.L.S., F.Z.S.

I am indebted to the kindness of my friend, Mr. Newcome, for the opportunity of exhibiting to the Society a specimen of a fine hybrid duck, beautifully mounted by Mr. Ellis, of Swaffham, which presents several points of interest.

This bird (a male) was bred by Mr. Durham, of Bremley Grange, near Ripon, from a male widgeon (*Mareca Penelope*, Selby) and a female which was a cross between the common wild duck (*Anas boschas*, Linn.) and an ordinary farmyard duck. It was sent to Mr. Newcome by the intelligent gamekeeper at Hornby Castle, Mr. Anthony Savage, from whom I learn that Mr. Durham has since bred several other hybrids from the same male widgeon and a female of the domesticated variety of *Anas boschas* known as the "Grey Call Duck." Of these hybrids, Mr. Savage informs me that he sent a pair to Mr. Grantley Berkeley, and another pair to Mr. John Hancock.

No detailed notice of the particular cross I now exhibit has, to my knowledge, been hitherto published, though Mr. Yarrell, in the last edition of his work ('B. B.' ed. 3, iii. p. 276) mentions the fact as having occurred; and my friend, M. de Selys-Longchamps, who has, it is well known, devoted especial attention to the subject, informed me about two years ago that he was aware of other instances of such a hybrid. According to the views of the last-named accurate observer, the *Anas bimaculata* of Keyserling and Blasius*—the *Anas glocitans* of Gmelin (but not of Pallas)—is the result of this cross; and Mr.

* Several writers assign the authority of Pennant for the trivial name "*bimaculata*." I cannot trace it further back than the "Wirbelthiere Europas" of the naturalists I have mentioned. There is no question about the *Anas glocitans* of Pallas being a good species, but I do not know any recorded instance of its occurrence in Europe.

Berkeley has also expressed a similar opinion (*Field*, March 16, 1861). With the greatest deference to these authorities, my own idea is that the birds so denominated have descended from the wild duck (*Anas boschas*, Linn.) and the teal (*Querquedula crecca*, Steph.), as has already been suggested by Mr. Tomes and Mr. Bartlett (*Zoologist*, p. 1698); and I have arrived at this conclusion not only from repeated examinations of the specimens described by Mr. Vigors (Linn. Trans. xiv. p. 559), which are now in the British Museum, but also from having seen several other birds of the same kind in different collections.

The principal distinctions observable between the subject of the present notice and the so-called *Anas bimaculata* are in the greater size of the former, and in the comparative obsoleteness of the dark patch which, in that supposed species, separates the light-coloured spots on the sides of the head. In the bird I now submit to your notice, this patch is reduced to a mere line, scarcely perceptible until looked for. The breast also wants the well-defined dark spots which are characteristic of the hybrid known as the "Bimaculated Duck."

MISCELLANEOUS.

We copy from a recent number of a very promising new scientific periodical, *The Popular Science Review*, a notice of the "Fiftieth Anniversary of the Liverpool Literary and Philosophical Society," one of the oldest and most important of its class.

THE FIFTIETH ANNIVERSARY OF THE LIVERPOOL LITERARY AND PHILOSOPHICAL SOCIETY.

Liverpool possessed a Literary and Philosophical Society in 1790; not the one which has just celebrated its fiftieth natal day, but another, with which was connected the name of Edward Rushton, the founder of the "School for the Blind," an institution which still calls forth the admiration of all strangers who visit Liverpool.

The present Literary and Philosophical Society was founded on the 13th March, 1812, when fifty-six gentlemen enrolled themselves as members; but it was not until December, 1817, that the Society rendered its name permanent by the election as member, and on the same evening as its president, of William Roscoe.

Here is Mr. Roscoe's letter to the secretary, accepting office :—

"My Dear Sir,—May I beg that you will take an early opportunity this evening to express my respectful thanks to the Literary and Philosophical Society for the honour they have done me, and which you so obligingly announced to me, in admitting me a member and nominating me to the distinguished situation of their president,—a situation the duties of which I shall be happy to discharge to the utmost of my power. If it will not be informal for me to make my appearance amongst you this evening, I will be in attendance in the ante-room, and will wait their pleasure.

"I am, my dear Sir, most faithfully yours,

"Wm. Roscoe."

Mr. Roscoe was introduced at the evening meeting, the members rose to receive him, and he signed the laws.

Amongst the gentlemen known in literary and scientific circles, who have since held office as presidents, we may mention Dr. Traill, J. B. Yates, F.S.A., Dr. Booth, F.R.S.. Dr. Dickenson, F.R.S. The present occupier of the presidential chair, the Rev. H. H. Higgius, is most zealous in his encouragement of science, being an active vice-president of the Naturalist's Field Club; as is also Dr. C. Collingwood, the secretary of the Literary Society,—a gentleman well known in the scientific world for his contributions to natural history.

It is no wonder that a society which, as our readers will perceive, has acquired more than a local reputation in the annals of science and literature, should seek to give some *èclat* to the silver year of its existence; and we find accordingly, that under its auspices the town-hall of Liverpool was thronged on the 13th of last month with a concourse of nearly 1,500 ladies and gentlemen.

The "west drawing-room" was devoted to the exhibition of philosophical instruments, electrical and other experiments, and telegraphic printing; the "east drawing-room" to books, autographs, and manuscripts; the most conspicuous of the last-named being one of Roscoe's, of the Life of Leo X. The remaining saloons were devoted to the arts, to music, and painting; and the council-chamber, &c., to refreshments.

The music consisted chiefly of part-songs, beautifully executed by the German "Lieder Tafel." The paintings in oil and water-colours, which were the property of the merchants and gentry in and around Liverpool, were collected and well hung under the superintendence of Arnold B[illegible]son, Esq., a patron of art in the town.

The Rev. President delivered a short address in one of the saloons during the evening, in which he sketched the history ef the Society; and his place was then occupied by the only surviving founder present, the venerable and much-esteemed William Rathbone, the friend of Roscoe, as well as of all that is good and useful in Liverpool. He addressed those around him as his "children," and called up old associations in the minds of many who had lived with him when science was a heresy. After these addresses the concert followed, and brought the proceedings of the evening to a close.

Such meetings as this, and others, of which we hope to be able to record a goodly and increasing number in each new issue, are calculated to place science in its true light, not as a dry study, hemmed in by obstacles insurmountable by the populace, but as one of the chief occupations that render life useful and agreeable.

CANADIAN INSTITUTE.

Session—1861-62.

FIFTH ORDINARY MEETING—*25th January*, 1862.

Hon. J. H. Hagarty, President, in the Chair.

I. The Rev. Professor Hatch, M.A., read a paper entitled "The Physical Theory of Heracleitus."

SIXTH ORDINARY MEETING—*1st February*, 1862.

Hon. J. H. HAGARTY, President, in the Chair.

I. *The following donation to the Library was announced, and the special thanks of the Institute voted to the Donor:*

From the HON. G. W. ALLAN, M.L.C.

Gould's Monograph of the Trochilidæ, five parts, which completes the work.

II. Rev. W. H. Stewart, Guelph, proposed as a member of the Institute at the last meeting, was ballotted for and duly elected.

III. *The following Papers were read:*

1. By Professor D. Wilson, LL.D.:
"On apparent Traces of Works of Art in the American Drift."
2. By T. C. Keefer, Esq., Civil Engineer:
"On Ice Phenomena."

SEVENTH ORDINARY MEETING—*8th February*, 1862.

Hon. J. H. HAGARTY, President, in the Chair.

I. *The following Gentlemen were elected members:*

SAMUEL C. DUNCAN CLARKE, Esq., Toronto.
THOMAS WELLS, Esq., Toronto.

II. *The following Papers were read:*

1. By Professor Croft, D.C.L.:
"On Toxicology, illustrating the application of Chemical Science in elucidating questions relative to poisoning cases in Jurisprudence."
2. By Rev. Professor W. Hincks, F.L.S.:
"Note on a Canadian Specimen of the Sula Bassana Solan Goose or Gannett."

EIGHTH ORDINARY MEETING—*15th February*, 1862.

Third Vice-President, SANDFORD FLEMING, Esq., C.E., in the Chair.

The meeting was adjourned to the next Saturday, on motion of P. Freeland, Esq., seconded by Dr. Morris.

NINTH ORDINARY MEETING—*22nd February*, 1862.

Hon. J. H. Hagarty, President, in the Chair.

I. *The following donation to the Library, received since last meeting, was announced by the Secretary, viz.:*

"The Bombay Magnetical and Meteorological Observations, for the year 1859."
The thanks of the Institute were ordered to be rendered for the above donation.

II. *The following papers were read:*

1. By Dr. Beverley R. Morris:
"On the habits of some water birds."
2. By Professor G. T. Kingston, M.A.:
"The Toronto Meteorological Report for 1861."

TENTH ORDINARY MEETING—*1st March*, 1862.

The First Vice-President, the Rev. Prof. G. C. IRVING, M.A., in the Chair.

I. *The following donation to the Library was announced, and the thanks of the Institute voted to the donor, J. D. Campbell, Esq.:*

"Doomsday Book; or, The Great Survey of England of William the Conqueror, relating to Cornwall. Fac-simile photo-zincographed by Her Majesty's command, at the Ordnance Survey Office, Southampton. Col. Sir Henry James, R.E., F.R.S., &c., director. 1861."

II. *The followidg Papers were read:*

1. By the Rev. Prof. Hatch, B.A.:
"A Sketch of the Pre-Socratic Philosophers."
2. By James Bovell, Esq., M.D.:
"Some recent Theories of Cell development, with Microscopical Illustrations."

ELEVENTH ORDINARY MEETING—*8th March*, 1862.

Hon. J. H. HAGARTY, President, in the Chair.

I. *The following Papers were read:*

1. By the Rev. G. P. Young, M.A.:
"Remarks on an argument of Dr. Whewell, against the claims of the Parmenides to be considered a genuine Dialogue of Plato."
2. By Prof. Wilson, LL.D.:
"On the aim of Shakespeare, in his Historical Dramas, as illustrated in his *King John*."

TWELFTH ORDINARY MEETING—*15th March*, 1862.

In the absence of the President and Vice-Presidents, Prof. WILSON, LL.D., was called to the chair.

I. *The following Paper was read:*

By Prof. Croft, D.C.L.:
"On the supposed existence of Benzole in Canadian Petroleum."

Prof. Chapman made a communication relative to the occurrence of the Phenomenon of Mock Suns, as observed by Mr. Clifford Thompson, P.L.S., near the mouth of the Muskoka River, in November last.

THIRTEENTH ORDINARY MEETING—*22nd March*, 1862.

In the absence of the President and Vice-Presidents, Prof. WILSON, LL.D., was called to the chair.

I. *The following gentleman was elected a member:*

F. E. DIXON, Esq., Toronto.

II. *The following donation for the Library was announced, and the thanks of the Institute voted to the donors, the Royal Society of Edinburgh:*

"Proceedings of Session 1860-61."
"Transactions of do." Vol. xxii. Part 3.

III. *The following papers were read:*

1. By Professor E. J. Chapman:

"Remarks on some recent Announcements and Discoveries in Natural Science."

2. By W. Ogden, M.D.:

"On an Atmospheric Cause of Disease."

FOURTEENTH ORDINARY MEETING—*29th March*, 1862.

Second Vice-President, T. C. KEEFER, Esq., C.E., in the Chair.

I. *The following Papers were read:*

1. By the Rev. Prof. G. P. Young, M.A.:

"Note on a Passage in the Euthypkro of Plato."

3. By the Rev. Prof. Hincks, F.L.S.:

"An Inquiry into the natural Laws which regulate the Interchange of Commodities between Individuals and Nations, and the effects of interference with them."

FIFTEENTH ORDINARY MEETING—*5th April*, 1862.

Hon. J. H. HAGARTY, President, in the Chair.

I. *The following Auditors were appointed:*

S. B. HARMAN, Esq.
G. WILSON, Esq.

II. *The following Papers were read:*

1. By the Rev. Prof. Hatch, B.A.:

"On the Relation of the Volscian Language to others of the Italian Family."

2. By Prof. Wilson:

"On the Influence of Mediæval Art on the subsequent forms of Literature."

The President stated that the Annual Converzazione would be held on the 24th instant.

SIXTEENTH ORDINARY MEETING.—*3rd May*, 1862.

First Vice-President, Rev. Prof. G. C. IRVING, M.A., in the Chair.

I. *The following Gentlemen were elected Members:*

GEORGE LANE REID, Esq., C.E., Hamilton.
WILLIAM BOULTBEE, Esq., C.E., Hamilton.

II. *The following donation to the Library was announced, and the thanks of the Institute voted to the donor, John Lovell, Esq., Montreal:*

"Catalogue of Economic Minerals of Canada transmitted to the International Exhibition."

III. *The following Papers were read:*

1. By Lieut. Ormsby, R.A.:

"On Modern English Guns."

2. By the Rev. Prof. Hatch, B.A.:

"On the Light which is thrown by the latest results of the Science of Language upon the Early History of Mankind."

MONTHLY METEOROLOGICAL REGISTER, AT THE PROVINCIAL MAGNETICAL OBSERVATORY, TORONTO, CANADA WEST—FEBRUARY, 1862.

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.				Excess of mean above Normal.	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	Result.	ME'N		
1	29.580	29.634	29.860	29.7035	28.7°	33.4°	17.6°	26.33°	+ 2.45°	.138	.126	.076	.109	.87	.66	.79	.76	S	W	W N W	N 89° W	0.6	11.0	4.0	4.83	5.01	...	Inp.
2	.980	30.023	—	—	16.8	24.1	—	—	—	.085	.107	—	—	.91	.82	—	—	W	W b N	Calm.	N 72 W	2.8	10.8	0.0	4.41	5.62	..	...
3	.951	29.711	.628	.7543	12.5	23.1	20.1	19.08	— 4.68	.067	.112	.091	.090	.88	.90	.85	.86	N E b N	E b S	N E b N	N 76 E	5.5	10.2	5.0	5.71	7.36	...	1.2
4	.759	.837	.952	.8612	17.6	24.1	20.1	20.53	— 3.15	.083	.107	.091	.096	.85	.82	.85	.86	N W b N	W	W N W	N 63 W	3.0	2.8	7.0	3.35	3.47	...	1.0
5	30.010	.888	.697	.8537	11.8	29.5	31.3	24.20	+ 0.62	.063	.113	.160	.116	.86	.69	.90	.84	Calm.	S E	E	S 72 E	0.0	4.0	6.2	3.95	4.18	...	...
6	29.432	.107	.366	.3088	32.4	35.2	35.3	34.58	+11.02	.169	.190	.139	.170	.91	.93	.67	.85	E	S E	W b N	N 76 W	2.2	2.0	25.8	9.18	13.39	0.125	0.5
7	.619	.715	.821	.7263	30.2	20.1	16.8	24.47	+ 1.03	.149	.118	.080	.109	.89	.73	.85	.81	W b N	N W b N	N b W	N 49 W	13.0	10.0	2.5	6.61	8.08	...	...
8	.823	.685	.633	.7082	13.2	16.1	15.0	14.90	— 8.47	.071	.081	.075	.077	.90	.90	.87	.90	N N E	E N E	Calm.	N 56 E	4.8	1.0	0.0	1.87	2.91	...	1.0
9	.522	.655	—	—	18.6	19.4	—	—	—	.083	.080	—	—	.83	.77	—	—	W b S	W N W	N W	N 80 W	15.5	12.0	1.5	8.98	9.21	...	0.4
10	.688	.561	.431	.5153	14.0	23.0	21.9	19.62	— 3.65	.075	.106	.084	.086	.91	.86	.71	.80	W N W	S W b S	S W	S 18 W	1.5	5.0	4.5	3.90	4.32	...	Inp.
11	.246	.080	.024	.1122	25.5	27.3	32.0	28.63	+ 5.37	.104	.139	.173	.142	.75	.94	.96	.89	S	S E b E	S b W	S 16 E	8.8	9.0	8.5	7.39	10.23	...	2.5
12	.237	.380	.585	.4178	30.2	32.0	27.7	29.42	+ 6.17	.157	.115	.135	.133	.93	.62	.89	.82	W S W	W b S	Calm.	S 86 W	9.0	15.0	0.0	5.27	6.92	...	0.2
13	.545	.510	.513	.5157	26.9	25.9	29.1	26.70	+ 3.45	.131	.120	.155	.131	.89	.86	.96	.90	E N E	E N E	S S W	N 38 E	6.4	5.0	3.5	2.89	6.23	...	1.5
14	.514	.670	.772	.6687	19.0	15.0	5.7	12.03	—11.23	.091	.057	.047	.061	.89	.65	.82	.77	N W b N	W N W	N	N 57 W	21.0	16.5	4.0	8.96	9.51	..	...
15	.742	.649	.571	.6497	—3.0	14.1	12.9	9.58	—13.67	.036	.043	.063	.051	.93	.52	.80	.75	Calm.	S W	W S W	S 67 W	0.0	12.5	14.8	10.93	11.49	...	...
16	.895	30.037	—	—	3.9	16.1	—	—	—	.045	.068	—	—	.86	.75	—	—	W b N	S S W	N N E	N 21 W	3.8	2.5	2.0	1.41	3.04	...	...
17	.909	29.729	.587	.7288	15.8	27.7	31.6	25.70	+ 2.35	.078	.135	.170	.132	.88	.89	.96	.92	N E b N	E N E	E S E	N 78 E	7.5	13.5	6.5	6.45	8.61	0.030	...
18	.532	.708	.891	.7263	33.4	35.2	29.5	32.83	+ 9.40	.188	.140	.121	.149	.98	.68	.74	.79	W S W	W b S	W b N	N 88 W	10.8	14.5	8.0	10.60	11.25	...	...
19	.863	.670	.364	.6100	24.8	29.8	25.5	26.52	+ 2.98	.112	.140	.133	.127	.84	.84	.96	.88	N b W	E N E	N E b N	N 38 E	6.5	12.4	16.5	11.32	13.06	...	8.0
20	.514	.730	.937	.7458	22.3	25.2	17.6	21.07	— 2.55	.115	.080	.088	.093	.96	.59	.92	.83	N W	N W b W	W	N 57 W	14.5	20.0	1.5	10.66	11.29	...	1.5
21	.943	.758	.546	.7383	10.7	29.5	21.2	21.42	— 2.32	.064	.113	.092	.094	.92	.69	.81	.81	W	S W b S	Calm.	S 45 W	1.5	1.8	0.0	1.23	2.38	...	Inp.
22	.521	.382	.362	.4092	25.2	33.4	30.2	29.72	+ 5.90	.122	.149	.157	.144	.90	.78	.93	.87	W b N	S b E	Calm.	S 38 E	1.0	3.0	0.0	0.47	1.52	...	...
23	.303	.199	—	—	28.8	35.6	—	—	—	.144	.187	—	—	.90	.89	—	—	N E b E	E	N E	N 59 E	4.0	3.4	1.0	3.48	4.19	...	2.0
24	.011	.479	.842	.4818	31.6	15.4	11.1	18.85	— 5.28	.170	.064	.060	.097	.96	.72	.83	.84	N b E	N W	N W b W	N 42 W	15.0	26.0	22.5	18.29	18.72	...	3.0
25	30.096	30.017	.864	.9825	—3.7	15.4	13.4	11.23	—13.10	.034	.077	.072	.067	.93	.87	.90	.88	N b W	S S W	N E	N 83 E	2.8	0.5	3.5	2.84	4.36	...	...
26	29.582	29.395	.275	.4003	25.5	30.2	29.1	28.13	+ 3.60	.118	.157	.155	.142	.86	.93	.96	.92	E b S	E	N E b E	N 55 E	7.5	9.0	4.8	4.04	8.19	0.025	0.3
27	.309	.427	.457	.4085	25.5	22.1	15.1	20.30	— 4.42	.111	.075	.074	.085	.81	.63	.86	.77	N W b W	W N W	W N W	N 68 W	21.2	23.5	13.0	19.76	19.83	...	In
28	.448	.491	.595	.5278	11.1	16.5	15.0	14.18	—10.72	.065	.069	.069	.066	.92	.77	.79	.81	W N W	N W	N W b W	N 48 W	20.0	28.5	23.0	23.99	24.13	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	......	......	......	......	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	......	......	......	......	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	......	......	......	......	...	...	...	...	...	...	...
M	29.6197	29.5922	29.6072	29.6077	20.05	25.34	21.87	22.50	— 1.17	.105	.109	.107	.107	.89	.77	.86	.84	....	....	....	....	7.51	10.19	6.77	......	8.52	0.180	23.1

REMARKS ON TORONTO METEOROLOGICAL REGISTER FOR FEBRUARY, 1862.

Highest Barometer........................ 30.138 at 8 a. m. on 25th } Monthly range =
Lowest Barometer .... 29.011 at 6 a. m. on 24th } 1.127 inches.

Self-registing Thermom.
- Maximum Temperature .... 37°8 on p.m. of 6th } Monthly range=
- Minimum Temperature .... —5°2 on a.m. of 15th } 43°0
- Mean maximum Temperature .... 28°25 } Mean daily range=
- Mean minimum Temperature .... 15°41 } 12°84
- Greatest daily range .... 30°0 from a. m. to p.m. of 25th.
- Least daily range.................. 3°4 from a. m. to p. m. of 7th.

Warmest day......... 6th... Mean temperature......... 34°53 } Difference = 24°95.
Coldest day......... .. 15th... Mean temperature......... 9°58 }
Maximum Radiation. { Solar.............................. 65°0 on p. m. of 1st } Monthly range =
{ Terrestrial.........................—12°9 on a. m. of 15th } 77°9
Aurora observed on 1 night, viz.: 28th.
Possible to see Aurora on 10 nights; impossible on 18 nights.
Snowing on 17 days, depth 23.1 inches; duration of fall, 73.4 hours.
Raining on 3 days,—depth 0.180 inches; duration of fall 14.0 hours.
Mean of cloudiness = 0.78. Above average 0.07.
Most cloudy hour observed, 6 a. m., mean = 0.89; least cloudy hour observed 10 p.m.; mean, = 0.67.

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

North.	South.	East.	West.
2121.56	626.73	1201.16	3374.57

Resultant direction N. 55° W.; Resultant velocity 3.81 miles per hour.
Mean velocity.......................... 8.52 miles per hour.
Maximum velocity .... 34.8 miles, from 2 to 3 p. m. on 24th.
Most windy day ......28th ....Mean velocity, 24.13 miles per hour. } Difference=
Least windy day......22nd ....Mean velocity, 1.52 ditto. } 22.61 miles.
Most windy hour ...11 a.m. to noon........Mean velocity, 11.93 ditto. } Difference=
Least windy hour...midn't to 1 a.m.........Mean velocity 5.59 ditto. } 6.34 miles.

Very Rapid Simultaneous Barometric and Thermometric Movement.

BAROMETER. { 24th, 6 a. m. = 29.011 } Ascending Range = 1.127 in 26 hours.
{ 25th, 8 a. m. = 30.138 }
{ 26th, midn't = 29.221 Descending Range=0.917 in 40 hours.
Movement........................ = 2.044 in 66 hours.

THERMOMETER { 24th, a. m. 32°0 } Descending Range = 36°5 in 24 hours.
{ 25th, a. m. —4°5 }
{ 26th, p. m. 31°0 Ascending Range = 35°5 in 34 hours.
Movement................ = 72°0 in 58 hours.

6th. Dense fog at 2 p.m.; wind sprang up with great rapidity at 4 p.m.—10th. Very perfect lunar halo from 7.30 to 9 p.m; lunar corona at midnight.—14th. Lunar halo at midnight.—19th. Very heavy snow storm commenced at 4 p.m., and continued snowing and drifting furiously all night; ceased at 9 a.m. on 20th.—24th. Very stormy day, snowing and drifting heavily.—26th. Rain, freezing as it fell, from 4 p.m. to 2 a.m. of 27th.—28th. Wind very high and squally; zodiacal light bright at 7 p.m.

COMPARATIVE TABLE FOR FEBRUARY.

YEAR.	TEMPERATURE.					RAIN.		SNOW.		WIND.		
	Mean.	Diff. above aver'ge (28°0)	Max. ob-served.	Min. ob-served.	Range.	No. of days.	Inches	No. of days.	Inches	Resultant Direction.	Resultant V'y.	Mean Force or Velocity.
1840	28.0°	+ 5.0°	49.1°	— 8.3°	57.4°	8	1.475	6	...	...	...	....
1841	22.4	— 0.6	43.4	— 0.3	43.7	1	Inap	9	...	...	...	0.61 lbs.
1842	26.9	+ 3.9	48.7	+ 2.5	46.2	8	3.625	9	...	...	...	1.03
1843	14.5	— 8.5	37.5	—10.2	47.7	1	0.475	21	14.4	...	...	1.05
1844	26.0	+ 3.0	47.1	— 0.4	47.5	4	0.430	7	10.0	...	...	0.43
1845	26.0	+ 3.0	46.6	— 3.9	50.5	5	Imp.	9	19.0	...	...	0.99
1846	20.4	— 2.6	41.4	—16.2	57.6	0	0.000	13	46.1	...	...	0.65
1847	21.5	— 1.5	42.2	— 1.0	43.2	2	0.550	13	27.3	...	...	0.69
1848	26.6	+ 3.6	40.9	— 0.6	47.5	4	0.775	8	10.8	N 65° W	2.53	5.69mls.
1849	19.5	— 3.5	41.1	— 9.2	50 3	2	0.240	13	19.2	N 41° W	1.48	6.58
1850	26.0	+ 3.0	49.2	+ 1.3	47.9	7	1.235	9	23.1	N 80° W	3.43	7.61
1851	27.6	+ 4.6	50.2	+ 1.3	48.9	7	2.600	4	2.4	N 64° W	1.99	6.94
1852	23.4	+ 0.4	41.2	— 3.2	44.4	3	0.650	11	13.0	S 75° W	3.34	6.42
1853	24.1	+ 1.1	43.4	— 0.6	44.0	4	1.030	15	12.6	N 49° W	2.51	7.30
1854	21.1	— 1.9	42.7	— 5.7	48.4	5	1.460	15	18.0	N 7° E	1.73	6.91
1855	15.4	— 7.6	37.3	—25.6	62.3	2	1.770	14	21.8	N 40° W	4.34	8.17
1856	15.7	— 7.3	35 3	—18.7	54.0	0	0.000	8	9.7	N 81° W	7.70	10.71
1857	28.5	+ 5.5	51.2	— 5.9	57.1	11	3.050	11	11.7	S 78° W	3.68	9.82
1858	17.0	— 6.0	40.9	— 6.6	47.5	1	Inap	16	26.7	N 72° W	3.22	9.12
1859	26.0	+ 3.0	43.3	+ 3.9	39.4	6	0.455	14	8.3	N 54° W	2.72	8.50
1860	22.8	— 0.2	48.1	— 8.4	56.5	7	1.330	13	18.8	N 61° W	3.28	8.73
1861	26.1	+ 3.1	44.6	—20.4	65.0	4	0.815	17	29.7	N 77° W	3.86	10.58
1862	22.5	— 0.5	35.6	— 3.7	39.3	3	0.180	17	23.1	N 55° W	3.81	8.52
Results to 1861.	22.98	...	44.15	—6.16	50.32	4.2	1.046	11.6	18.03	N 69° W	3.02	8.08
Diff. for 1862.	— 0.48	...	— 8.55	+2.46	— 11.02	— 1.2	— 0.866	+ 5.4	+ 5.07	....	......	+ 0.44

MONTHLY METEOROLOGICAL REGISTER, AT THE PROVINCIAL MAGNETICAL OBSERVATORY, TORONTO, CANADA WEST,—MARCH, 1862.

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°. 6 A.M.	2 P.M.	10 P.M.	Mean.	Temp. of the Air. 6 A.M.	2 P.M.	10 P.M.	ME'N	Excess of mean above Normal.	Tens. of Vapour. 6 A.M.	2 P.M.	10 P.M.	M'N	Humidity of Air. 6 A.M.	2 P.M.	10 P.M.	M'N	Direction of Wind. 6 A.M.	2 P.M.	10 P.M.	Resul't. Direction.	Velocity of Wind. 6 A.M.	2 P.M.	10 P.M.	Re-sul't.	ME'N	Rain in inches.	Snow in inches.
					°	°	°	°	°												°							
1	29.625	29.599	29.681	29.6382	12.5	25.9	15.4	17.75	− 7.47	.062	.093	.070	.075	.80	.66	.80	.76	N W	N W	N W b N	N 42 W	15.0	16.4	11.0	10.78	11.17	...	0.5
2	.623	.681	—	—	9.3	24.0	—	—	—	.062	.115	—	—	.94	.89	—	—	N b E	E N E	N E	N 58 E	8.2	6.4	9.0	9.92	10.55	...	...
3	.319	.069	28.849	.0588	26.2	31.3	34.9	30.70	+ 4.98	.110	.174	.203	.163	.77	.99	1.00	.94	E b N	E	S E	S 79 E	19.5	17.0	11.4	7.90	16.73	0.700	3.0
4	28.992	.111	29.270	.1372	21.9	25.2	24.1	23.78	− 2.22	.097	.101	.120	.107	.82	.74	.93	.83	W S W	S W b W	S W b W	S 67 W	17.0	18.5	5.5	8.36	16.81	...	...
5	29.272	.280	.308	.2912	21.9	27.0	21.9	23.07	− 3.13	.105	.115	.097	.103	.89	.77	.82	.82	W b S	W b S	W	S 87 W	5.0	9.4	9.0	7.83	8.10	...	Inp.
6	.285	.325	.418	.3475	19.4	29.5	24.4	24.68	− 1.82	.037	.136	.103	.111	.83	.83	.78	.83	W N W	S W b W	W b S	S 83 W	6.5	10.0	8.4	7.72	8.40	...	...
7	.425	.486	.545	.4967	25.5	37.8	34.5	32.83	+ 6.02	.118	.157	.157	.147	.86	.69	.78	.78	W b N	W b N	N W b W	N 65 W	4.8	2.5	8.5	5 22	5.61	...	...
8	.624	.672	.758	.6962	32.4	36.7	34.5	34.52	+ 7.28	.153	.144	.173	.153	.83	.66	.86	.77	N W b N	N	S b E	N 76 W	6.5	3.8	2.0	2.50	4.19	...	...
9	.803	.690	—	—	33.4	38.1	—	—	—	.171	.169	—	—	.89	.74	—	—	E b S	E	E	S 72 E	4.0	11.5	5.0	7.36	7.91	0.370	...
10	.545	.168	.506	.3532	37.8	38.8	32.7	35.95	+ 8.13	.217	.229	.135	.190	.95	.97	.73	.88	S S E	S W b S	W	S 81 W	6.0	9.0	17.0	9.77	11.50	0.160	...
11	.686	.640	.561	.6275	25.5	35.3	29.8	30.38	+ 2.15	.118	.164	.133	.137	.86	.80	.80	.81	W	S W b S	W S W	S 60 W	7.4	13.0	5.0	6.93	7.55	...	...
12	.556	.664	.846	.7018	24.1	32.0	24.1	27.02	− 1.53	.114	.106	.114	.107	.87	.58	.87	.74	S W	N W b W	N b E	N 45 W	3.5	20.4	3.5	8.35	12.46	...	0.1
13	.824	.746	.720	.7612	21.2	28.0	25.5	25.25	− 3.75	.092	.124	.111	.111	.81	.81	.81	.81	E N E	E b N	E N E	N 75 E	11.0	17.4	9.8	12.28	12.35	...	0.1
14	.695	.658	.561	.6285	25.5	30.9	30.6	29.25	− 0.07	.125	.134	.160	.139	.91	.77	.93	.86	E N E	E N E	E	N 61 E	7.0	5.5	13.5	8.04	8.59	0.525	...
15	.400	.246	.147	.2537	32.0	32.7	30.6	31.63	+ 1.92	.181	.172	.168	.171	1.00	.92	.98	.96	N E b E	N E b E	N E b N	N 48 E	8.8	10.0	11.0	10.33	10.44	0.745	3.0
16	.162	.225	—	—	27.3	31.6	—	—	—	.139	.148	—	—	.94	.83	—	—	N E	N E b E	E N E	N 28 E	7.4	7.0	4.0	3.77	4.60	Inp.	1.0
17	.400	.447	.548	.4747	22.6	34.2	30.2	29.58	− 0.87	.103	.168	.149	.144	.85	.85	.89	.87	N b W	N b W	N b W	N 23 W	3.0	6.5	4.5	4.68	5.23	...	...
18	.682	.771	.828	.7610	23.3	37.0	27.0	28.75	− 2.10	.110	.114	.129	.121	.87	.51	.88	.78	N b W	S b W	N W b N	N 49 W	6.0	3.8	5.0	1.56	3.97	...	...
19	.814	.762	.701	.7433	20.8	35.6	27.3	28.22	− 3.05	.097	.142	.126	.120	.87	.68	.85	.78	N E b N	S W b S	N N E	N 56 E	3.5	1.0	7.0	3.00	4.51	...	...
20	.656	.572	.441	.5422	27.0	33.4	33.8	30.97	− 0 70	.121	.134	.144	.131	.82	.70	.75	.75	N E b E	E	E	N 80 E	10.0	15.8	22.0	16.89	17.11	...	9.0
21	.255	.152	.139	.1743	29.8	33.1	31.6	31.57	− 0.52	.162	.185	.163	.170	.98	.98	.91	.96	E	E b N	N	N 63 E	22.5	11.8	7.6	9.14	11.57	...	1.5
22	.068	.047	.119	.0810	30.6	35.6	30.6	31.90	− 0.58	.160	.177	.160	.165	.93	.85	.93	.91	N W	S S W	W	N 85 W	6.0	8.4	2.0	3.67	4.59	0.020	0.2
23	.133	.171	—	—	29.8	38.8	—	—	—	.154	.195	—	—	.94	.82	—	—	W b N	N W b N	N N W	N 34 W	2.5	8.8	20.5	12.26	12.50	...	...
24	.322	.386	.446	.3913	26 2	30.6	24.1	26.60	− 6.57	.131	.108	.114	.117	.92	.63	.87	.82	N W b N	N W b N	N W b W	N 39 W	13.0	12.2	16.5	13.64	13.80	...	0.1
25	.515	.544	.589	.5568	16.1	32.7	21.5	23.80	− 9.77	.081	.143	.088	.101	.90	.76	.77	.78	N W b W	N W b N	N W b N	N 50 W	7.2	13.0	6.5	7.01	7.25	...	...
26	.612	.610	.683	.6545	13.2	34.2	27.7	26.30	− 7.68	.066	.125	.128	.111	.83	.63	.84	.77	W N W	S W b S	W N W	S 82 W	5 0	9.2	2.5	3.21	4.01	...	...
27	.692	.636	.682	.6710	23.0	41.4	32.4	32.32	− 2.10	.106	.135	.121	.120	.86	.51	.67	.67	W	W N W	W	N 68 W	1.5	14.6	8.6	8.18	8.87	...	...
28	.713	.701	.776	.7310	25.5	34.5	22.6	27.27	− 7.45	.116	.128	.104	.105	.86	.64	.86	.72	N W b N	N b W	N	N 2 E	9.0	12.8	6.4	7.90	8.94	...	...
29	.774	.738	.691	.7303	21.2	29.8	30.6	27.98	− 7.12	.085	.117	.138	.119	.75	.71	.80	.77	N E	E b N	E	N 89 E	8.8	12.5	10.8	10.74	11.00	...	...
30	.602	.453	—	—	32.4	35.3	—	—	—	.161	.158	—	—	.87	.77	—	—	E	E	S S W	S 72 E	13.0	19 0	3.5	7.53	11.32	0.040	...
31	.426	.545	.748	.5865	36.3	38.5	35.2	36.43	+ 0.52	.193	.173	.174	.182	.90	.74	.85	.85	S W b W	W b N	W N W	N 78 W	10.0	17.4	15.0	14.31	15.12	...	...
M	29.5003	29.4848	29.5216	29.5036	24.67	33.14	28.37	28.79	− 1.59	.120	.142	.134	.132	.87	.75	.84	.82	......	......	......	......	8.34	11.12	8.77	......	9.38	2.560	18.5

REMARKS ON TORONTO METEOROLOGICAL REGISTER FOR MARCH, 1862.

Highest Barometer . . . . . . 29.828 at 10 p.m. on 18th. } Monthly range=
Lowest Barometer . . . . . 28.805 at 11 p.m. on 3rd. } 1.023 inches.
Self-registering Ther. { Maximum temperature . . . 43°2 on p.m. of 27th } Monthly range=
Minimum temperature . . . . 8°0 on a.m. of 2nd } 35°2
{ Mean maximum temperature . . 34°64 } Mean daily range=11°52
Mean minimum temperature . . 23°12 }
{ Greatest daily range . . . . . . 23°6 from a.m. to p.m. of 26th.
Least daily range . . . . 3.4 from a.m. to p.m. of 15th.
Warmest day . . . 31st ...Mean Temperature . . .=36°43 } Difference=18°68.
Coldest day . . . . 1st ...Mean Temperature . . .=17°75 }
Maximum { Solar . . . . 68°0 on p.m of 23rd } Monthly range=
Radiation } Terrestrial . . . . −4°2 on a.m. of 2nd } 72°.2

Aurora observed on 2 nights, viz.: 25th, and 27th; Possible to see Aurora on 13 nights; Impossible on 18 nights.

Snowing on 11 days: depth, 18.5 inches; duration of fall, 52.8 hours.

Raining on 8 days; depth, 2.560 inches; duration of fall, 54.0 hours.

Mean of cloudiness=0.63; above the average, 0.04. Most cloudy hour observed, 4 p.m.; mean=0.71; least cloudy hour observed, midnight; mean=0.55.

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

North.	South.	East.	West.
2304.43	682.35	2600.26	2991.53

Resultant direction, N. 12° W; Resultant Velocity, 2.50 miles per hour.
Mean velocity 9.38 miles per hour.
Maximum velocity 25.8 miles, from noon to 1 p.m. on the 12th.
Most windy day 20th—Mean velocity 17.11 miles per hour. } Difference 13.14 miles.
Least windy day 18th—Mean velocity 3.97 miles per hour. }
Most windy hour, 1 to 2 p.m.—Mean velocity, 11.45 miles per hour. } Difference
Least windy hour, 1 to 2 a.m.—Mean velocity, 8.05 miles per hour. } 3.40 miles.

3rd. Very stormy day; hail 7 to 8 a.m.; Raining 8 a.m. to 11 p.m., and snowing from 11 p.m. to 5 a.m. of 4th.
9th. Solar halo from 9 to 10 a.m.
10th. Foggy during the forenoon.
11th. Solar halo at 7.15 a.m. (imperfect).
12th. Lunar halo from 7 p.m. to midnight.
14th. Raining; freezing as it fell from 7.20 p.m. to 8.30 p.m. of 15th.
15th. Snowing and drifting from 8.30 p.m. to noon of 16th.
19th. Ground Fog at 6 a.m.
20th. Heavy snow storm from 10.10 p.m. to 3 p.m. of 21st.
24th, 25th, 27th, 28th and 29th. Zodiacal light very bright, 7 to 8 p.m.
29th. Very perfect solar halo, 9 to 11 a.m.; sheet lightning in S.W., 10 p.m.

March, 1862, was cold, wet and windy.

COMPARATIVE TABLE FOR MARCH.

YEAR.	TEMPERATURE.					RAIN		SNOW.		WIND.		
	Mean.	Excess above Average, (30°1).	Maximum observed.	Minimum observed.	Range.	No. of days.	Inches.	No. of days.	Inches.	Resultant. Direction.	Resultant. Velocity.	Mean Velocity
1840	33.3	+ 3.2	56.9	8.7	48.2	8	1.640	8	...	...	...	...
1841	27.7	− 2.4	53.5	− 6.9	60.4	5	1.170	7	...	...	...	0.51lbs
1842	35.8	+ 5.7	68.7	14.9	53.8	4	3.150	8	...	...	...	0.70 "
1843	21.3	− 8.8	38.6	− 2.8	41.4	2	0.625	18	25.7	...	...	1.18 "
1844	31.3	+ 1.2	50.3	9.6	40.7	8	2.470	8	14.0	...	...	0.57 "
1845	35.4	+ 5.3	61.7	9.9	51.8	5	Imp.	8	2.8	...	...	0.66 "
1846	33.1	+ 3.0	49.3	7.6	41.7	9	1.965	5	2.3	...	...	0.30 "
1847	26.2	− 3.9	44.3	4.8	39.5	5	0.850	6	4.2	...	...	0.71 "
1848	28.6	− 1.5	58.9	0.9	58.0	5	1.220	6	9.7	N 66 W	2.03	5.80ms.
1849	33.5	+ 3.4	53.4	15.4	38.0	7	1.525	2	2.3	N 3 W	1.48	5.37 "
1850	29.8	− 0.3	46.0	6.0	40.0	2	0.745	7	11.2	N 52 W	2.62	7.62 "
1851	32.4	+ 2.3	58.7	13.1	45.6	3	0.770	9	8.8	N 21 W	1.93	7.65 "
1852	27.7	− 2.4	44.8	− 3.2	48.0	8	3.080	12	19.5	N 8 W	0.71	5.81 "
1853	30.6	+ 0.5	56.3	− 0.1	56.4	6	1.080	8	7.1	N 58 W	2.60	5.96 "
1854	30.7	+ 0.6	52.8	10.4	42.4	9	2.425	3	2.8	N 53 W	3.39	8.03 "
1855	28.5	− 1.6	48.6	− 2.9	51.5	5	1.485	11	18.1	N 88 W	4.76	9.95 "
1856	23.1	− 7.0	39.3	−13.6	52.9	0	0.000	12	16.2	N 71 W	7.68	11.39 "
1857	27.8	− 2.3	56.5	− 3.9	60.4	4	0.335	15	11.3	N 63 W	6.63	10.84 "
1858	28.4	− 1.7	54.1	− 5.5	59.6	10	0.917	6	0.2	N 58 W	5.45	8.56 "
1859	36.3	+ 6.2	53.7	10.4	43.3	15	4.054	8	1.0	N 64 W	1.96	10.39 "
1860	34.5	+ 4.4	66.4	14.2	52.2	5	0.882	11	2.4	N 64 W	7.61	12.41 "
1861	26.9	− 3.2	43.2	− 4.1	47.3	8	2.125	14	7.1	N 54 W	4.33	10.56 "
1862	28.8	− 1.3	41.4	9.3	32.1	8	2.560	11	18.5	N 12 W	2.50	9.38 "
Results to 1861.	30.13	...	52.55	3.77	48.78	6.0	1.548	8.7	8.77	N 60 W	3.68	8.60
Diff. for 1862.	−1.34	...	−11.15	+5.53	−16.68	+2.0	+1.012	+2.3	+9.73	...	...	+0.78

MONTHLY METEOROLOGICAL REGISTER, ST. MARTIN, ISLE JESUS, CANADA EAST—FEBRUARY, 1862.

(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.—F.			Tension of Vapour.			Humidity of Air.			Direction of Wind.			Horizontal Movement in Miles in 24 hours.	Mean of Ozone. (tenths)	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.
1	30.177	29.977	29.992	— 4.0	28.4	17.4	.024	.142	.087	.45	.88	.84	N E b E	N E b E	N E b E	64.70	3 0	...	1.10	Cu. Str. 10.	Snow.	Snow.
2	205	30.250	30.349	6.0	20.5	5.0	.087	.075	.040	.64	.70	.70	N N W	N	N	64.80	1.5	...	...	Clear.	Cirr. Cum. 4.	Cl'r.Zo.li't br't
3	364	339	197	—17.1	12.1	4.9	.008	.045	.032	.40	.60	.60	E b s	N E b E	N E b E	18.30	1.0	...	...	Clear.	C. C. Str. 8.	Snow.
4	139	112	234	4.1	14.2	4.5	.038	.061	.038	.73	.73	.73	N E b E	N E b E	s s E	189.40	3.0	In'p.	0 57	Cu. Str. 10.	Cu. Str. 6.	Cu. Str 10.
5	367	279	258	—12.1	18.9	8.1	.012	.077	.048	.50	.76	.77	s s E	s E	s s E	2.70	2.5	...	...	Hoar Frost.	Clear.	Cl'r.Imp.L.H.
6	046	29.769	29.085	1.0	24.1	17.1	.032	.094	.078	.70	73	.85	N E b E	N E b E	N E b E	119.00	4.5	...	0 51	C. C. Str. 4.	Cu. Str. 10.	Snow.
7	29.759	862	30.069	14.1	21.0	14.8	.067	.075	.051	81	.71	.6[illegible]	W	W N W	W N W	293.30	2.5	...	1.10	Cu. Str. 10.	Do. 6.	C. C. Str. 4.
8	30.098	30.096	29.985	0.0	24.0	11.0	.030	.094	.045	.69	.73	.69	N W	N W	N W	27.20	1.5	...	...	Clear.	Do. 2.	Do. 10. L. H.
9	29.885	29.847	994	0.0	27.0	10.3	.034	.111	.049	.71	.75	.70	s b E	s W	s W	8.30	1.5	...	...	Str. 2.	Clear.	Clear.
10	30.008	949	960	— 17.0	15.6	— 5.4	.011	.065	.030	51	.74	.82	N E b E	E b E	E s E	1.90	1.0	...	...	Clear.	Do.	C.C.Str.8. L.C.
11	29.840	757	690	— 4.7	17.0	11.0	.029	.053	067	.82	58	.79	N E b E	N E b E	N E b E	68.00	2.0	...	...	C. C. Str. 4.	Cu. Str. 4.	C. Cirr 4. L.H.
12	560	644	762	18.0	28.8	27.7	.078	.127	.129	81	.76	.8[illegible]	s s E	W	s W	57.50	3 0	...	1.17	Snow.	C. C. Str. 4	Cu. Str. 10.
13	990	951	923	1.1	17.4	14.1	.088	.047	.067	.85	.50	81	W	s s W	N E b E	48.80	2.0	...	0.51	Clear.	Cu. Str. 10.	C. C. Str. 10.
14	778	700	30.004	16.0	24.7	4.2	.080	.105	.036	.91	.80	.79	N	N b W	W b N	122.10	3.0	...	0.77	Snow.	C. C. Str. 4.	Clear.
15	30.115	997	29.952	—19.9	14.0	7.9	.002	.051	.048	.67	.63	.77	s s E	N E b E	N E b E	29.30	2.0	...	...	Cu. Str. 4.	Cu. Str. 4.	C. Str. 4. S.H.
16	106	30.300	30.382	2.0	19.0	3.8	.034	.061	028	.71	.60	.57	W b N	W b N	W b N	138.40	2.0	...	...	Clear.	Clear.	Clear.
17	427	325	190	— 2.1	19.7	10.6	.027	.081	.048	.67	.77	69	s s E	s s E	N N E	33.10	1.5	...	...	Cirr. Str. 10.	Cu Cir. 4.	Do.
18	29.845	29.764	030	12.5	34.0	25.0	.060	.155	.105	.80	.79	.80	N E b E	W s W	W b s	148.10	2.0	...	1.14	Snow.	Cu. Str. 8.	Cl'r.Zo.li't br't
19	30.204	30.154	29.949	10.0	25.3	19.4	.054	.105	.093	.78	.80	.92	s E	N E b E	N E b E	46 90	2.5	...	...	Cu. Str. 10.	Do. 2.	Cu. Str. 10.
20	29.747	29.7 4	79	16.1	21.4	9.0	.074	.090	.050	.84	.78	.76	N E b E	W	W	190.00	2.0	...	4.14	Do. 4.	Do. 4.	Clear. Au. B.
21	30.174	30.111	30.047	2.0	31.0	20.2	.034	.168	.090	.71	.7[illegible]	.84	W b s	W s W	W s W	247.66	1.0	...	...	Clear.	Do. 2.	Cu Str. 10.
22	29.882	29.814	29.0[illegible]4	16.0	34.2	20.0	.073	.155	.097	.82	.79	.9[illegible]	E b N	W	s b E	6 00	1.5	...	In'p	Cu Str. 10.	Clear.	Clear.
23	734	679	620	18.0	37.9	32.1	.082	.177	.162	.84	.80	.89	s W	s W	W s W	28.70	1.0	...	...	Do. 8.	Cu. Str. 10.	Cu. Str. 10.
24	431	324	679	31.1	27.9	7.1	.155	.117	.045	.89	.77	.76	N E b E	N E b E	W	283.16	3.0	...	12.16	Snow.	Snow.	Do. 10.
25	30.103	30.152	30.206	—11.1	16.4	5.5	.014	.059	.046	.54	.66	.87	W b N	W b N	W b N	525.20	1.5	...	...	Clear.	Clear.	Cl'r.Zo.li't br't
26	090	29.901	29.769	—10.1	25.6	2.0	.017	.091	.034	.57	.68	.71	s s W	s W	s s W	37.80	1.0	...	...	Do.	Do.	Do.
27	29.614	507	57[illegible]	4.0	20.0	17.4	.038	.081	.072	.75	.77	.75	N E b E	W s W	W s W	124.59	2.0	...	1.10	Cu. Str. 10.	Snow.	Snow.
28	490	474	513	14.0	28.4	22.0	.067	.123	.101	.81	.82	.86	W s W	W s W	W	241.60	2.0	...	3.50	Snow.	Do.	Cu. Str. 10.
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

MONTHLY METEOROLOGICAL REGISTER, ST. MARTIN, ISLE JESUS, CANADA EAST—MARCH, 1862.

(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.—F.			Tension of Vapour.			Humidity of Air.			Direction of Wind.			Horizontal Movement in Miles in 24 hours.	Mean of Ozone. t'nths	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.
1	29.679	29.700	29.791	11.1	23.0	19.1	.057	.095	.077	.79	.79	.77	w s w	w	w	302.70	2.5	...	0.75	Snow.	C. C. Str. 4.	Cirr. Str. 10.
2	929	942	952	17.1	32.1	15.0	078	143	161	87	79	73	w b s	w	w	76.70	1.5	...	...	Cirr. Cum. 4.	Clear.	Clear.Z.l't br't
3	920	814	742	— 3.1	32.1	25.6	025	143	111	66	79	81	...	N E b E	N E b E	0.70	2.5	...	...	Clear.	C. C. Str. 4.	Cu. Str. 10.
4	318	420	507	33.1	34.6	24.6	168	162	105	89	84	80	N E b E	N E b E	N E b E	363.50	3.5	...	1.85	Snow.	Cu. Str. 10.	Snow.
5	498	500	504	23.0	31.4	24.1	106	130	111	86	74	86	w s w	w s w	w b N	330.00	3.5	...	5.00	Do.	Snow.	Cirr. Str. 10.
6	511	574	601	22.1	41.0	28.0	098	212	135	78	82	86	w s w	s w	w b N	119.70	3.5	...	1.09	Cu. Str. 10.	Cu. Str. 10.	Snow.
7	662	741	779	20.0	50.1	35.2	091	283	182	83	78	89	w b s	w s w	w	34.10	2.0	...	...	Fog.	Clear.	Cirr. Str. 2.
8	823	947	30.051	26.2	56.2	34.2	126	391	160	86	87	86	w b s	s w	s w	10.40	1.5	...	...	Cirr. Str. 8.	Do.	Clear.
9	30.152	30.147	062	24.1	49.7	34.2	094	265	155	76	74	80	s w	w	s w	10.60	1.5	...	...	Clear.	Do.	C. C. Str. 10.
10	29.790	29.592	29.417	33.1	36.7	34.7	168	164	169	89	76	84	s b E	s b E	s E	203.60	3.5	0.581	...	Rain.	Rain.	Rain.
11	800	897	901	30.0	36.4	30.0	130	170	132	78	80	79	s E	N w	s w	242.50	3.5	...	...	Cu. Str. 4.	C. C. Str. 4.	C.Cum.4. L.H.
12	802	789	30.064	21.4	39.7	21.3	105	188	095	80	77	79	w b s	N b w	N N E	201.10	2.5	...	0.40	Cirr. 4.	Snow.	Str. 2.
13	30.211	30.279	243	6.4	30.3	26.1	040	124	120	70	73	86	w s w	s s w	N E b E	44.20	1.5	...	0.09	Clear.	Cirr. Cu. 4.	Snow.
14	057	030	057	25.1	30.4	23.4	117	146	106	88	87	86	N E b E	N E b E	N E b E	200.50	3.5	...	0.63	Snow.	Snow.	Cu. Str. 10.
15	29.934	29.817	29.749	24.2	30.4	23.4	111	142	100	86	84	79	N E b E	N E b E	N E b E	326.90	4.0	...	3.98	Cu. Str. 10.	Do.	Do. 10.
16	609	579	600	21.1	27.0	26.1	085	105	117	78	70	82	N E b E	N E b E	N E b E	641.40	2.0	...	...	Do. 10.	Cu. Str. 10.	Snow.
17	647	727	734	24.1	27.9	24.2	111	117	094	76	74	87	N E b E	N E b E	N E b E	403.60	3.0	...	1.47	Do. 10.	Slight Snow.	Slight Snow.
18	999	30.074	30.027	25.1	45.6	24.3	117	245	094	87	80	73	N E b E	s s w	N N E	6.90	1.5	...	0.74	C. C. Str. 4.	Clear.	Str. 4.
19	30.079	29.977	054	6.1	39.0	19.0	029	195	072	51	82	70	N E b E	w s w	E s E	24.70	1.0	...	...	Str. 4.	Cu. Str. 4.	Clear.Z.l't br't
20	29.977	997	002	7.4	43.0	34.2	040	209	162	64	75	80	s s w	s	E N E	0.00	1.0	...	...	Clear.	Clear.	Clear.
21	834	730	29.648	20.1	34.6	32.0	091	169	162	85	84	89	N N E	N E b E	s E	79.30	2.5	...	1.75	Cu. Str. 10.	Snow.	Snow.
22	410	437	432	30.0	36.4	35.4	136	170	189	83	80	92	N E b E	N E b E	N E b E	1.10	2.0	...	...	Do. 4.	Cu. Str. 4.	Sleet.
23	519	574	637	33.4	50.0	34.2	162	283	162	84	78	84	s E b E	s E	s w	0.30	1.8	...	...	Do. 10.	C. C. Str. 10.	Nimb. 10.
24	496	644	630	32.4	42.6	32.0	175	194	143	89	74	79	w	s w	w s w	0 10	2.5	0.010	...	C. C. Str 8.	Cu. Str. 4.	Clear.
25	727	751	804	31.1	36.0	28.8	140	156	111	80	75	71	w	w s w	w	183.20	1.0	...	...	Cu. Str. 2.	Clear.	C. C. Str. 8.
26	807	900	952	28.4	42.7	23.0	129	193	087	83	71	72	s w	s s w	w	159.00	1.0	...	...	Clear.	Do	Clear. Au. B.
27	927	841	960	14.1	52.0	35.0	051	315	183	63	83	90	w b s	s s w	s w	50.70	1.0	...	...	Do.	Do.	Cu. Str. 4.
28	824	917	30.050	17.1	32.9	26.2	068	137	105	75	73	75	w	N E b E	N E	314.70	1.5	...	...	C. C. Str. 4.	Do.	Clear.Z.l't br't
29	30.124	30.121	120	15.7	42.4	32.4	065	215	143	74	79	79	w s w	w s w	w s w	22.20	1.0	...	...	Clear.	Do.	Clear.
30	097	109	29.917	18.7	48.1	32.1	077	234	143	76	80	79	w s w	w s w	s s E	4.90	1.0	...	...	Do.	C. Cirr. 4.	Do.
31	29.821	29.820	924	32.6	60.2	34.2	175	203	162	94	82	84	s s E	s	E b N	207.20	2.5	Inap.	Inap.	Snow.	Sleet.	Cu. Str. 10.

REMARKS ON THE ST. MARTIN, ISLE JESUS, METEOROLOGICAL REGISTER FOR FEBRUARY, 1862.

Barometer	Highest, the 17th day	30.427
	Lowest, the 6th day	29.085
	Monthly Mean	29.943
	Monthly Range	1.342
Thermometer	Highest, the 23rd day	37°.9
	Lowest, the 15th day	−19°.9
	Monthly Mean	13.°52
	Monthly Range	57°.8

Greatest intensity of the Sun's Rays .... 73°.8
Lowest Point of Terrestrial Radiation .... −20°.4
Mean of Humidity .... .740
Rain fell on 1 day, inappreciable.
Snow fell on 13 days amounting to 27.77 inches. It was snowing 101 hours and 44 minutes.
Most prevalent wind, the N. E. by E.
Least prevalent wind, the E. by S.
Most windy day, the 25th; mean miles per hour, 20.88.
Least windy day, the 5th; mean miles per hour, 0.11
Aurora Borealis visible on 1 night.
3 Lunar Haloes and 1 Corona seen.
1 Solar Halo.
Zodiacal light bright and well defined.
The Electrical state of the Atmosphere has indicated moderate intensity.
Crows first seen on the 10th.

REMARKS ON THE ST. MARTIN, ISLE JESUS, METEOROLOGICAL REGISTER FOR MARCH, 1862.

Barometer	Highest, the 13th day	30.279
	Lowest, the 4th day	29.318
	Monthly Mean	29.858
	Monthly Range	0.961
Thermometer	Highest, the 27th day	52°0
	Lowest, the 3rd day	− 4°1
	Monthly Mean	29°29
	Monthly Range	56°1

Greatest intensity of the Sun's rays .... 73°1
Lowest point of Terrestrial Radiation .... − 5°7
Mean of Humidity .... .793
Rain fell on 4 days, amounting to 0.621 inches; it was raining 34 hours.
Snow fell on 12 days, amounting to 17.75 inches; it was snowing 128 hours and 50 minutes.
Most prevalent wind, N. E. b E.
Least prevalent wind, E.
Most windy day, the 16th day; mean miles per hour, 26.74.
Least windy day, the 20th day: Calm.
Aurora Borealis visible on 2 nights.
Solar Halo visible on 1 day.
Lunar Halo visible on 1 night.
Zodiacal light frequently very bright.
The Electrical state of the Atmosphere has indicated feeble intensity.