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ON ERRATA RECEPTA, WRITTEN AND SPOKEN.

BY THE REV. DR. SCADDING,
LIBRARIAN TO THE CANADIAN INSTITUTE.

(Continued from *Vcl. IX. p. 326.*)

III. FOREIGN WORDS ANGLICISED—(continued.)

3. *Anglicised German Words.*

The bulk of our English speech is Anglo-Saxon; and Anglo-Saxon itself was, antecedently, a composite product of several Low German dialects. It is no part of my undertaking to notice differences in words essentially identical, differences occasioned by the legitimate growth of a national language. Nor am I to remark upon unadulterated German words, or German words very nearly unadulterated, such as gneiss, quartz, schale, spar (spath), felspar (felspathic), grau-wacke, muschel-kalk, floetz, (schist is not German), gas, sitz, seidlitz, nickel, mangel-wurzel, &c. These have been confessedly borrowed by us for convenience, just as Germans, at the present time, are borrowing terms, like essay, self-government, &c., from the English.

I simply design to point out instances of words or terms which have passed into our language from German dialects, but which, after adoption and naturalization, have neither been preserved strictly

in their native shape, nor, in some cases, used in their proper relations. In my collection I may include some instances not of very recent introduction, which may therefore from familiarity of use, not at the first glance be obvious examples of *errata recepta*; and some, that, although they may have reached us through the Italian and French, yet entered those languages from Teutonic dialects, and cannot be understood etymologically in English without an acquaintance with this fact in their history.

1. To begin, then, with some of the parts and materials of a house, and some familiar objects in and about a house. I mention first a word which will be more familiar to the Canadian than the English reader. The partially-closed-in verandah often attached to the kitchen-part of a farm-house is commonly called with us, a *stoop*. This is the Low German *stoep*, and properly signifies the step, or platform before the door. Again, *shingle*, a slate of cleft-wood, so to speak, is strictly *schindel*, High German for the same thing. In like manner, *deal*, applied by us to a plank of pine-wood exclusively, is *diele*, denoting in German any kind of plank. *Clap-board* is the Low German *klap-hout*, *hout* being *wood* or *timber*. *Sas*, a word in the same dialect, signifying a *sluice*, gives us *sash*, in window-sash; the frame containing the glass ascending and descending after the manner of a sluice-gate. A sash is thus, in idea as well as in fact, an air-slucce. *Lobby* and *lodge* are ultimately the High German *laube*, a bower of *lauben*, i.e. leaves. *Lodge* has come to us through the French *loge* and the Italian *loggia*; but these are both the Old High German *laubja*, the same as the modern German *laube*. *Laubja* was Latinized into *laubia*, whence the Grison *laupia*, and the Piedmontese *lobia*, first a gallery in a church, then our *lobby*. *Loggia* in Italian still denotes a leafy verandah; thus in "Italian Pictures," in *Blackwood*, January, 1865:—

"I sit upon my loggia, where the vines
Spread their green shadow to keep off the sun."

Hamper, *hanniper*, meaning now with us, a kind of basket, is the Old High German *hnappf*, a bowl or basin, written in the modern language *nappf*. In the expression *hammer-cloth*, *hamper* has undergone a further transformation. *Ticket*, coming to us through the French *étiquette*, (formerly *estiquette*) is from the German verb *stechen*, and has reference, in the first instance, to the "bills" which

we ſee “ſtickers” ſometimes notified not to affix. *Towel*, intermediately French or Italian, is the Old High German *twahilla*, from *thwahan*, to waſh. *Eiderdown* is *eiderdunnen*. *Bolſter* is *polſter*. *Spool* is *ſpule*. *Clock* is *glocke*, really, the *bell*. *Shuttle* is an adaptation of *ſchutteln*, to vibrate. *Can*, a veſſel to hold fluids, is the ſame as the German *kanne*; but with us, without doubt, it is the Anglo-Saxon *canne*. It may be recognized as the ſtem-ſyllable of *can-alis*, and *can-tharus*. *Fauteuil*, generally held to be an arm-chair, is the Old German *faltſtuol*, properly a ſeat that folds up, like the portable *sella curulis* of the Roman magiſtrate. Our old Engliſh word *faldſtuol* is ſometimes wrongly taken to be a kind of devotional deſk.

Sleigh, the ſoft word which, in the United States and throughout Britiſh America, has ſo fittingly improved upon and diſplaced the heavy-ſounding, inappropriate *sledge*, is a modification of *sledge* under the influence of *ſchlitten* or *ſchleife*, German for the ſame thing. In 1759, this word was written *sley*. Thus in “*Journals of Excursions in the Late War in North America*,” London, 1765, by Major Robert Rogers, p. 161, we are told “My own *sley* was taken with £1196, York currency, in caſh.” Again, at page 130, in a letter from Col. Haldimand to Major Rogers, dated March 10th, 1759, “I congratulate you heartily on your good ſucceſs, and ſend you twenty-two *sleys* to transport your ſick.”—It would have been well, perhaps, had this form of the word continued.—Correctly ſpeaking, *Sleigh* is a proper name, of conſiderable antiquity in England and Scotland, according to Burke’s “*General Armory*.” Has it, as ſuch, like *Dennet*, *Brougham*, *Hanſom* and the odious *Buggy*, in parallel caſes, had anything to do with the cis-Atlantic term for our ſwiftly-gliding winter-vehicle?

2. Among names of edibles we have one or two Angliciſed German words. In *sour-kROUT* we ſimply write in an Engliſh form the German *sauer-kROUT*; juſt as the beverage which, a few years ago, uſed to be advertised as *lager-bier*, is now generally announced in the windows plainly as *lager-beer*. Out of *sauer-kROUT* the French have made *chou-kROUTE*,—a tautology, both ſyllables denoting the ſame thing.—A certain preparation, or, to adopt an old Engliſh term, a *furmety*, or *frumenty*, of Indian-corn-meal, is, with us, popularly designated *mush*. This is the German *muſ*, by which toothſome comestibles of various kinds are denoted.—*Kruller*, the *curled*

or twisted cake to be found generally on the table of country-inns, is an unchanged Low German word.

3. In the animal kingdom,—we give to a certain kind of fish the name of *bass*. We have here a corruption of the German *bars*, which is properly the *perch*. Again, the rein-deer is in reality the *running-deer*, being the German *renn-thier*, derived from *rennen*, to run. *Reynard*, the popular sobriquet for the fox, which, in French, supplanting *goulpil*, has ceased to be a proper name, is the German *Reinhart* or *Reginhart*, ‘powerful in counsel,’ the title given to the fox in the celebrated fable of *Reineke de Vos*, written in 1498, by Nicholas Baumann, under the pseudonym of *H. van Alkmaar*.

The syllable *mouse* in *titmouse* is an Anglicising of the Low German *musch*, which is simply ‘sparrow.’ In like manner, ‘hammer’ in *yellow-hammer*, is the High German *ammer*, i.e. the bird called a ‘bunting.’ *Cob-web* is the web of the *spinnekop*, Low German for ‘spider.’ *Capon* is *kupphahn*. By *fugleman*, *flugel-man* is intended to be said.—*Isinglass* in English, is *hausenblase* in German: on which side is the corruption?

A common United-States and Canadian term, denoting a pair of horses, is the Low German *span*, in the phrase *een span paarden*, a team or set of horses. Unapprised of this verbal usage, the English reader would not catch the supposed wit of the American fast youth who, on hearing that “Life is but a span,” is reported to have remarked, “And I am your man to drive it.”

4. In the vegetable world: our *bass-wood* (the lime, linden, tilia or whitewood,) is more correctly *bast-wood*, from the Low German word *bast*, inner bark. *Krause-beere*, the rough berry, has been transformed by us into *gooseberry*. Dr. Johnson suggested *gorseberry*. The French have made it *grosseille*. *Pompion* (pumpkin) is the Low German *pompoen*. Has *cranberry* anything to do with *kronsbeere*? *Cabbage* comes to us from the Low German *kabis-kool*, headed-cole; but this is from the Italian *cappuccio*.

5. In relation to money,—*groat* is the Low German *groot*, and signifies the *great* coin, equivalent to four silver pennies. With this compare *groschen* and the French *gros sou*. *Shilling* is *schilding*, the coin bearing a *shield* with the royal or national arms. Some say it is from the Swedish *skilja*, to divide.—*Dollar* is *thaler*, coin struck in the first instance (A.D. 1518), from silver of the Thal of Joachim in Bohemia. Here, again, others will have it that the word

is connected with *theilen*, to deal out.—*Pewter* is the Old German or Teutonic *peauter*, white brass. *Bourse*, being now almost English, may be admitted into our list. The term is thus accounted for. The meeting-place for merchants at Bruges in the 14th century happening to be in a house once inhabited by the noble family of *van den Beurse*, whose armorial cognizance of three purses was sculptured over the door, the building became known as the *Beurse*, and supplied a name for buildings similarly used elsewhere. *Bourse* itself is, of course, a descendant of the Late Latin *bursa*, a leather-purse. (We may have occasion to detail hereafter other instances of buildings accidentally entailing their names; as, for example, the old Parisian convents of the Jacobins, Feuillants, and Cordeliers.)

6. Among military terms, we have *knapsack*, properly *schnappsack*, a pouch for carrying *schnapps*, provisions on the march. Again, *havesack* is *hafersack*, a bag for *hafen*, oats; a word recalling the time when a *meal* had a literal significance.—*Bivouac* also is German. It is altered from *beiwacht*, expressive of the extra-amount of vigilance necessary to be maintained by an army suddenly encamping without defences.—The well-known French term *auberge*, and Italian *albergo*, a way-side inn, are modifications of the Old High German *heriberga*, quarters for an army when marching through a province. Our terms *harbour* and *arbour* have properly the same signification. But they have come to us through the Anglo-Saxon *herebeorga*. *Harbinger* is a person sent forward to see that quarters are in readiness for an approaching military force. The numerous *Cold-harbours*, to be met with in various counties of England, are said to have been farms, outposts, or garrisons of Roman Colonies. They are generally found near a Roman road or settlement. If the suggestion is correct, *Cold*, in these words, is a corruption of *Col*, i.e. *Colonia*.

A *marshal* was originally the groom in charge of the King's horses. (Old High German *marah*, horse, and *scalc*, servant.) This person was next required to see to the ordering of companies of horse on the field of battle and elsewhere, under the *comes stabuli*, the count of the stable, the Grand Constable. At last the term is applied to the highest rank in the army.—In French, a *farrier* is still a *marechal*. (*Seneschal*, not unknown in our poetry, is O.H.G. *sini*, old, *scalc*, as above.)

Hauberck and its diminutive *habergeon* are given in the English

Dictionaries (e.g. in Ogilvie's and Worcester's), as from the French and German. These terms, however, have descended to us from the Anglo-Saxon, also. In Bosworth we have *healsbeorga*, defence for the neck. [*Halter*, through the French *halterel*, is likewise from *hals*, the neck.]—*Arquebus* is the German *haken-buchse*, i.e. a *buchse* or gun fired from a crotch or rest, *haken*. The Italians have made of this word *arcobugio*, as if it were a perforated cross-bow (*bugio* perforated); whence the suggestion, ingenious but baseless, of a French etymologist, *arc-à-buse*, bow with a tube.—We, in our English way, have persuaded ourselves that the Low German *donderbus* (thundergun), is *blunderbus*. *Howitzer* is *haubitze*, and *halberd*, *hel-lebarde*.—*Truce* is the Old German *triuwa*. It has in it the word *true*, and expresses a *fœdus* or faithful compact between belligerents. It was Latinized into *treuga*, where the *g* is made to represent *w*. *Fife* is the German *pfeife*, as *flute* is *flöte*. Finally, the phrases 'to ask quarter,' 'to give quarter' are said to have originated in an understanding between the Netherlanders and Spaniards, to the effect that the life-ransom of a soldier, of whatever rank, should be a quarter of his year's pay.

7. In connexion with ships—we have *skipper*, which is the Low German *schipper* (H. G. *schiffer*), and the Anglo-Saxon *scipere*, sailor. *Bowsprit* is L. G. *boegspriet*, the spar which *sprouts* from the bow. (*Spritsail* is a sail sustained by a *sprit*.) *Starboard* is H. G. *steuerbord*, the direction in which, with reference to the steersman, is the helm; *larboard*, is probably *babord*, i.e. L. G. *bakboord*, the direction in which, in the same relation, is the ship's side. *Bunting* is from H. G. *bunt*, variegated in colour. Literally, therefore, it is the material out of which the ship's *colours* are made. *Orlop* is L. G. *overloop*; *sheets* are L. G. *schooten*, and *sheaves* H. G. *scheiben*; *tar* is H. G. *theer*, and *pitch* is H. G. *pech*. *To belay* is H. G. *belegen*. We have Anglicised into *windlass* the L. G. *wind-as*, which is the H. G. *winde-achse*, the *axis* or *axle* for winding the cable on.—*Sloop* is the L. G. *sloep*, and *schooner* the H. G. *schoner*. *Yawl* is the L. G. *jol*, which gives us *jolly-boat* also. *Smack* is the H. G. *schmact*; *hoy* is the H. G. *heu*. *Yacht* is the H. G. *jacht* (and Danish *jaht*), from *jagen*, to hunt or ride quickly. It is properly a boat towed by horses. A vessel is said to be *crank*, when liable to upset from being too narrow, or from not being sufficiently ballasted. This is the H. G. *krank*, properly sick, out of sorts. [*Binnacle*,

formerly *bittacle*, should be added to our instances of Anglicised French. It is from either *habitacle* or *boite d'aiguille*, both terms denoting the receptacle for the compass. *Capstan* is Spanish—*cabrestante*, goat-rampan. *Ketch* is Italian, *caccia*.]

8. Our English changes in German and other proper names are to be considered in a future section. If we may rely upon the theory of Mr. Ferguson, as set forth in his work entitled "The Teutonic Name-System applied to the Family Names of France, England and Germany," the most wonderful misconceptions are in vogue in relation to proper names, owing to their vernacularisation in English, French and German. Some of the more striking of these alleged misinterpretations we shall give in the proper place. In the mean time, we notice in passing that we have made Cape *Horn* out of Cape *Hoorn*, which has its name, not from its shape or appearance, as might be imagined; but from *Hoorn* in Holland, the native place of the navigator Schonten, who first doubled this promontory in 1616. The two names, however, are identical in meaning; and promontories or extremities of islands were *cornua*. Thus Corn-wealas in Britain, and Cornouailles in Brittany both have reference to the Wealas or Celtic foreigners, as the later-arrived Teutons would speak, inhabiting narrow headlands jutting out into the sea—*pens*, as they would be termed by the Celtic people themselves. Supposing *κέρας* (horn) and *cairn* (visible memorial pile) to be allied in root, Cornubia, the Late Latin appellation of Cornwall, may convey the graphic impression of a region of rock-piled masses. Richard of Cirencester even asserts that its inhabitants were *Carn-abii*.—The *bosch-man* of the Cape has become *bush-man* with us. The country-farmers of the same colony, in their own language *boers*, with us are now *Boors*, without, however, the depreciative sense usually attached to the term. *Pieter-Both*, a mountain in the Mauritius, we in like manner Anglicise into *Peter-Botte*. *Delft* we make *delf*. *Prusse*, Prussian, we have transformed, in one instance, into *spruce*. Nay in more than one, for *spruce-fir* means, I believe, the tree with the bark of which Prussian leather is tanned.—*Sclave*, i.e. Slavonian, we, as other nations, have transformed into *slave*. Previously, the *Serbs*, a subdivision of the Slaves, had furnished *servus* and *serf*. *Dolopia*, on the contrary, would seem to be a national name derived from *δούλος*.—*Swiss*, in one department of French terminology, has come to be a synonym for a Church-beadle. In the phraseology

of the late Confederation in the United States, the soldiers of the North were *Hessians*.—*Contraband*, which in our time has acquired the force of a proper name, euphemistic for *negro*, is of German descent: it is something imported in contravention of *ban* or public edict.

9. I come now to miscellaneous examples. And first, I notice *bos*, the style and title under which lumberers, surveyor's assistants, workmen in manufactories, farm-laborers, and others, commonly, among themselves at least, speak of their employer. It is the Low German *baas*, having exactly the same import. Netherlanders have the phrase *den baas spelen*, to act the *bos*, to domineer.—*Drug* is the L. G. *droog*, literally *dry*, having reference to the herbs, roots and barks of the primitive pharmacopœia.—*Copperas* is probably *kupferwasser*. *Potash* is the plain English of *pott-asche*, which is the original also of the mongrel Latin *potassium*. The *maulstick* of the artist is *mahler-stock* Anglicised, *mahler* being *painter*.—*Jig* is the H. G. *geige*, from *gehen* to go or move. (The French *gigot* means the *violin-shaped joint*.) *Buskin* is the L. G. *broose-kin*, a diminutive of *broos*, a leather-cothurnus.—*Smug*, and *arch*, in the special sense of sly or shrewd, are H. G. *schmuck* and *arg*.—The *shark* of the Exchange is the L. G. *schurk*, an uncomplimentary appellation.—*Hurly-burly*, although explained otherwise also, is, according to some, from *ehrlich*, honest, and *wahrlich*, true-ly.—*Cricket*, the game, appears to get its name from *krack-e*, a trestle or wooden horse, i.e. the wicket. (May *Croquet* be a modification of *cricket*? Or has it anything to do with a well-known abbreviation of *Crockford*, a name associated, temp. Geo. IV., with a not dissimilar game?)—*Haber-dasher* is from *habt-ih-r-das?* 'have you that?'. Others explain the term by a reference to *habe*, wares, and *tauschen*, to exchange. It has also been assigned, with less probability, to a French source, *avoir d'acheter*. The verbs, *to dismay*, *to carouse*, *to shore up*, *to eschew*, *to lure* or *allure* are transformations of Teutonic words. *To dismay* is *dis* (privative), *magan*, the same as *machen*, to make. Hence it means *to unmake*, *undo*, *render inefficient through fear*, &c. *Carouse* is deduced from the L. G. *kroes*, cup. Others fetch it from a greater distance—from H. G. *gar aus*, quite (drained) out. *To shore up* comes from the L. G. *schoor*. *To eschew* is the H. G. *scheuen*, to shun or be shy of. *To lure* or *allure* is to bring back the falcon to the hand by means of the *luoder*, O. H. G. for the piece of

coloured *leather* used for the purpose.—The low Americanism *loafer* is a curtailed form of the German *herum-lauser*, one who vagabondizes about (*herum*, circum, and *laufen*, to run.) Some such word existed in the English of former days. In the Play of “Sir John Oldcastle,” attributed occasionally to Shakespeare, the term *leufter* occurs. (See Act v., Sc. 2.) The annotators cannot with certainty explain it. They suggest that it may be for *leuterer*, i.e. loiterer. It is put in the mouth of an Irish character. In Spanish there is a term equivalent in sense, and somewhat similar in sound—*gaglioffo*. It denotes, first, a strolling French pilgrim to the shrine of St. Iago, where, for such persons was provided a dole called *Galli offula*; and, secondly, any vagrant character. *Gaglioffo* may have crept into Ireland and England from Spain.

The ecclesiastical expression *ember-day* unexpectedly proves to be Anglicised German. It is thus deduced. Latin *Quatuor tempora*, (i.e., since A.D. 1095, the Wednesday, Friday, and Saturday after 1st Sund. in Lent, Whitsunday, Sept. 14th and Dec. 13th, respectively), corrupted into *Quatember*. This then in L. G. passes successively into *Kottemper*, *Tamper*, *Tamper-day*, *Ymber-day*, transformed by us, under the influence probably of *dies cineris*, ash-wednesday, into *ember-day*.—By steps somewhat similar an attempt has been made to shew that *Whitsun* in *Whitsun-day* is a descendant of the H. G. barbarism for *pentecost*, viz., *pfingsten*. Corruption, however, as *Whitsun* probably is, it is not proposed to be thus derived. Its orthography in the days of Wycliffe and the early translators, was *Witson* or *Wytson*. Up to about the twelfth century the name of the festival was the same in England as on the Continent; but the technical *Pentecost* then began to be displaced by the vernacular *Witson*—a term understood to be indicative of the season when the first Christian disciples became, in the highest sense, “sons of wit,” children of wisdom; some such text as this being glanced at—“*vos docebit omnia*;” or this, “*sapientia est justificata ab omnibus filiis suis*.”—The conversion of *wit* into *white*, and the attributing of the name to the white vestments of neophytes were later popular misapprehensions.

Finally, the word *country*, though not an Anglicised German term, had nevertheless its origin in a transformed Teutonic idiom. Its history is said to be this.—*Gegend*, country or region, is literally that which is *gegen*, over against you. An early Teuton, attempting

to convey to a Roman mind the idea involved in the native term *gend*, coined some such word as *contrata* or *contrada*, "the things which are *contra*, over against you." The complaisant Roman is then supposed to have afterwards employed the barbarism of his master, to the neglect of *patria*, or whatever other Latin expression he would naturally have used. Thus the word from which we get our pregnant English term *country* became established in the Italian, Provençal and French.—It is curious to observe how *contra* has Anglicised itself into *country*—in *country-dance*; and into *counter*, in *counteract*, *counterblast*, &c.

(*To be continued.*)

THOUGHTS ON BELIEF AND EVIDENCE.

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IF I had any idea of treating this subject in such a manner as to attempt both to establish just principles, and to derive from them practical rules, I should need a considerable volume instead of a short essay; but all that I now propose is a summary view of theoretical principles. Some thirty years ago, when my professorial duties obliged me to give close attention to questions in the philosophy of mind and the science of evidence, and when what had then been written on the subject was frequently in my hands, I was persuaded that the sensational philosophy, as it has been termed, in the form in which I held it, cleared away difficulties, and enabled me to present the whole subject in a peculiarly satisfactory manner. During the greater part of the time which has since elapsed, I have ceased to read much on the subject, and have but a slight acquaintance with the great works which have since been produced; but my attention having been recently strongly directed to past speculations, of which the loss of all my papers has left me no record but what memory furnishes, I ask the indulgence of this meeting to a few remarks, which, I hope,

may not be entirely unworthy of notice, though much study of what has been written since my inquiries would be necessary to enable me to make them what I would wish. The importance of the subject no one will question, and, probably, the most generally received notions are much at variance with these I shall present.

Most people think that they know very well what is meant by belief, yet such is the looseness with which language is employed that there are really several distinct states of mind, which, in accordance with approved custom, are designated by this name, and of this fact few seem to be aware.

Belief in a mathematical theorem, in a scientific generalization or natural law, in a series of facts or events not perceived by our own senses, in the occurrence of some change as the consequent to a known antecedent, and in the existence of what we have perceived by our own senses, is by no means produced in all these cases by the same process, nor is the state of mind produced identical. Somewhat different still is the belief in various opinions impressed upon our minds in early years, or communicated to us by those around us, of which most of us have never properly examined the sources or grounds, although the feeling of believing them may be strong. It may be worth while to examine these cases somewhat particularly, that we may observe how they differ in their origin and nature. We will begin with what seems simplest, the case of our own sensations present or past. We are so constituted as to experience sensations in certain combinations, and in a certain order, as we say, from external objects; though some philosophers contend that we know the sensations, and do not know their external causes, which, they allege, that we believe in without reason. However this may be, we have the sensations, and to have them is to believe them. The belief is not a consequence of having them, or the result of the application to them of some faculty or some mental process, but it is the very state itself of experiencing them. When we say we believe them, we mean nothing more or different from saying that we have them. No evidence could possibly be offered to convince us that we have them if they are not part of our consciousness. As to their having external material causes, an invariable association in all human minds refers them to such, or, in other words, the state which we call the perception of externality of objects arises from certain clusters of sensations in all minds; and those who argue against the existence of the causes have the same

feeling on the subject as others, which is not an inference true or false, but something so involved in the mode of our receiving the sensations, that to have the sensations is to believe not in them only, but in their external causes, nor is it easy to conceive of such an invariable effect, in all minds, being delusive and unreliable. But whatever may be said of the external causes, the existence of the sensations is undeniable, and to experience them is to believe them, there being no place for any evidence on the subject. It may be said that we are deceived even in our sensations, having afterwards, if not at the moment, full assurance that certain supposed perceptions of our organs of sense were not to be trusted; or, if we remain under the delusion, it being fully known to others that we are misled, so that a reasonable man would not rely too firmly even on the evidence of sense. There is some truth in this, yet not so as to invalidate our previous statement respecting our belief in our sensations. The mental states so termed, arise out of states of certain nerves, which states convey to us the notion of real things, existing independently of us, and becoming, by their means, known to us. But there is another class of mental states, distinguished by many philosophers as *ideas*—that term being used as contrasted with *sensations*—the connection of which with affections of the nervous system may also be well proved, and which appear really to differ from sensations chiefly in the degree of vividness of the nervous action. Now it is an ascertained fact that, under the influence of disease, producing abnormal excitement of the nervous system, or some part of it, these ideas may have, to the individual experiencing them, all the force of sensations, so that he receives them as such, or, in other words, believes in the reality of what is thus brought before his mind. It is from other persons in full health being in a position to receive the same sensations, and not receiving them, or from their comparison with facts well known to great numbers, that we are assured that what the individual supposes himself to perceive has no reality, and that he is under the influence of disease, which may amount to madness, or may be only partial, connected with disorder of a particular organ, and of such kind that the patient, though believing in the false sensations for the moment, can convince himself of their real nature, and correct, by his judgment, the delusion to which he has been subject. There is also another class of deceptions, usually regarded as deceptions of the senses, but really consisting in so strong an

association of certain ideas with actual sensations, that we are apt to consider the whole mixed cluster as one kind, and receive the whole with the belief which belongs to the sensation. Deceptions of this kind chiefly occur when the sensations are, from some cause, obscure or imperfect, and when the mind is under the influence of some strong emotion. How many ghost stories, that seem to be plausibly supported, may be well explained by separating with care what might easily have been perceived by the senses from the mode of accounting for such sensations, suggested to the mind when under the excitement of fear, sorrow, or enthusiastic feeling, and, in such circumstances, confounded with actual sensations, so as to appear to the memory of the same nature with them.

When these mistakes from ideas associated with our sensations are not intensified by strong emotion, they are easily corrected by the judgment, even in opposition to the feeling of the moment, so that we have no permanent false belief; as when the crossed fingers touching a smooth spherical substance have, from associations respecting the parts usually affected by one or by two distinct objects, the sensation as of two, though we are certain of the fact that there is but one; or, when the revolving circle of card seems to present to our vision a bird in a cage, or a tree in its summer foliage, though we are well aware that the image of the bird and the foliage is at one side, that of the cage and of the naked branches on the other, the combination depending on the rapid motion. The real cases of deception are only where a sensation occurs unexpectedly, under circumstances fitted to awaken some emotion, under the influence of which associated ideas are intensified so as to seem parts of what is perceived by the senses. In all cases when we view the subject philosophically, it is necessary cautiously to separate the actual sensations we receive from objects from the ideas excited in connection with them, and which are easily confounded with them. In such instances we do not really receive false or unreliable sensations, but only obscure ones, which the mind completes by its own associations; just as in dreams, the noise or touch which awakens us will, before it completes that work, suggest to the fancy means of accounting for it, which pass like scenes before our mental vision.

A little calmness and collectedness of mind, with the attempt to place ourselves in a more favourable position for observation, or to apply a second sense in aid of our inquiries, would save us from

chances of being deceived, which weak fear or a reproachful conscience multiply. It appears plainly, from what has been said, that, in all ordinary cases, we are not liable to be deceived by our senses. We have sensations, and to have them is to believe them. Disease and peculiar excitement may, occasionally, create difficulties; but, as a rule, where sense is concerned, no evidence beyond its own action is needed or could add to its force.

Remembered sensations differ very little from present sensations in respect to the nature of our belief in them. Past events which passed immediately in our own view, and directly affected ourselves or those in whom we were interested, especially supposing them to have been of such a character as at the time to produce a vivid impression, are frequently revived as ideas in our minds, in such a manner as to have a distinct place in a series of ideas forming our consciousness of the past. In such a case we cannot have the ideas without belief in the occurrence of the events. The memory is revived consciousness, and its existence constitutes our belief. It is true that although the kind of confidence we have in our remembrances is the same as we have in our sensations, i e., their forming a part of our actual consciousness, yet the degree differs because, whilst it is very rarely that there can be any pretence for questioning our sensations, the gradual fading away of remembrances, and the degree in which other mental states may become associated with them so as to alter their character, obliges us to make certain allowances, and in some instances to assure ourselves of the correctness of memory by the conjunction of two or more remembrances, or by other independent means. The precautions necessary in this way need not be discussed at present.

We proceed then to the consideration of the nature and grounds of our belief in states or changes of external objects not falling within the range of our own senses. These can become known to us only by having been perceived by the senses of our fellow-creatures and communicated to us by the instrumentality of language—that is to say, they are known to us by testimony, and we have to inquire why we believe testimony; whether such belief is reasonable, and if so what limits ought to be placed to it, or what cautions are needed to prevent our being misled. The full consideration of these subjects would require a large treatise, but the guiding principles are not very difficult to indicate and will answer the purpose of our present inquiry. Other men, like ourselves, believe in their own sensations, and cannot help

believing in them, nor does any doubt affect them which would not equally affect our sensations, respecting which we cannot admit doubt. If, then, we could be sure in each case of having communicated to us the sensations experienced by fellow-men and nothing more, the sources of error would be limited indeed, and we might place an almost implicit reliance upon testimony. Why, then, do we not do so? Why do we believe at all if not to the fullest extent? What are the principles which should reasonably guide us on the subject, since universal scepticism would be manifest folly and would stop all the pursuits of life, and to believe or reject according to momentary fancy would be quite as unjustifiable? Some tell us that we believe in testimony by instinct, and learn to modify and regulate our belief by experience. I cannot think the use of the term instinct proper in such a connection, but it seems to be true that our first tendency is to believe testimony and not less so that experience wisely used regulates without destroying this belief. The primary and natural purpose of language is to communicate our states of mind to others, making known our wants and desires, our hopes and fears, and as it were transferring to them our sensations and thoughts, either through sympathy or as affording reasons for their acting according to our wishes. Where there is no strong purpose to the contrary, we speak truth naturally, and because our own words are intended to convey our perceptions, feelings and desires, and we all hear from others a great deal more truth than falsehood we are as naturally disposed to believe: but because where there is no moral control in the mind, selfishness would dispose to falsehood, and we all find ourselves occasionally deceived; a certain amount of distrust is gradually created by observation of what passes around us. There are also other sources of difficulty: testimony ordinarily communicates, not single sensations or definite clusters of them, which would leave little room for doubt or confusion in the mind of the witness, but series of successive events which were hastily viewed from one point of view and which would be rendered obscure either by his indifference or his agitation of mind; frequently too sufficient time has elapsed to admit of a partial fading of the events from the memory, whilst in an attempt to recall them, supposing no intention to deceive, desire and emotion would modify the result, giving colour to the narration. We may easily observe in our own minds the difference there is in clearness of revival between a

single sensation or contemporaneous group, or even the various sensations combined in any single scene, and a series of occurrences and changes with various actors and perhaps various causes of excitement; and we know that when called upon to express the whole in words, we might well, in the latter case, vary our account on different occasions in the minor particulars, though entirely free from fraudulent intentions. Inaccurate habits of observation, and the want of sufficient command of language to express well what is in their minds, greatly increase the danger, in ordinary cases, of conveying false impressions. Such then are the sources of the uncertainty of testimony. Men do not always desire to communicate their real sensations, interest and passion often exciting them to wilful deception, without moral feeling offering any efficient check; and where there is no fraud, confusion of ideas, indifference on the subject, want of good observing power, want of clearness of language, and the colouring influence of prejudice, passion and desire, distort the narrative so as to render it essentially deceptive. Against all these causes of error we have to be upon our guard; and if, as often happens, testimony reaches us only through a chain of witnesses, each step in the transmission increases the danger of some mistake, so that the value of such evidence is perpetually deteriorating. But we must recollect that *recorded* testimony, though it may require evidence as to the reliability of the record, is subject to no such deterioration as has been referred to, and on the other hand, it very often happens that the same scenes and series of events are witnessed by several different individuals whose separate recollections we can obtain, and as the chances are almost inconceivably great against mere inventors agreeing in the same narrative or any principal part of it, the concurrence of independent witnesses, *i.e.*, of such as cannot be supposed to have agreed together respecting what they should say, produces an amount of confidence nearly equalling what belongs to our own sensations and approaching very near to certainty. In fact the consistent narrative of a disinterested, and still more of a sacrificing witness, supported as to main facts by other independent witnesses, produces a confidence in which we are conscious of no deficiency, and which is fully equal to what is needed for any practical purpose, whilst any record of alleged facts containing no inconsistency in itself, or with what is well ascertained by other means, and no strange improbability or incompatibility with the ordinary course of nature, is reasonably received as true, unless

some special ground for doubt, founded on the character or purpose of the narrator, can be established. The question, how great a weight of that improbability which arises from inconsistency with the ordinary course of nature, good testimony will counterbalance, need not be discussed here, but the rule may be laid down that everything which is not contradictory and, in the strict sense of the word, absurd, may be established by sufficient testimony; and it is evident that the kind of reasoning employed by sceptics against the facts which are the foundation of religious faith, would destroy all belief in either distant scenes or past events, and thus both limit our pleasures and confine within the narrowest limits the sources of useful knowledge. Testimony may often be so imperfect as not to create belief in what is antecedently probable. It may also be good enough to compel our belief of any thing not absolutely impossible, however opposed to natural probability. The weighing of it is a most important operation to be carried on according to well considered rules and often demanding a clear and practical judgment, but it deserves notice that the cases which form the subject of judicial investigations are just those which afford the greatest opportunities and inducements to falsehood, and we should be wrong if we judged of human nature by a standard formed from the experience of the courts.

I proceed next to the consideration of our belief in consequences following their known antecedents, or in the relation of cause and effect. This is continually spoken of as involving something very mysterious, and many think that it can only be explained as an instinct, or a primary essential principle of our nature. It includes the notion of *power*, which, indeed, is only an abstraction of what is common to the many cases of cause and effect which are continually under our notice. If there are uniform laws of Nature, that is, if the Author of nature governs the universe according to a plan founded on Wisdom and Benevolence, not leaving the course of events to accident or unceasing change, then this existence of Law implies and renders necessary that antecedents really the same should have the same consequents. The ultimate cause is supreme and infinitely powerful intelligence, acting on a perfect plan with a view to a result. The regularity which prevails is what ought to be expected under such control. Its action on our minds in producing firm expectation or belief when the known antecedent occurs that the consequent will follow, is, in my view, quite intelligible. States of the mind depend

on states of the brain, and it is a grand general law that simultaneous or immediately successive states become sympathetically connected; so that the recurrence of the one, whether as a sensation or its corresponding idea, brings up the idea or thought of the other, the connection becoming stronger and more certain by every repetition. Accordingly, when certain changes have recurred again and again, the one following the other, the presence of the antecedent uniformly suggests the idea of the consequent, and this thought of it as about to come constitutes our belief or expectation. Every observed case of uniform sequence has the same character, and generalizing, we obtain the ideas of the relation of cause and effect and of power in the antecedent to produce the consequent—this latter abstraction being only our feeling of the certainty with which the consequent follows. The whole is a case of invariable association creating irresistible and steady expectation. When we reason backwards from the effect to the necessity of a cause, we only apply to a partially known particular case a general law derived from all known cases. It has been maintained that, according to this view, the necessity for a cause exists only in our minds, not in the nature of things, and, however strongly felt by us, has no real existence. The reply is, that philosophy knows of no greater force of conviction than invariable association of certain ideas, and that where the laws of our nature compel belief it is madness to demand different or stronger grounds for it. The very simplicity of the cause of our belief in effects following their causes, is what has given occasion to its being described as *instinctive*, and it is so truly, if that term be assumed to mean only that it is an invariable result of our nature. In this case there is no act or state of belief different from the presence of an idea which is raised according to a uniform law.

I pass to the investigation of belief in a scientific generalization. This is a sort of proposition affirming some definite relation between the objects or ideas expressed by or contained in the subject, and the objects, qualities, or ideas included in the predicate. It can have no meaning if the proper extent and limits of the terms be not clearly understood. This being so, it contains an intelligible proposition, and the question arises: Why we believe it? The case is one in which a great many believe on authority merely. Science offers its truths for the guidance of practical men, who receive them as coming from those who know, and as being established to the satisfaction of:

competent judges, before being put forth for their instruction. But what we require now to know is, in what consists the belief, and how was it caused of those who first delivered them to the world as truths, and of all those inquirers who accept them as such from knowledge of the evidence. To say that they are truths, is to say that, taking any particular case of an object or idea, properly included as one of those to which the term forming the subject is applied, it would be found to possess the qualities, or, in certain circumstances, to pass through the changes, or otherwise to manifest the relations expressed by the predicate. Now it is clear that, if the general proposition were founded on the actual personal experience by our own sensations of every possible case coming under it, so that each instance of the application of the general statement must be one, or the exact copy of one of the instances upon which it was founded, then general truths must be of comparatively narrow application and limited use in economising labour or extending knowledge. Their great value consists in the general proposition, rule, or natural law covering a much greater number of cases than have been actually examined or perceived by the senses, and yet deserving our confidence. We assume, as sufficiently established by every one's experience, that what is found to be true in one instance will be true in all similar instances; that is, we assume the uniformity of the laws of nature, consequently that it is only necessary to show that a certain proposition expresses a natural law, in order that it may be confidently applied to every single case really falling within the rule. But the assertion of the uniformity of the laws of nature is only giving the form of a general proposition to the feeling of the mind, resulting from various and continued observation. We know nothing of laws of nature, as separately existing powers, exerting any controlling force; but we recognise them as expressions of the regularity with which effects are seen to follow causes, and, finding this regularity to prevail to such an extent in respect to cases of very different kinds, we are prepared not only to admit separately different laws as making part of the government of the world, but to adopt the general principle that the universe is regulated by constant laws, the knowledge of which is the best guide, on all matters to which they apply, for those who dwell in it: and this confidence in uniformity enables us, from a few good observations, to lay down a rule as to what may always be expected. Where the proposition expresses what will happen to a given sub-

stance in certain given circumstances, a single good observation might establish a law. Where it expresses relations of a class of objects, a number of examples may be necessary, and certain precautions are required, to avoid rash and misleading generalization; but, when we have once reached a law, we apply it with confidence to all cases really coming within its terms, because we have established in our minds a general expectation of the uniformity of natural laws, which is really the same mental state as our expectation of effects from causes, and is explained in the same manner.

Belief in opinions philosophical, moral, religious, political, or relating to personal character, has the same nature as our belief in the generalizations of physical science. The opinion is the verbal expression of a generalization of the mind. It implies that, on these subjects, there are real uniform relations of things, which may be known, and which we consider that we know; but the fact that the opinions of mankind on these subjects vary to such a degree, as they are known to do, shews either that the inductive process is less carefully performed, owing to the subjects of examination not being objects of sense, or that passion and prejudice interfere much more with our conclusions than they can well do in generalizations which relate to the laws of external nature. These difficulties affect real enquirers, but the proportion is very large indeed of those who, in such matters, only accept the instructions of others, and whose opinions, early received from those whom they deem sufficient authorities, and impressed by repetition and the force of example, become so associated with all their trains of thought as to be firmly fixed independently of evidence. Hence the strongly marked differences which prevail on all these matters of opinion, and the certainty that they can only be removed when those who try to form an independent judgment carry on their inquiries by the same methods as would be employed in physical science, and when the proportion of those who have really examined and endeavoured to appreciate evidence is far greater than it is at present.

Every opinion tends to excite or restrain some action. If the opinion be true—that is, if it be the expression of the real mode of existence and relations of the objects or ideas to which it refers, and the real regular consequents of certain known antecedents—it leads us to act with due regard to these relations, and thus to guide our conduct so as to attain to well-being, whilst a false opinion necessarily tends to produce uneasy thoughts, unwise conclusions, or disappointing

and unhappy results. Truth is as much a reality which man may reasonably hope to obtain in what are called matters of opinion, as in questions of physical science, and no wise man is blind to its importance; but associated feeling, prejudice, habit, interest, act so powerfully, though often indirectly, and unperceived by the individual, that the right decision on questions of the kind under consideration, important as it is, must unavoidably be more slow of attainment than where we can appeal directly to the senses. The kind of evidence available and the proper tests of truth on questions religious, moral, metaphysical, political and social are subjects of vast importance and universal interest, but their discussion would lead me far beyond the bounds I must prescribe to myself. The general principle is clear. Every opinion is the expression of a generalization, implying the sufficient knowledge of a number of particulars. It rests on observation or acquaintance with facts directly or indirectly obtained. It is vitiated by assuming as facts what are not so, or by insufficient or wrongly conducted induction. Freedom of opinion means the right of every individual to decide doubtful questions for himself by such means as to him appear best, an inalienable right of human beings, and the full recognition of which is the best means of securing the ultimate prevalence of truth, and of the good which attends it, but this recognition is not for a moment to be supposed to imply indifference to truth in the possession of which consists the highest good and highest happiness of man, and the promotion of which is one of the noblest objects of philanthropy.

It remains for me to speak of the nature of our belief in mathematical propositions. There is manifestly some great difference in kind between this belief and that which we have in our sensations, or in any generalisations respecting the changes or relations of objects or ideas. Belief in a mathematical proposition is not merely confidence but absolute certainty of a kind unattainable in other subjects of thought and involving the absurdity of believing otherwise. This peculiarity of mathematical propositions seems to depend on their being concerned with a limited class of ideas, and with them not as they may be obtained by our senses, but as pure abstractions of the mind. We separate number and the forms of extension from the objects, by means of which alone we could first acquire these ideas. We define the fundamental ideas in terms which exclude the real and physical, leaving us a pure abstraction. In this we do nothing really

different from what is done in some of the commonest proceedings of language. The name of a colour implies a coloured object as much as extension in one or more directions implies something extended, but we can think and speak of the colour without any reference to the object, as we can of a line or surface without concerning ourselves with extended substance. The abstraction and the absence of a real matter of fact separation of the abstract ideas are the same in both instances, but in the latter it relates to a class of ideas (those of number and magnitude) specially fitted for the exercise upon them of our powers, and furnishing an endless variety of results. Having laid down our definitions, we consider and logically develop the necessary relations of the ideas submitted to us, so as to form a chain of inferences all implicitly contained in those definitions. To believe one of these propositions is to perceive its logical connection with those preceding it up to the commencement, and its necessarily arising from the definition. If we are asked whether we really understand and believe the definitions themselves we reply that although physically we cannot separate position from magnitude or linear extension from the body extended, yet the mind can consider the one without the other, and we understand the definition as indicating that in the studies we are engaging in, we have no concern with what is physical and material, but are keeping in view one class of qualities or attributes so as from the required series of definitions to elicit a chain of absolute but abstract truths, having a most important bearing on realities though founded on assumptions impossible in fact. The very nature of mathematical reasoning shows the mistake of supposing that any similar proof is attainable in any case unless where we can begin by defining certain ideas in the abstract, and then unfold their relations with no other assumptions, but such as must necessarily be admitted as soon as understood by all human minds. Whether these conditions can be found in any science besides logic and mathematics may be doubted, certainly the method of demonstration is exceedingly limited in the subjects to which it can be applied. Want of attention to this truth has been betrayed by a vain attempt to give the forms of demonstrative proof to subjects which do not admit of the reality, and by a most unreasonable demand for mathematical certainty in the case of questions involving matters of fact or relating to religion, morals and other such subjects which have their own proper evidence, by the right application of which alone they can be judged. Even setting aside the strict-

ness which is required in the sciences of number and magnitude, ratiocination or the deductive process is by no means the only or principal means of attaining truth. It is necessary to man as an employer of language with its generalisation and abstractions, and it is most important both in excluding a large class of errors, limiting greatly the abuses to which language is liable, and in presenting truths in various aspects, leading to fresh applications of them, and exhibiting them in all possible forms; but other methods must be employed for a real extension of the bounds of human knowledge, and, admirable as logic may be as one mode of exercise of the powers of the mind, under due discipline, its merits must not be exaggerated, for, after all, the perceiving clearly and certainly as a necessary truth, that what is meant by one set of words arranged as a proposition is already implied in other propositions, the truth of which is admitted, is not to be accounted among the greatest achievements of human intellect. The belief produced is, that certain words express a real relation of the ideas conveyed by them, which relation must first have become known by observation or induction, and can only by reasoning be combined with other admitted truths and set in various lights. Mathematics has the advantage of its foundation in definitions, which secure its abstract character, and of the wonderful variety of the relations which its subjects, number, and the forms of magnitude admit. It is a wonderful science equally admirable in its results, and in the high exercise it affords to several most important faculties; yet it is possible for it to be too highly valued, and there is no inconsiderable danger of its peculiar methods leading the mind astray in other inquiries.

In all that I have said of the kinds and grounds of belief I have not yet found it necessary to name intuition, and I am myself strongly persuaded that the mind is incapable of reaching to any truth within itself, and entirely independently of what comes from without, the simplest and most universally admitted truths being believed from early constant and universal experience. An *axiom* is only the verbal expression of some relation which experience compels us all to know, so that as soon as we understand the terms we admit the truth. If any proof is required, the assertion cannot be called an axiom. It was once thought by many philosophers that mathematical science was built upon axioms—such an error now needs no refutation—the axioms are laid down as a caution against assuming in our reasoning

any thing beyond them, in addition to what has been already proved, but the fundamental principles are contained in the definitions.

We have now reviewed the various states to which the word *belief* is applied as a common name. They all consist either in the presence in the mind of sensations or remembrances, the mere existence of which constitutes the belief; in invariable association of two or more sensations or ideas, causing the presence of the one to suggest the other as about to arise, which constitutes the expectation of it or belief that it will come; or in the knowledge of certain conditions or relations of things; or of the meaning and proper limits of certain terms introduced into the mind by means which we call *evidence*. There can be no evidence afforded or needed of the truth of a sensation, or of a belief in a succession of associated ideas; but where the perceptions of others are communicated by testimony, where general conclusions arise from multiplied observations, or where deductive reasoning unfolds relations not before perceived, the belief is produced by means, which means constitute evidence, and certain rules and precautions are laid down for its regulation, constituting the laws of evidence, which must be correct generalizations of observed facts respecting the means of securing truth in the classes of cases here referred to.

Truth is the expression of the real condition and relation of things. The term is used ethically for the conformity of our words to our belief, but the two senses must be carefully distinguished. Truth is something real, not variable according to individual judgments or feelings, but existing in the nature of things. Without all doubt much of it has been, and, by persevering efforts, much more may be obtained. It is, on all possible subjects, the proper and only safe guide for human conduct. To deny its usefulness is about as reasonable as to reject either light or guidance in passing at night through an unknown wilderness, abounding in quagmires, chasms, and water channels. We are furnished with faculties for its attainment, and to employ them well, so as to benefit ourselves and others, is the glory and happiness of our nature.

NOCTURNAL LEPIDOPTERA FOUND IN CANADA.

PART II. HOMOPTERIDÆ.

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In a former number of the *Canadian Journal* (vol. viii. 1-16, Feb., 1863) descriptions of all the then known species of the genus *Catocala* found in Canada and the neighbouring States, were published with a view to assist collectors in naming their species, and to furnish at the same time a contribution to Professor Hincks' contemplated "Fauna Canadensis." A valuable Synopsis of Canadian Arctiadae, by Mr. William Saunders, has since been published (vol. viii. 349-377, Sept., 1863) in furtherance of the same objects. The following descriptions of new and previously known species of another family of moths (Homopteridæ) are now offered as a further contribution, small though it be, to our limited stock of information respecting the insects of this country.

QUADRIFIDÆ—EXTENSÆ.

The section *Extensæ* of the group *Quadrifidæ*, to which many of our handsomest night-flying moths belong, is divided by M. Guénée into three families, one of which, *Polydesmidæ*, is not represented in America; of another, *Hypogrammidæ*, only two species are found in the Southern States, but none in Canada; of the remaining family, *Homopteridæ*, which I now propose to consider, a goodly number of species are found in this country.

HOMOPTERIDÆ.—Guen.

The members of this family, in their perfect state, may be readily distinguished from all other Noctuidæ by the following characteristics:—All the wings are broad and nearly alike in colour, wood-brown or the colour of an ordinary withered leaf, and black predominating; their markings are also similar, the subterminal line forming on the anterior wings two large arcs which unite on the middle of the hind margin, and on the posterior wings one, the space thus enclosed being in several species covered with white or pale green scales. The palpi are long and ascending, with the third joint well developed and linear. The thorax is broad, with the tegulæ very large and divergent, cut

squarely or hooked at the tips. The abdomen has a broad crest at the base, and fine linear ones on most of the following segments. It is divided into eight genera, of which four are represented in Canada and the United States. They may be thus distinguished:—

- A. Thorax round or nearly so.
 - B. Wings black. 1. *Anthracia*, *Hüb.*
 - BB. Wings not black. 2. *Phæocyma*, *Hüb.*
- AA. Thorax square.
 - C. Subterminal line on the anterior wings forming two arcs.
 - 3. *Homoptera*, *Boisd.*
 - CC. Subterminal line nearly straight. 4. *Ypsia*, *Guén.*

Gen. 1. ANTHRACIA.—*Hüb.*

Antennæ, more than half the length of the body; crenulate in the male. Palpi ascending, thick, curved; third joint rather less than half the length of the second. Thorax moderately robust, convex, rather rounded; tegulæ slightly projecting. Abdomen conical, pointed posteriorly; in the male with two small linear crests on the third and fourth segments. Wings entire, of uniform colour, glossy, with long fringes.

The members of this genus may be distinguished at once from all the others by their deep glossy black wings, like ravens' plumes, and their tegulæ, which, though very hairy, do not expand so much as usual at the tips.

Larva with sixteen equal feet; smooth, cylindrical, very much attenuated posteriorly, without protuberances; head thick, lenticular. Lives on trees.

Pupa obtuse anteriorly, very acute posteriorly, without efflorescence; subterraneous.

- 1. A *SQUAMULARIS*, *Drury*.—*Walk.* *C. B. M.*, *Noct.* xiii. 1075.
Coracias, *Guén.* *Noct.* iii. 19.

Wings glossy coal-black, tinged here and there with dun-coloured brown; anterior with several parallel and undulating dull black lines, the last one usually most distinct, and sometimes relieved by some whitish scales. Reniform spot indistinct, but followed by a group of yellowish-white scales. A terminal series of small black points with whitish tips.

Posterior wings with a brownish streak between the sub-median and

fourth inferior nervures, and the costa broadly tinged with the same colour.

Under side grey, shining, with one or two indistinct lines.

Female similar above, but with the under side quite dull, and of a more reddish-grey colour, transverse line more distinct.

Alar expansion 1.4 inch. Larva on oaks.

Hab.—N. America; Georgia. In May.

2. *A. CORNIX*, Guén.—*Noct.* iii. 19, pl. 15. Walk. *C. B. M.*, *Noct.* xiii. 1075.

Very like *A. squamularis*, from which it chiefly differs in the palpi, the third joint of which is, in this species, very short and hardly discernible, whereas it is rather long and linear in the former. The wings are more varied with brown; the marginal streaks are larger, longer, and almost confluent.

Hab.—North America.

Gen. 2. PHÆOCYMA.—Hübner.

Antennæ long; in the male crenulate with very short cilia. Palpi vertical, rather slender; third joint long, erect, linear, obtuse. Head small; eyes in the female very small, and approximate. Thorax globose, with very divergent tegulæ. Abdomen smooth, acute, a little depressed, slightly keeled, with fine crests. Wings alike in colour, denticulated: anterior pointed at the tips, with the ordinary spots distinct; posterior with few markings.

P. LUNIFERA, Hübner.—Guén, *Noct.* iii. 3, pl. 15. Walk, *C. B. M.*, *Noct.* xiii. 1045.

“Wings greyish testaceous. Anterior covered with small black transverse streaks; base deep brown, well defined, clouded with blackish. A similar apical spot, pointed, and black at the tip. Elbowed line well marked, fine, and undulating. Reniform spot crescent-shaped, russet yellow colour; orbicular represented by a black dot which is placed upon a large transverse space of clear grey. Posterior wings with a subterminal brown band, traces of another above, and the terminal border much streaked. Under side clearer, with a lunule, and a fine central undulating line. Female larger and a little more sombre.

Alar expansion 1.3 to 1.5 inch.

Hab.—Georgia, Florida.”

Gen. 3. HOMOPTERA, Boisd.

Antennæ much more than half the length of the body : crenulate, with small bunches or whorls of hairs ranged regularly on each side of the stem in the male ; in the female these hairs are simple, short and remote. Palpi vertical ; second joint slightly recurved ; third a little shorter, linear, flattened, slightly obtuse. Proboscis moderately long. Thorax robust, large, hairy, quadrate, with the tegulæ long, flattened, hairy, and divergent at the tips. Feet hairy in the male, the intermediate thighs very thick, and densely clothed with long hairs exteriorly. Abdomen stout, slightly flattened, with a large flat crest at the base, and very small ones on the following segments. All the wings of uniform colour, and with similar markings : the anterior straight along the costa, rounded at the tips, rather oblique and slightly convex on the exterior margin.

Larva smooth, elongate, narrowed anteriorly ; head small ; a bifid protuberance on the eleventh segment ; sixteen feet, of which the first pair are membraneous, shorter than the rest, and unfit for progression. *Pupa* formed within a slight cocoon among leaves ; obtuse anteriorly, conical and pointed posteriorly, covered with a blueish-white, or pale violet efflorescence. (*Guén*)

Most of the species of this genus are found in their perfect state during the end of May and beginning of June ; some few however, do not appear till August and September. They come freely to sugar at night, and may be captured in the day time reposing on the under side of the cross-beams of fences, and in similar sheltered positions. All the species known to inhabit the extra-tropical regions of North America, not including Florida, are, with one exception, found in Canada, and no doubt others will be met with when the mode of capturing by sugar is more generally adopted by Entomologists throughout the country. Two of the new species have been thus discovered during the early part of the present season.

SYNOPSIS OF CANADIAN SPECIES.

A. Size large.

B. Wings blackish.

C. Wings with exterior margin paler. 1. *H. calycanthata*, *Smith*.

CC. Wings with no paler margin. 2. *H. nigricans*, *Bethune*.

BB. Wings more or less wood-brown colour.

D. Disk of thorax, black. } 3. *H. lunata*, *Drury*.
 } 4. *H. involuta*, *Walk*.

DD. Disk of thorax not black.

E. Wings with a white or glaucous marginal fascia.

F. Reniform spot distinct. 5. *H. minerea*, *Drury*.

FF. Reniform spot obsolete. 6. *H. edusa*, *Drury*.

EE. Wings without a white marginal fascia.

G. Anterior wings without white bands. 7. *H. Saundersii*,
Bethune.

GG. Anterior wings with two white bands. 8. *H. albo-*
fasciata, *Bethune*.

BBB. Wings dark cinereous. 9. *H. duplicata*, *Bethune*.

AA. Size small.

H. Wings ferruginous. 10. *H. contracta*, *Walker*.

HH. Wings whitish cinereous. 11. *H. herminioides*, *Walker*.

1. HOMOPTERA CALYCANTHATA, Smith. Guén. *Noct.* iii. 15.
Walk. C. B. M. Noct. xiii. 1054.

Glossy coal-black; cinereous beneath. Antennæ brown. Tegulæ tipped with brownish. Wings deep glossy black, with a broad whitish border on the exterior margin, thickly speckled with black and brown scales. Anterior wings with the ordinary lines, fine, undulating, deep velvety-black. Reniform spot indistinctly margined with the same. A paler costal spot adjoining the exterior side of the extra-basal line, and another just before the elbowed line. The pale border forms two deep well-defined sinuses on these wings, but is not crossed by a shade in the middle, as in most of the other species. Posterior wings, with the costa as well as the exterior margin, broadly paler; the remainder of the wing deep black, without markings. Under side, with obscure lines and streaks, and a darker shade corresponding to the black part of the wings above. Length of the body, 6 in.; alar expansion, 1.6 in.

Hab. Cobourg, captured at sugar, in June. London, C. W. (Mr. Saunders). U. S.

The larva is thus described by M. Guénée:—Cinereous-grey, clouded with whitish and blackish, with the usual lines blackish; the sub-dorsal doubled, continuous, but only on the first three and last seven segments; the stigmal surmounted by very oblique black marks. A small ochre-coloured spot between the fourth and fifth segments; these two, and also the second, third, and sixth, are

sprinkled here and there with black marks, of which some have the centre white. Spots on the eleventh almost horizontal. Abbot figures it on the *Calycanthus floridus* (Carolina allspice), but it lives also on oaks. Pupa, red, without efflorescence.

2. II. NIGRICANS, Bethune. *Pro. Ent. Soc. Philada.* iv. 214.

Black, with a deep purplish-brown tinge, cinereous beneath. Thorax, black, brownish in front, where it is crossed by two narrow black lines; tegulæ also crossed by two lines composed of pale atoms, the hinder one edged with deep black. Anterior wings, deep brownish-black, darkest along the costa; the two basal lines double, black, distinct, the outer one followed by a slightly paler band; median space, brownish-black, deepened by three tolerably distinct, transverse, wavy black lines; elbowed line very distinct, undulating, narrow, and deep black, its posterior half doubled; sub-terminal line, pale fuscous, with some scattered glaucous atoms for half its length, then deep velvety-black and doubled, forming, as is usual in this genus, a large lunule; a marginal series of pale fuscous lunules, edged interiorly with a darker shade; orbicular spot denoted by a black dot; reniform, black, indistinct, with a small whitish spot on its under side.

Posterior wings, of the same general colour as the anterior, but becoming gradually paler towards the base, which is cinereous; median portion of the wings crossed by a number of dark, wavy, tolerably distinct lines, terminated by a very fine black line; terminal portion of the wing enclosed by a deep velvety-black line, a continuation of that on the anterior wings, edged with fuscous exteriorly, and followed by a blackish band, speckled with glaucous atoms, and a series of lunules as on the anterior wings.

Under side, cinereous, darker towards the exterior margin; anterior wings with a black discal dot, a faintly indicated transverse line, and a series of marginal dots between the nervures, black, edged with white; posterior wings with a black discal lunule, three very wavy black lines, the outer one almost obsolete anteriorly, and a marginal series of black white-edged dots.

Length of body, .19 in.; alar expansion, 2.3 inches.

Hab. Toronto; in August.

3. H. LUNATA, Drury. Guén. *Noct.* iii. 19. Walk. *C. B. M.* xiii. 1053.

Wood-brown, varied with deep blue-black. Antennæ and palpi,

brown. Thorax, brown, and with a black line in front, wholly black on the disk, with a few cinereous scales. Abdomen, brownish, with a black spot on the last segment. Anterior wings, wood-brown, clouded with black, darker on the costa and at the base. Extra-basal line doubled, and generally becoming lost in the costal shade; median space traversed, as far as the reniform spot, by several vague undulating brownish-black lines, which are sometimes concealed by a black cloud across the wing; remainder paler. Reniform spot, deep blue-black, well defined, often with a whitish dot adjoining it posteriorly; orbicular represented by a black dot. Elbowed line, fine, black, very undulating anteriorly, almost straight posteriorly, occasionally obsolete; subterminal line, obsolete anteriorly, posteriorly deep velvety-black, followed by a broad blue-black line, which forms a large arc, enclosing a paler black-speckled space. Subapical spot, deep black; a marginal series of black points edged exteriorly with white.

Posterior wings with a black discal dot; two or three transverse wavy dark lines; two fine velvety-black lines, followed by a similar black arc to that on the anterior wing; terminal space covered with black streaks. Under side of both wings cinereous, with indistinct discal lunules, and an infinity of obscure streaks; in some specimens with well defined transverse black lines.

Length of body, .5 to .7 in.; alar expansion, 1.7 to 1.9 in.

Hab. Cobourg; at sugar and in repose, during the end of May and beginning of June. London (Messrs. Saunders and Reed). Montreal (Mr. D'Urban). United States. St. Domingo.

Larva, "whitish, clouded with grey, with the vascular and the subdorsal lines blackish, interrupted. The posterior incision of the fourth segment has a large yellow spot, surmounted by two black *omicrons*. A small yellow spot in the incision of the sixth; the seventh is partly occupied by a large grey space; the first three have each a black mark instead of the stigmatal line. Feet and head of the same colour as the body; the head with some black marks also. Pupa entirely covered with a lilac or violet efflorescence. The food-plant which accompanies Abbott's figure is a *Hypericum* (St. John's Wort), but it feeds also on oak, ash, and plum trees. It forms its chrysalis between leaves."

4. II. INVOLUTA, Walk. *C. B. M. Noct.* xiii. 1055.

"Wood-brown colour, minutely speckled with black. Thorax with a slender black band in front. Fore tarsi, black, with pale bands.

Fore wings with the lines much like those of *H. lunata*, to which this species is very nearly allied, but may be distinguished by the two distinct exterior, black undulating lines; three large blackish costal patches; first and second, diffuse; third, more defined, and with some pale dots in front; a large diffuse blackish spot by the middle of the exterior margin; marginal streaks with whitish tips. Hind wings with some paler lines. *Var. B.*—Darker. Hind wings with the pale lines hardly apparent. *Var. C.*—Fore wings much paler, with the exception of the costal patches, and two irregular and incomplete blackish bands. Length of the body, $6\frac{1}{2}$ – $7\frac{1}{2}$ lines; of the wings, 18–20 lines. *Hab.* United States.”

The foregoing description, by Mr. Walker, is hardly sufficiently definite to enable one to determine the species with certainty. I have in my possession two Canadian specimens, which agree pretty well with his description of *H. involuta*, but from a comparison of sixteen specimens from the United States and different parts of Canada, I am led to think that they are merely varieties of *H. lunata*; the only palpable differences being that in one the thorax is entirely brown, and in both the blue-black subterminal band is wanting on the posterior wings, though pretty well marked on the anterior.

5. *H. MINEREA*, Guén. *Noct.* iii. 15, pl. 18. Walk. *C. B. M. Noct.* xiii. 1054.

Ferruginous wood-colour, sometimes ochraceous, and sometimes with a purplish tinge. Thorax, brown, with a black line in front, and a black and cinereous band posteriorly. Anterior wings with the base dark-brown, crossed by some white lines, as far as the extra-basal line; then a pale transverse band, composed of cinereous, glaucous, and sometimes ochraceous scales; the remainder of the median space is almost entirely of the dark ground colour of the wing, which varies from ochraceous to ferruginous-wood colour, and sometimes deep purplish-brown. Reniform spot tolerably distinct, blackish-brown; orbicular represented by a black dot opposite the reniform. Subterminal line, black, well-defined, parallel to the elbowed for half its length posteriorly, then divergent towards the apex, forming, by means of the black shade in the middle of the exterior margin, two large arcs, which enclose white glaucous-flecked spaces. A series of black marginal streaks, and a brownish-black apical spot.

Posterior wings, with the basal portion pale, speckled with black and glaucous scales; a black discal dot; two fine black undulating

lines, corresponding to those on the anterior wings, the posterior one forming a V in the cellule, and enclosing a large terminal glaucous and white space, flecked with black streaks, which are more numerous exteriorly.

Under side, brownish-cinereous, with the discal lunules generally well-defined, several more or less distinct transverse lines, and a marginal series of black dots. Length of the body, .6 to .7 inch.; alar expansion, 1.7 to 1.9 inch.

Hab. Cobourg; not uncommon, at the same time as *H. lunata*. Quebec (Mr. Saunders). York Mills (Dr. Cowdry).

Larva, "clear cinereous-grey, clouded with white in places, with the ordinary lines festooned and interrupted, and the points blackish. Between the fourth and fifth segments there is a large citron-yellow spot; in the anterior part of the fourth and seventh a blackish spot, marked with white dots. Dots on the eleventh, blackish, with a lateral mark of the same colour. Head and feet of uniform colour with the rest of the body. On oak and iron-wood. Pupa covered with violet dust."

6. *H. EDUSA*, Drury. Guén. *Noct.* iii. 14. Walk. *C. B. M. Noct.* xiii. 1054. *Putrescens*, Guér. *Regne Animal*.

Wood-brown. Thorax with a black band in front, and some black and cinereous scales behind; tegulæ hooked at the tip. Wings, wood-brown, slightly clouded, and streaked with darker; anterior with an ill-defined greenish-white fascia, including a black discal dot after the extra basal-line; a white point on the inferior side of the reniform spot, which is obsolete; elbowed line, black, very wavy, indistinct; subterminal, deep black, well-defined posteriorly, and forming two large greyish or blueish-white lunules; a terminal series of thick brown spots, often confluent. Posterior wings with some indistinct lines across the middle; a deep velvety-black line, corresponding to the subterminal on the anterior wings, and forming a similar large blueish-white lunule, followed by a similar series of marginal spots. Under side, cinereous-grey, with discal lunules, and some indistinct lines. Length of body, .8 inch.; alar expansion, 2.2 inch.

Hab. Cobourg, in September. United States.

Larva, "flesh-colour, with all the lines interrupted, festooned, blackish; the trapezoidal and lateral of the same colour, as well as the two spots on the eleventh segment; between the fourth and fifth segments there is a large orange spot, and upon the back of the fourth

two blackish circles, which include the trapezoidal. Head and feet of the same colour. On the '*Verge d'or*,' and, probably, on oak; turns towards the middle of September; probably double-brooded. Pupa entirely covered with a blueish efflorescence."—(*Guén.*)

7. H. SAUNDERSII, Bethune.—*Proc. Ent. Soc. Philada.* iv. 215.

Brown wood-colour, brownish-cinereous beneath. Thorax with a narrow black line in front; tegulæ with alternate black and whitish bands. Abdomen brown wood-colour (or the colour of an ordinary dead leaf). Anterior wings of the same general colour; basal portion dark brown, with the usual lines whitish, margined with black; median space paler, yellowish posteriorly, with a pale band proceeding from the costa half-way across the wing, composed of whitish atoms and enclosing a black discal dot, then two zigzag brown lines, well defined anteriorly, touching the reniform spot, which is black and tolerably distinct, the remainder of the median space brownish with a few dark scales scattered over it; elbowed line fine, very undulating, distinct, deep black, edged exteriorly with pale brown; subterminal line wavy, bluish-white, with its outer edge black; a black apical streak, and another in the middle of the exterior margin; a marginal series of tiny brown lunules.

Posterior wings cinereous-brown; basal portion with no markings except a small black discal spot; median space occupied by five transverse dark slightly wavy lines, the outer one black and very fine; terminal portion enclosed by a black velvety line, edged with yellow exteriorly, followed by a bluish-white line in a black shade, the large lunule thus formed is covered with minute flecks of black; a marginal series of lunules as on the anterior wings.

Under side of both wings brownish-cinereous; with a black discal lunule, preceded by a black dot in the anterior wings, a transverse wavy black line, and a marginal series of black dots; posterior wings with an exterior transverse line also, which is almost obsolete until it approaches the anal angle.

Length of body, .80 inch. Alar exp. 2 inches.

Hab.—London, C.W. (Coll. Mr. Wm. Saunders.)

8. H. ALBO-FASCIATA, nov. sp.

Whitish, streaked and speckled with brown. Thorax brown, with an imperfect black band in front, and some cinereous scales posteriorly. Abdomen white, with a few black scales; the basal tuft brown, and a small black spot at the tip. Anterior wings streaked and spotted with

black and brown as far as the extra basal line, which is thick, brown, and irregular, and is followed by a white fascia, enclosing a rather large black discal dot; median space streaked and clouded with brown; reniform spot blackish-brown; elbowed and subterminal lines fine, doubled, parallel, and well-defined posteriorly, but losing themselves anteriorly in a dark costal patch; the elbowed thickened into a black spot opposite the reniform; immediately succeeding the subterminal, a pure white slightly wavy fascia running across both wings, and followed by a brownish-black parallel band; a series of black marginal dots on a paler space.

Posterior wings whitish, with a small discal dot, a few indistinct transverse lines, and a well-defined brown black-edged line corresponding to the sub-terminal on the anterior wings, the marginal dots rendered obscure by a number of black and brown streaks. Under side whitish-cinereous, with discal lunules, a dark transverse line, a marginal series of black dots, and a second discal spot on the anterior wings. Length of body, .6 inch; alar expansion, 1.75 inch.

Hab.—Cobourg; May and June, at sugar.

This species bears a considerable resemblance to *H. minerea*, but may be distinguished by its much paler colour, and the sub-marginal white fascia and black band, instead of the two large terminal glaucous-white lunules.

9. *H. DUPLICATA*, nov. sp.

Blackish-cinereous, male darker; female clouded with tawny or ferruginous. Thorax with a fine black band in front; tegulæ tipped with ferruginous. Anterior wings with all the lines distinct, black; extra-basal with a sharp denticulation just below the costa, then slightly sinuous; elbowed, with two nearly rectangular denticulations anteriorly, irregularly curved posteriorly; subterminal forming two regular arcs which unite in the middle in a sharp denticulation. Across the middle of the median space, which is slightly paler than the rest of the wing, there is an irregular dark band edged with black, and enclosing the deep black reniform spot (in some specimens this band is almost obsolete, and in the male quite so). Marginal space paler, covered with numerous black dots and streaks, but not divided by the usual shade in the middle.

Posterior wings cinereous, with a dark brown black-edged submarginal band commencing at the anal angle, where it is elbowed, thence straight across the wing, but becoming obsolete before it reaches the costa; faint traces of another above. Under side of both wings cine-

reous, with discal lunules, and two tolerably distinct transverse black lines. Length of body, .5 to .6 inch; alar expansion, 1.6 inch.

Hab.—Cobourg; beginning of June. Toronto (Dr. Sangster). London (Mr. Reed).

10. *H. CONTRACTA*, Walk—*Can. Nat. and Geol.* v. 258. (August, 1860.)

“*Female.* Ferruginous-brown, cinereous beneath. Palpi curved, slender, obliquely ascending, rising higher than the head; third joint lanceolate, about half the length of the second. Wings with black undulating lines; interior line double, the intervening space partly black; middle line dentate, much dilated on the costa; exterior line pale-bordered; marginal points black. Fore-wings with two basal lines. Length of the body, 4 lines; of the wings, 11 lines.”

Hab.—Montreal, (Mr. D’Urban). Middle of July.

11. *H. HERMINIODES*, Walk — *Can. Nat. and Geol.* v. 259.

“*Female.* Whitish-cinereous, slender. Palpi very slender, rising higher than the vertex; third joint lanceolate, full half the length of the second. Wings with four zigzag lines; interior and exterior lines black, much more distinct than the other two which are cinereous; fringes with blackish points. Fore-wings with black orbicular and reniform marks, the former small, the latter large, full. Length of the body 4 lines; of the wings 10 lines.”

Hab.—Montreal, (Mr. D’Urban). July.

12. *H. OBLIQUA*, Guén.—*Noet.* iii. 16., pl. 15.

Wings very little denticulated, slightly reddish-cinereous, clear, clouded here and there with whitish. A thick spot of ferruginous-red in the place of the reniform. Subterminal line fine, sinuous, well-defined only in the inferior half of the wing, and preceded by a line still more fine and vague. On the inferior wing a similar broad line, curved, with an exterior narrow border of a clear colour; these lines are ferruginous-red. Some black atoms on the terminal space. Under side very clear reddish-grey, without markings. Palpi slender. Feet almost smooth. Alar exp. 1.6 inch.

Hab.—North America.

A supposed variety of this species, from Canada, is thus described by Mr. Walker, (*C. B. M. Noct.* xiii. 1054):—“*H. obliqua*, var.? Wood-colour; thorax varied with fuscous, and with an anterior black

fascia ; wings fuscous, partly wood-colour ; the margin of the reniform spot black ; the transverse oblique undulating lines also black. Anterior wings with a broad interrupted pale fawn-colour marginal fascia.

Hab.—Orillia, (Mr. Bush)."

The following species is found in the United States, and many occur in Canada :—

13. II. LINEOSA, Walk.—*C. B. M. Noct.* xiii. 1056.

"*Male.* Fawn-colour, cinereous beneath. Thorax with a black band in front, and with a black mark on each of the tegulæ. Abdomen cinereous. Fore-wings with alternate oblique black and pale fawn-coloured bands from the base to beyond the middle, from whence to the tips the pale hue is only interrupted by slender parallel undulating bands, which enclose between them a black glaucous-flecked costal patch ; a row of black marginal dots. Hind wings much like the fore wings, but wholly pale towards the base, and with a slight exterior glaucous band. Length of the body 7 lines ; of the wings 20 lines.

Hab.—United States."

Gen. 4. YPSIA, Guén.

Body stout. Antennæ more than half the length of the body. Palpi ascending, compressed ; third joint rather less than half the length of the second, obtuse, cylindrical. Proboscis moderate. Thorax quadrate, with hairy tegulæ, divergent at the tips. Antennæ and abdomen as in *Homoptera*. Wings rather broad, slightly denticulated : anterior almost rectangular at the tips, with the subterminal line continuous, and not forming two arcs.

Larva elongate, moniliform, without protuberances ; feet all equal ; head rather robust. Pupa not efflorescent.

1. Y. ÆRUGINOSA, Guén.—*Noct.* iii. 17. pl. 18. Walk. *C. B. M.*, *Noct.* xiii. 1074.

Wings deep blackish-brown, with a common reddish-gray or clear violet ambiguous band, traversed by three lines, of which the intermediate is most marked and blackest. Extrabasal slightly marked, and followed by a band of clear green atoms, marked by a black dot in the cell. A group of similar atoms instead of the ordinary spots, the middle one of which is sometimes marked by a black dot. Terminal space of the same general colour as the rest of the wing, but thickly

powdered with the green atoms; a series of black dots before the fringe. Under side dirty grey, covered with brown atoms, with a discal lunule and some traces of brown lines; a black point near the anal angle. Thorax, palpi, and abdomen concolorous.

Alar expansion 1.75 inch.

Larva "entirely clear green without any markings; head tolerably thick, of the same colour; feet slightly yellowish-green. It has no protuberances; and all its ventral feet (as is characteristic of this genus) are equal and moderately long. On 'swamp dog-wood.' Pupa obtuse anteriorly, with the abdomen very conical and ending in a fine point; clear red, without any efflorescence.

Hab.—North America. In April.

2. *Y. UNDULARIS*, Drury.—Guén, *Noct.* iii 18. Walk, *C. B. M.*, *Noct.* xiii. 1074.

Wings coal-black, with a great number of undulating lines as far as the subterminal, and of streaks on the terminal space, all very dull black; subterminal moderately thick, swollen at both ends, and interrupted opposite the cell by three white spots sullied with brown scales; reniform spot formed by some black lines, twisted, open at both ends. Posterior wings with a black line which forms a continuation of the subterminal, relieved below by some white atoms, and surmounted by another much finer line.

Under side of both wings clear testaceous-brown, with a multitude of blackish streaks and scales, but without any definite markings; a line on the hind wing indicated, however, near the anal angle, where it is relieved by a little white. Palpi black, with white tips. Alar expansion 1.75 inch.

Hab.—North America. New York.

REVIEWS.

CANADIAN CANALS*.

Notwithstanding the slight encouragement given by the Province generally to works of Canadian authorship, it is gratifying to record the issue, within the last few years, of several Canadian works of undoubted and acknowledged merit. Amongst these, Mr. Kingsford's recent book on our Canals, published at so opportune a moment, may fairly claim its place. Impartially and honestly written, filled with facts and data laboriously collected and carefully put together, and containing many well-timed suggestions for future action, based on past errors and present exigencies, it cannot fail, we think, to win for itself a wide and favorable reception. Apart, moreover, from its special merits, it is the only book to which we can turn for any connected information respecting this branch of the internal economy of the country.

The subject of our canal policy is one of such paramount importance in the present state of our commercial and political relations with the mother country and the United States, whilst, at the same time, so little attention has been bestowed upon it by general readers, that we propose, in this notice, to offer a brief analysis of its principal facts and bearings, as set forth in the very lucid exposition contained in Mr. Kingsford's work.

Undoubtedly, the most salient feature in the geography of Canada is the immense extent of the St. Lawrence River, with its connected series of lakes, all forming part of one vast system of inland navigation, without its parallel in any other part of the world. Were it not for a few natural obstacles—comprising, chiefly, the flats of St. Clair, the Falls and other obstructions of the Niagara River, and the shallows and rapids of various parts of the St. Lawrence proper—the entire line of the more habitable frontier of the Province would be practically one unbroken seaboard. Ships of heavy tonnage, in place of being arrested at Quebec and Montreal, might continue their western course for another thousand miles; and, returning to the shores of Europe, carry back a direct freight,

* The Canadian Canals: their History and Cost; with an Inquiry into the Policy necessary to advance the well-being of the Province. By WILLIAM KINGSFORD, Civil Engineer. Toronto: Rollo & Adam. 1865. 12mo. pp. 191.

untouched and undisturbed, from the rich metallic deposits and teeming granaries of the West*. If this condition of things could be realized—if Kingston, Toronto, Hamilton, and the other cities of our western lakes, could be thus placed, as it were, upon the actual seaboard—it is impossible not to admit that an extraordinary impulse would be imparted to them, commercially and generally, superinducing a rate of progress hitherto, as regards western Canada, entirely unknown. The attempt to produce this state of things, by the deepening of shallow places, and the construction of canals at various points, has indeed been made; but the work has stopped far short of actual fulfilment. This has arisen from no inherent difficulties, such as would render the scheme impossible, but from a variety of accidental causes, some no longer existing, and none possessing any actual power to arrest the work, if western voices persistently and collectively demand its accomplishment. Failure has occurred hitherto, in many instances at least, from early errors and mismanagement in the construction and supervision of the canals and other engineering works resorted to for the purpose of overcoming the natural obstacles to our inland navigation; and more especially from the now self-evident fact that the original promoters of these works failed to foresee, or to make provision for, the ultimate requirements of the Province. To these causes must be added the general apathy of the west in reference to all but local interests; the changed current of ideas occasioned for a time by the rise of our railway system; and, above all, the active, uncompromising jealousy of eastern cities, bent upon retaining, as long as possible, the special advantages which they now enjoy.

Following the arrangement adopted in Mr. Kingsford's book, we may discuss our existing canal systems under the following heads:

* "The interior of North America is drained by the St. Lawrence, which furnishes for the country bordering on the Lakes a natural highway to the sea. Through its deep channel must pass the agricultural productions of this region. The commercial spirit of the age forbids that international jealousy should interfere with great natural thoroughfares, and the Governments of Great Britain and the United States will appreciate this spirit, and cheerfully yield to its influence. The great avenue to the Atlantic, through the St. Lawrence, being once opened to its largest capacity, the laws of trade, which it has never been the policy of the Federal Government to obstruct, will carry the commerce of the North-west through it."—Report of Commissioners appointed by the State of Illinois, in 1863, to communicate with the Canadian Government on the subject of our canals. In referring to this Report, Mr. Kingsford observes (p. 168): "It is estimated that from the State of Illinois alone, there has been shipped annually, for the last ten years, a surplus of food sufficient to feed ten millions of people, and, at the same time, there has been a positive waste from the inability to bring the crops profitably to market."

(1) the Chambly Canal; (2) the Rideau Canal system; (3) the St. Lawrence Canals; and (4) the Welland Canal. The Chambly Canal was constructed to avoid the long stretch of rapids between St. John's and Chambly, which presents between these points a total difference of level of 74 feet; but viewed in its complete relations, or in connection with the River Richelieu, Lake Champlain, and the Whitehall or Champlain Canal of New York, it may be said to unite the waters of the St. Lawrence with those of the Hudson. Although first devised by a private company in 1819, the work was finally constructed by government, its commencement dating from the latter end of 1831, and its actual completion—a delay having arisen from the exhaustion of the sums allotted for its construction—from November, 1843. The total cost, up to its day of opening, was \$480,816. Its length is $11\frac{1}{2}$ miles; and it contains nine locks of 124 feet by 24, with a depth of 6 feet on the sills. The Saint Ours lock and dam, on the Richelieu, 12 miles above Sorel, properly forms part of the Chambly Canal system. This work was finished in 1849, at a cost of \$114,554. Its object was to remedy the comparative shallowness of the river, and to increase the supply of water to the canal. In 1863, the canal and lock together seem to have yielded a net revenue of \$9,500, or somewhat less than 2 per cent. upon the actual cost. To improve the limited capacity of this canal, or to open a more ready communication between the upper St. Lawrence and New York via the Hudson River, several projects have been devised. These comprise: (1) An enlargement of the existing canal with an increased elevation of the dam at Saint Ours to the height of 4 feet, so as to ensure 10 feet of water in the Richelieu at all seasons: estimated cost, \$2,016,080.—(2) The construction of a canal from Longueuil, immediately opposite Montreal, to St. John's: estimated cost, \$3,473,360.—(3) The construction of a canal from Caughnawaga, nearly opposite the terminus of the railway at Lachine, to St. John's, with the Champlain level as a summit; length, $34\frac{1}{2}$ miles, with three locks: estimated cost, \$3,706,230.—(4) The construction of a canal from Caughnawaga to St. John's, supplied by a navigable feeder from the St. Lawrence; length $25\frac{1}{2}$ miles, with eight locks: estimated cost, \$4,267,890.—(5) The construction of a branch in connexion with the existing Beauharnois Canal, running from Beauharnois to St. John's, 37.66 miles, and descending to the Champlain Canal by three locks: estimated

cost, \$3,369,400. These estimates assume a width of canal, at bottom, of 80 feet. The locks are assumed to measure 230 feet by 36 feet, with a depth of 10 feet of water on the sills. Although these projects refer entirely to the eastern section of the Province, they are not, in the estimation of their promoters, without important collateral bearings upon western trade. Mr. Kingsford discusses this question very thoroughly; and as his views upon the subject, although differing from those generally advocated, appear to be based upon much patient inquiry, and to be free from anything like special pleading, we lay them before our readers, in his own words:—

“The objects proposed by the Canal are two fold :

I. “To compete with the Erie Canal, both by the route at its entrance at Buffalo, and *via* Oswego; and to create facilities for vessels from the upper lakes to pass down the Saint Lawrence, through the proposed Caughnawaga Canal to Lake Champlain, and thence to New York. Likewise to ensure an easy and cheap communication for vessels freighted with wheat and other grain for the Eastern States, to connect with the Boston Railway at Burlington.

II. “To provide an improved communication for the Ottawa lumber trade, and its consequent business with New York and the Eastern States.

I. “It may be remarked that the destination of a vessel will be determined before it leaves Lake Erie; and that consequently few occasions will arise, when a vessel passing through the Saint Lawrence Canals, within a few hours of Montreal, would seek the New York Markets.

“The distance from the east of Lake Erie by the Erie Canal to Albany, entering at Buffalo, is 352 miles.

“*Via* Oswego by Welland Canal it is :

“ By Welland Canal.....	28 miles.
“ Lake Ontario to Oswego.....	138 “
“ Oswego Canal to Syracuse.....	38 “
“ Erie Canal from Syracuse to Albany.....	166 “
	<hr/>
Total.....	370 miles.

“Being 232 miles Canal navigation.

“ 138 “ Lake “

“By the Saint Lawrence it is as follows:—

“ By Welland Canal.....	28 miles.
“ Lake Ontario to Kingston.....	160 “
“ Kingston to Caughnawaga:	
“ River Navigation.....	132 miles.
“ Canal	35 “
	<hr/>
	167 “

Carried forward..... 355 miles.

Brought forward.....	355 miles.
" By Caughnawaga Canal.....	25½ "
" River Richelieu to Rouse's Point.....	23 "
" Lake Champlain to Whitehall.....	111 "
" New York Champlain Canal to Albany.....	73 "
	587½ miles.

" Being 161½ miles Canal navigation.

" 426 " Lake and river navigation.

" We observe by this comparison that by far the shortest route for a vessel from Albany to the Upper Lakes is by the Erie Canal: accordingly, there must be manifest advantages in other respects to counterbalance the fact, that to reach the foot of Lake Erie by Lake Champlain and the Saint Lawrence, 217 miles additional distance must be travelled. On the other hand we must remember that there would be 70½ miles less canal navigation than by way of Oswego. Therefore with the greater distance, the Champlain and St. Lawrence route, if admitting the passage of vessels of greater tonnage, would be preferable. For quicker trips could be made, and from the increased capacity of the vessel, the greater cargo, with the relative less expense, would bring more profit to the forwarder. Moreover a vessel of this character could discharge at New York, and avoid the delay and cost of transshipment at Albany entailed upon vessels passing through the Erie Canal. The limited accommodation of the New York Champlain Canal* is a bar to the establishment of the trade. Were the enlargement of this Canal an admitted necessity, and it were at once to be undertaken, the route

*"The length of the Champlain Canal from Whitehall to its junction with the Erie Canal at West Troy is 66½ miles; continuing by the latter to Albany the distance is increased by 73 miles. It is supplied by a feeder from the upper waters of the Hudson at Glen's Fall, 282 feet above the tide water at Albany—7 miles long having 13 locks. The summit level of the Canal is 150 feet above tide water.

" The up lockage from junction with Erie Canal at West Troy to summit level at Fort Edward is.....	125½ ft.
" The Erie Canal level below that point is.....	24½ "
	150
" The down lockage from east end of summit level at Fort Ann to Whitehall is...	54½
" Accordingly the elevation of Whitehall above tide water at Albany is.....	95½ ft.

" The locks are 20 in number, and 90 ft. by 15 ft. in size, with 4 ft. water on the sills. The only vessels which navigate this Canal are the old fashioned Canal boats towed by horses.

" The height of Lake Champlain is here given according to the authority of American Engineers. But it is proper to mention that it is not authenticated by Canadian experience, which places it no higher than 84 feet. That this discrepancy arises from error, is proved, independently of its magnitude, by the fact, that while the Americans taking tide water at Albany as a datum make Lake Erie 665 feet above it, the Canadians taking tide water at Three Rivers as a basis make Lake Erie 564½ feet higher, which would go to shew the not unimportant fact in physical geography that the Saint Lawrence at Three Rivers and the Hudson at Albany are at about the same level. I am not aware that this fact has been previously published, and I owe it to Mr. Walter Shanly, that I can state it here. It may be added that this matter has been somewhat closely investigated by us, and the opinion is strongly entertained that the error does not lie on our side.

would then assume a character which it has not at present, and the Caughnawaga Canal would be a definite link of it. The necessity of the construction of this work could then be urged. But it can scarcely be hoped that the New York Legislature would desire to encourage an improvement which would create a formidable opposition to the only great state work which it has to protect by legislation. The Saint Lawrence has already proved a formidable rival to the New York Canal system, and it seems there is no interest, particular or local, which would be powerful enough to carry any measure at all injurious to the Erie Canal. Besides, in estimating the chances of realizing any project, we must consider the outlay it involves; and certainly to increase the sixty-seven miles of the New York Canal to the size of the proposed improvement of the Saint Lawrence Canals would exact an expenditure of from twelve to fifteen millions of dollars.

"It is convenient to state in this place the opposite view. The advocates of the construction of the Caughnawaga Canal totally independent of the improvement of the Whitehall navigation, argue in its favour with much ability. They contend that it would at once take the Western grain trade both for the Eastern States and for New York.

"The New England States form the great mart for Western produce, which now finds its way through the Erie Canal by Buffalo and Oswego, to New York; whence it generally passes by water to Boston and other ports on the north-east coast. What is not taken by water is distributed by railway. It is argued that the imperfections of this route are such, that were facilities given to reach Lake Champlain, that route would be followed to Burlington—a distance by railway from Boston 248 miles—at which point a transshipment would be made to the rail of the cargo or cereals; the propeller at once obtaining return freight of New England manufacturers for the west. A comparison of time is made in order to shew that the 20,000 bushels of wheat or 6,000 barrels of flour would be at Boston long before it had even passed through the Erie Canal; and under one phase the favorable estimate is not to be disputed. But the element of time in this instance is of secondary consideration. Yet are we so sure if a heavy railway traffic of flour and grain passed over the railway there would be no delay? If the transfer were direct from the propeller to the wheat car there would be a certain guarantee of immediate transmission; it would however scarcely be possible to count upon that connection, and it is a legitimate inference that the natural period of the route would be much prolonged by circumstances. On the other hand the present mode of traffic warrants the opinion, that the forwarder of Western produce will cling to the water as long as he is able, unless compelled to abandon it under extremely unfavorable circumstances. But should he desire to transfer to the railway car his freight of breadstuffs for New England; would it not be profitable for him to do so at Ogdensburg—distant from Burlington by railway 158 miles? This line was built with Boston capital to gain that traffic, but it has not done so. It is true that the distance by the Caughnawaga Canal to the same point would be very little in excess of the railway, 220 miles, of which 69 will be by canal. I at once admit that of the two routes to Burlington the latter would be the best and cheapest; and taking in view the necessity of transshipment, the quickest. But I do not think that the comparison can be allowed to remain in this limit. From Burlington to Boston, *via* Vermont Central Railway,

is 248 miles, and it seems to me this extent of railway distance is the bar to the route as a whole; and that were the route to Boston *via* the Saint Lawrence and Burlington one advantageous to adopt, the transshipment from the propeller to the rail being a cost and necessity under any circumstances, it would be as profitable to take the rail at Ogdensburg as at Burlington. The presumption is at once rejected, on the ground that a comparison between Ogdensburg and Albany has a totally different relationship, to the comparison of transshipment at Albany with transshipment at Burlington. But is not the fact clearly stated, when we take into account the railway distance between the three points and Boston.

	MILES.
1. " From Ogdensburg to Boston	406
2. " From Burlington "	248
3. " From Albany "	200

" Side by side of which must be considered the peculiar water navigation of each route. Both at Ogdensburg and at Burlington a break of bulk will be avoided, one transfer of the cargo from the propeller to the railway being incident to each. Both at Buffalo and at Oswego the cargo is divided among smaller craft again to be re-handled in order to be put on the railway. It is contended that the less distance of railway carriage (158 miles) gives Burlington an immense advantage over Ogdensburg, and the one transshipment an equal preëminence over Buffalo and Oswego.

" I am aware that there is a great difference of opinion with regard to this matter: accordingly I have endeavored to present both sides of the argument. Many public men to whose opinions I attach great weight have implicit faith in the project, and consider it the first necessity of the many improvements. Such as these also affirm that even with the present dimensions of the Whitehall Canal, the New York trade would pass by the Lake Champlain route. The reasoning is parallel with that urged in regard to the New England States. That is to say, the greater bulk of cargo will admit of the longer distance. We must bear in mind that from Oswego there is 170 miles of Canal to Albany, and that before the 67 miles of the Whitehall Canal be reached 300 additional miles of navigation have to be passed over, of which 60 miles would be canal navigation, and that equally the bulk of the propeller's cargo must be broken at the end of both routes.

" I must say that to my mind the advantage lies on the side of Oswego to such an extent that every little trade would seek Lake Champlain.

If this reasoning be correct it follows :

1. " That until the Whitehall Canal is enlarged, the preferable channel from the upper Lakes to Albany is, in ordinary circumstances, by Oswego.
2. " That there is no ground to hope that the Whitehall Canal will be improved, and that in such a case competition with the Erie Canal is an impossibility.*

* " I advance this opinion on the ground of the great cost of the work, and the influence which western New York would bring against the project. I do not say that the vote of the State Legislature to carry this improvement would be the death warrant to the prosperity of Buffalo and Oswego, but it would most certainly injure them materially by changing the direction of the lake grain trade. On the other hand the cities on the line of the Erie canal, Rochester, Rome, &c., would perhaps be favourable to the scheme, as it would remove the pressure from the navy-

3. "That the balance of probability is not in favor of the supposition, that the grain freights to the Eastern States will take the Caughnawaga Canal to Burlington. Therefore, that the canal would be at the best, an experiment made at the cost of four millions, and concerning which opinion is much divided.

4. "It would therefore seem that the project possesses no positive and assured result beyond extending facilities to the Ottawa trade for New York and Boston. That it is desirable to have as direct a route as possible is a commercial axiom. But would the Country in its present condition be justified in expending \$4,000,000 to save at the most a couple of days to the vessels engaged in the trade. For the limit of the Whitehall Canal would still control the tonnage of vessels passing through it. All the lines pointed out have solid advantages, and much can be said in favor of nearly every location. Perhaps the route with a navigable feeder from the Beauharnois Canal with its special terminus at Caughnawaga may claim the preference. For evidently to lock down the difference of level between the River at Caughnawaga, and at Montreal again to lock up to the level of the Champlain Canal, can hardly be commended.

"The difference in distance from Lake St. Louis to Saint John's would be 16.25 miles in its favor, viz :

"To cross River.....	2 miles.
"Distance by the Lachine Canal.....	8.5 "
"Across river at Montreal.....	3 "
"By Canal from Longueuil.....	28.25 "
"Total.....	<u>41.75 miles.</u>

"Caughnawaga Canal, being to the same point 25.5 miles.

"This subject has been entered into at some length in detail, as it will doubtless again become a topic of public discussion."

The Rideau Canal system unites the Ottawa with the city of Kingston on Lake Ontario, and thus practically connects the latter with Montreal, without the intervention of the St. Lawrence. It consists of the Rideau Canal proper; the Grenville and Carillon Canals; the Saint Anne's lock and dam; and the Lachine Canal. The latter, however, may be considered more conveniently as forming part of the St. Lawrence system. The Rideau Canal connects the Rideau and Cattaraqui Rivers, availing itself, within its course, of several intervening lakes of small size. It contains 47 locks, of 134

gation and accordingly admit of a more rapid passage through it. It now takes 15 days to get a boat through from Buffalo to Albany. My own opinion is, that with locks 250 feet long, 45 feet wide, with 13 feet of water, vessels would sail through the Caughnawaga and Whitehall Canals direct from Chicago to Boston, and that the western grain shipper would entirely abandon the Erie Canal. A contingency of this character, and with these results, would awaken an opposition, which at the moment seems insurmountable, more especially as the interests of the city of New York lie in the direction of maintaining the present condition of trade.

by 32 feet*. Devised, at the outset, entirely for military or defensive purposes, its construction was carried out by the Imperial Government, and it was only transferred to the Provincial Executive in 1856. It appears to have been commenced in 1826. In its formation, dams have been largely used to overcome the effects of rapids. This mode of structure may be economical in the first instance, but, in addition to its liability to drown many acres of land, it is open to the great risk of being damaged and often entirely destroyed by ice and freshets; and it necessarily entails, after a few years, a considerable annual outlay for repairs and maintenance, even if it escape any serious disaster. The total cost of the Rideau Canal is usually quoted at about £1,000,000 sterling, but that estimate is probably above the true sum. Its expenses in 1863 appear to have exceeded its revenue by about \$8,000, and to have been still more disproportionate during the five or six preceding years.

The Carillon and Grenville Canals are three in number, but their combined length is under six miles. They are constructed to avoid the Longue Sault rapids on the Ottawa, and the Châte-à-Blondeau, and other rapids near Carillon, on the same river. Altogether, the locks are eleven in number, three on the Grenville Canal being less than 20 feet broad. Vessels drawing more than 4½ feet of water are unable to pass through these canals. The Saint Anne's Lock and Dam, situated near the celebrated rapids lower down the stream—the burden of Moore's familiar boat-song—was completed in 1843. The lock is 190 feet long by 45 feet broad, with a lift of 3½ feet. The Carillon and Grenville Canals appear to have been always worked at a loss, ranging from \$700 in 1863, to \$7,425 in 1862, \$7,295 in 1861, and \$9,491 in 1860. In 1863, the returns of the Saint Anne's lock exhibit a net revenue of \$3,816; but during the three preceding years, there was an annual loss of between \$2,000 and \$3,000. On the other hand, between 1843 and 1859, the lock appears to have yielded an annual profit, averaging from \$2,000 to \$5,000. These figures are, of course, exclusive of the interest on the construction cost.

The St. Lawrence Canals, constructed for the purpose of connecting Lake Ontario directly with the seaboard, are properly four

* The limits and general character of a review compel us to omit many technical and engineering details in reference to this and other canals brought under the reader's notice. It is but right to state, however, that these details are given with great exactness and amplitude in Mr. Kingsford's book.

in number, as shewn by the annexed table, extracted from Mr. Kingsford's book :—

	Number of Locks.	Mean Rise, in feet.	Length, in miles.
1. The Lachine Canal	5	44½	8½
2. The Beauharnois Canal	9	82½	11¼
3. The Cornwall Canal	6	48	11½
4. Williamsburg Canal. {	Farren's Point	4	¼
	Rapide Plat	2	3¼
	Iroquois Junction }	3	7¾
	Gallops }		

The annual revenue of these canals, from their opening in 1861, appears to have generally exceeded the cost of their maintenance and management. The net revenue in 1863 is stated at \$49,232—thus yielding, according to Mr. Kingsford's estimate, a dividend of about three-fourths of a per cent. on their construction cost.

All Upper Canadians must be familiar with the position of the Welland Canal. Constructed to form a navigable channel between Lake Ontario and Lake Erie, rendered necessary by the great Falls and other obstructions of the Niagara River, this important work is 28 miles in length, with a summit level of 330 feet, and 27 locks. Three of these latter, or those between Port Dalhousie and Saint Catharines, present dimensions of 200 feet by 45 feet. The others, with the exception of the lock at Port Colborne which is 240 feet by 45 feet, measure 150 feet by 26·6 feet. The depth of water on the sills, originally 9 feet, was raised an additional foot in 1853. The history of public works too frequently reveals instances of extreme mismanagement, of want of foresight, and reckless expenditure; but few, we think, can compare in these respects with that of the Welland Canal. The chapter in Mr. Kingsford's book, which records the history of this canal, is so replete with suggestion, and so interesting, moreover, in itself, that we are induced, at the risk of a somewhat long quotation, to extract from it the following account of the origin and general progress of the work in question :—

"The history of this important work* is so marvellous and so little known, to some extent even so misrepresented, that a consecutive narrative is indispensable, correctly to understand the vicissitudes through which it has passed. So far as the writer knows, no connected account of it exists, and it has to be traced out

from official documents, and the records of legislative proceedings. One fact is certain: had not the project been of a character which nothing could destroy, it would long since have irretrievably foundered. This Canal can be adduced as one of the many proofs, how almost impossible it is to destroy that which has inherent vitality. The honor of being its originator has been claimed by many; but it was precisely one of those projects which the situation itself suggests. The earliest settled parts of Western Canada were those easiest of access to the new United States, from which the United Empire Loyalists came. Thus both Kingston and Niagara, two old French posts, had been resting points for years. Their names figure largely in the French wars; and as known and identified localities, they attracted many who clung to the British flag even in its reverses. Accordingly much of the early immigration came in by Newark—the present town of Niagara—and the surrounding district was settled early in the history of Western Canada. No one who had heard of the Duke of Bridgewater's Canal,

“ * The history of the Welland Canal, until the close of 1835, is contained in a report of the Select Committee of the Upper Canada House of Assembly, appointed to enquire into its management. It is a volume of 575 pages, and contains some very extraordinary revelations. It does not fall within the scope prescribed to the writer to allude except in general terms to this document. Its contents cannot be entirely ignored even here, and it will be a special duty of the historian of the last fifty years to reproduce this Chapter in Canadian history. It may be briefly stated that of a Committee of nine, seven signed the report, in which it is stated that the books and accounts of the Company had been ‘ kept in a very careless, irregular and improper manner, highly discreditable to a public body.’ That even on a partial investigation there was a defalcation of upwards of £1724; that the clerks were only able afterwards to account for £266 of this sum; that an item of £579 paid to a director was falsely entered in the accounts; that unjustifiable expenditure was entered into; ‘ that the sum of £417 10s.,’ for loss on Steamboat Peacock, ‘ is enveloped in mystery;’ that there were irregularities anything but creditable to the Company's officers; that the various sums of £2500, £1178 13s. 5d., £164 14s., and £100, ‘ were without any authority of the Board given on loan to officers and directors;’ that a Secretary was appointed quite incompetent for the discharge of his duties; that improvident contracts were entered into, some of them most shamefully performed to the serious injury of the Company; that modes of raising money without the approbation of the Directors ‘ was to say the least of it, highly injudicious, and might have involved the Company in serious difficulties; that the officers of the Company received water privileges, a proceeding stigmatized as highly improper; that in 1831 the Company sold to ‘ an alien,’ through a third party all the lands of the Company, amounting to nearly 15,600 acres for £26,000; that 18 months interest was paid and refunded in the shape of water damages; that in 1834 the Company resumed the land excepting 200 acres in Port Colborne and Allanburgh, cancelling the debt of £25,000, and giving bonds with interest for £17,000 more. ‘ This transaction, to your Committee,’ was ‘ inexplicable: no statement that they have heard has satisfied them of the justice or even expediency of an arrangement which, if applied to the ordinary transactions of life, would not only be deemed ruinous, but the result of insanity.’ Further, that large sums of money were missing; that a shorter route for the Canal might have been selected at less expense to the proprietors; that the monies were expended improvidently; that a debt of £30,000 was forgiven without an equivalent; that £1340 worth of timber was bought, and which was ‘ allowed to be stolen and lost to the Company without one shilling's worth ever being accounted for;’ that some was sold without the Company receiving benefit from the sale, and that some was used by contractors without the material being charged to them.

“ When it is added that everybody was exonerated from blame, and that not the least stigma was ever attached to any of the public men who were included in the above proceedings, further comment is useless.

and of Brindley; of Smeaton's Forth and Clyde, or Telford's Caledonian, could have failed to see the necessity of connecting the two lakes by artificial navigation. The Erie Canal was during this period, either proposed or in course of construction, and its example must have stimulated the appreciation of the geographical advantages apparent in the Niagara peninsula. The war of 1812, however, gave the great spur to thought. It has been seen also in the case of the Lachine Canal, that Sir George Prevost pointed out its necessity; and the news of that recommendation would be suggestive in the western world, of what was needed there. In the account of the Cornwall Canal, mention has been made of Gourlay and his views of the improvement of the Saint Lawrence. The description of them shows how imperfectly he understood the subject, and how visionary were his ideas. Such however as he was, so far as the enquirer can judge by existing records, he may be mentioned as the first who gave any defined views in writing on the subject; this was in 1819. And in his "Statistical Account of Canada," published in London in 1822, he furnished a map of the District, and pointed out the necessity of a Canal. He had, however, very crude ideas of what the work should be, and although his opinions are enunciated with much positiveness, his knowledge of the subject was evidently superficial to a degree. The friends of the late Mr. Merritt assert that he communicated the idea to Gourlay. It is a fair inference, that Gourlay can claim no particular originality of design; and if the thought in the first instance came from Mr. Merritt, it was a mere echo of a generally expressed opinion. But whoever the originators were, very little merit is due to them; for a wilder, more ill considered scheme than the one originally put forth, one shewing more ignorance and recklessness on the part of the projectors, it is scarcely possible to conceive.

The public accounts show the cost of the work to be about six and a half millions of dollars. The original estimate was £26,000, or \$104,000.

The first idea of the route was to run up the natural waters of the Welland River or Chippewa Creek, and to pass across the township of Thorold, tunnelling through the high ridge of land about a mile and a half wide, and then proceeding direct by Canal to the brow of the high land. The latter was to be descended and overcome by a Railway connecting, by means of another Canal, with the navigable waters of Twelve Mile Creek, by which egress to Lake Ontario should be effected. The navigation was simply to be for *bateaux* and barges.

This project was put prominently before the world in 1823; an engineer of the name of Mr. Hiram Tibbett furnishing the description of the route. Public meetings were called, circulars were sent, and an address to the people of Upper and Lower Canada authoritatively disseminated, in which the probable expense of the undertaking was named at £22,125. Early in 1824, a petition was sent to the Legislature asking for an Act of Incorporation for a Canal, to admit boats of from 20 to 40 tons, and at the same time defining the route. The capital was named at \$150,000, being 3,000 shares of \$50 each. The work was commenced on 30th November, 1824, 'and as a proof how little the subject had attracted public enterprise at the time,' says an official document, 'not half a dozen gentlemen of capital or influence in the district attended this ceremony.' The actual amount of stock subscribed at this time cannot be authoritatively given, but as the sum

total of the subscriptions in Upper Canada amounted in 1836 only to £3,712 10s. the money in the Treasury must have been a small sum. It is true subscriptions had been taken up in Lower Canada and in the United States, but the Quebec subscribers, even in the previous year, had shown a marked want of confidence in the scheme. In the Annual Report, the Directors gave no figures; they merely stated that 'a sufficient quantity of stock had been subscribed.' Early in 1825 the Company came before the Provincial Parliament and obtained an amendment to their charter to raise the stock to \$800,000; and the Canal was extended for sloop navigation. We learn from a statement of Mr. Merritt that on the passing of this Act the Hon. J. H. Dunn, 'the President proceeded to New York and obtained £75,000 subscriptions.' The Committee reported in 1836, that the maximum of United States subscriptions was £69,625; a proof that the work had been commenced the preceding year with literally an empty exchequer. The ground was re-surveyed. The Welland River route was considered objectionable; or at the best to be developed to hasten the connection of the two waters; for although it was still to be retained, the advantages of a direct opening to Lake Erie through the Grand River was specially commended. The distance was estimated at 41 miles. Nevertheless it was still urged that a connection with the Welland River was virtually a connection with Lake Erie; that its junction with the Niagara River was only 18 miles from the lake; and that although the current was strong, vessels could sail up against it. But at the same time it was represented that there would be difficulty in passing Fort Erie, owing to the great rapidity of the stream below that spot. It was accordingly considered advisable, that in order to avoid 'this impediment to navigation,' and to attain 'other important advantages,' a connection should be effected with the Grand River, which turned at a high level into a navigable feeder, would furnish both a sufficient supply of water and extend a satisfactory and quiet navigation. Considering that the work had been commenced, the discovery came late. But a change from the entrance by the Welland River, was in any circumstance wise and expedient. The size of the locks was established. The dimensions were 100 feet \times 22 feet, with 7.6 feet depth of water: they were maintained in the construction of the first Canal, except that the sills had only 7 feet. The locks were 40 in number.

The route thus determined, the contracts were partially given out in November, 1826, at least it was so stated before the Committee of the House of Assembly, and the work from the Welland to Lake Ontario was to be so far completed by April, 1827, that the communication to Lake Erie would be assured by that date. The connection by the Grand River was hereafter to be developed. In this position, an application was made to the Legislature for assistance. Sir Peregrine Maitland was then the Lieutenant-Governor, and he appears rightly to have estimated the importance of the project. The ground of this assistance is succinctly stated, viz.: that £25,000 had been subscribed in the Canadas;—the actual amount was not £14,000—that £75,000 had been subscribed in New York; and that the directors 'being desirous that at least a majority of the stockholders should be British subjects,' a limit had been placed on American stock to that extent, and that accordingly £100,000 had been left for the English market; that the 'Canal was rapidly advancing,' and to prevent any delay in meeting the obli-

gations consequent upon these works a loan of \$100,000 was asked; a loan, the first of a very long series. The money was granted 9th January, 1826: 21 voting for the bill and 12 against it. Nor was this the only aid the Company received, for in a communication dated 30th September, of the same year, Lord Bathurst informed the Lieutenant-Governor, that the British Government would contribute the same assistance which had been given to the Lachine Canal, viz.: one-ninth of the estimated cost towards the completion of the Welland. As the cost was named at £147,240, the quota offered by the British Government was £16,350; the equivalent being free toll on Government stores for ever. With this material aid, the work went on in comparative tranquility, diversified by the failure of contractors, and the consequent arbitrations. But it was found that the stock did not sell in the London market; so an appeal was made again to the Legislature in January, 1827. This time a loan was not asked, but the Legislature was prayed to take £50,000 worth of stock. The Special Committee recommended that the stock should be taken, as the completion of the entire Canal would be placed without a doubt; and that the countenance of the Government would give a value to the shares, so that they would be generally sought after. Further, it was suggested that the stock was, in all respects, as good security as any which could be obtained for a loan; and it was obscurely hinted that the Imperial Government 'from public inducements might take possession of the whole work,' 'an arrangement which would be facilitated by the Government becoming stockholders.' The Act affording aid was passed the 5th February, 1827. The Bill however had a very narrow escape, 20 voting for and 18 against it. It is thus very evident that the scheme had fallen into great disfavor, so much so that Sir Peregrine Maitland in his speech in proroguing Parliament made special allusion to it. He said he felt the responsibility of giving this additional aid, and that he cheerfully shared that responsibility. The result of this encouragement was, that the Legislature of Lower Canada likewise subscribed the sum of £25,000, taking stock to that amount.

"The year 1828 found the Company still embarrassed. The enquiry of after years drew out the fact, that there was still £38,837 1s. of stock not taken; and it shews how recklessly this work was begun, and the extent to which foresight and calculation were wanting. It was now considered that the sum of £90,000 was required to finish it. The amount in the exchequer was a little more than £21,000, and this was only prospective, being 19 per cent. on 8,893 shares. As it seemed that little could be obtained from the Canadian Legislature, an appeal was made to the Imperial Government who, with a truly Imperial generosity, advanced to the undertaking £50,000 sterling; security being given on the tolls, funds and all property of the Company. In the year 1829, no loan was applied for. The works were, nevertheless, pushed on with great energy so that two vessels, in the month of November, passed between Lakes Ontario and Erie. In the following year this fact was made a ground for a new appeal to the Legislature. It was certainly something to say that vessels drawing 7½ feet of water with 21½ feet breadth of beam, could sail from Lake Ontario, a distance of 16½ miles of canal, ascending 34 locks, and pass down the River Welland to the Niagara. It may be worth while to preserve the names of the schooners: they

were the 'Ann and Jane,' and 'R. H. Boughton.' The route of that day may be thus briefly described. About a quarter of a mile west of the entrance to the Welland River, a canal commenced, leading to that stream, through which the route ran, $9\frac{1}{2}$ miles, ascending by two locks to the deep cut, at which point the Canal proper commenced, the feeder of which was the Grand River, carried by an aqueduct across the Welland: from this point it descended to Lake Ontario. The sum of \$100,000 was named in this year as necessary to complete the work, and the petition prayed that the stock should be increased to \$300,000. Reference to the records of Parliament of that day, shows how unwelcome the application was. It was, nevertheless, favorably entertained, 19 voting for, and 9 against it. It was during the debates on this grant—which were evidently stormy enough throughout—that, on a motion that the Welland Canal Loan Bill be read a second time that day three months, the votes were equal—24 against 24; the Speaker, the present Mr. Justice McLean, giving a casting vote in the negative. Throughout the session the measure was violently opposed, and escaped only by majorities of two and three. Besides granting the money, the Act likewise authorized the appointment of a Commissioner to examine the canal, and to report to the Lieutenant-Governor all facts and information that might be useful to aid in forming an opinion of the progress of the work. Mr. Randall, who was appointed to this duty, reported 31st May, 1830. He bore general testimony in favour of the stability of the works. Specially he examined the "Deep Cut," which gave much trouble during construction. His remarks throw little light on the subject, but he regrets that more preliminary precaution had not been taken. At the close of the year, the work was so far completed as to afford a convenient communication by the Welland River. But the Directors were not satisfied; the route was described as "tardy and circuitous;" and it was determined to apply to the Legislatures of both Provinces, and to ask equally of each \$100,000, so that a Canal would be taken directly to Lake Erie. On the 14th of March, 1821, an Act to afford further aid to the Welland Canal was passed, authorizing the Receiver-General to issue \$200,000 of debentures, as a further loan. It was much opposed; 25 voting for and 21 against it. In 1832, no call was made upon the Legislature; but, in 1833, an Act of affording further aid towards the completion of the Welland Canal was passed, appropriating \$30,000 to subscribe for the unsold stock, and at the same time the expenditure of the sum was placed in the hands of Commissioners. In 1834, fresh legislation was called for. It was stated that the means of the Company were exhausted; that the concern was in debt \$100,000, and another \$100,000 was needed "to put the canal in a complete state for use the next season." Such was the unpopularity of the scheme, that the Committee of the House to whom the petition was referred, shrank from the responsibility of making any recommendation. They hoped that something might be done to place the Canal in such a situation as might be most beneficial to the public interest. The members who supported the petition acted with their usual energy, and it resulted that an additional aid of \$200,000 was given, stock being taken to that amount. The money was raised by debentures, paying 6 per cent. The votes on the motion were 22 against 14. The stock was likewise, by enactment, increased to a million of dollars. It was further provided that the affairs of the Company should be

managed by four directors, three of whom should be named by the House of Assembly. It is true, that by these means an apparent control was placed in the hands of the Legislature; but, by accepting the responsibility, the House became, as it were, identified with the future management. The year 1835 was marked by no particular vicissitude. Sir John Colborne was then Lieutenant-Governor, and he communicated to the House an Imperial despatch from Mr. Spring Rice, the Colonial Minister, that he could not recommend the Imperial Government to cancel the debt of the Canal Company of £50,000, for a loan only made five years before. The Assembly had, with some inconsistency, asked this act of favor at the hands of the Imperial Government; on what ground it is somewhat difficult to say. During the session, Messrs. Thorburn, Duncombe, and Mackenzie were appointed directors. There cannot be a doubt that these gentlemen went to their duties with a knowledge of the general dissatisfaction which existed generally in the Province. The continued calls on the public chest, the unsatisfactory and contradictory statements, the Canal ever on the verge of completion and never finished, had destroyed all confidence in the management of the undertaking. There seems to have been a foregone conclusion that the Canal was a necessity, and that if the Province did not complete it, it would remain unfinished; and it followed that the Province must take possession of it. Feelings of this character led to a very unfriendly supervision of the accounts and antecedents of the Company, and ended in Mr. Mackenzie making thirty specific charges against the directors. The decision of a Committee of the Legislature, appointed to consider them has already been given.

“The following “concise statement of the property in the Canal, as it is held by individuals and the public,” was appended to the report :

Loan by Great Britain (Prov. cur.).....	£55,555	11	2
Loan by Upper Canada.....	100,000	0	0
Stock taken by Provincial Legislature.....	107,500	0	0
Stock taken by Lower Canada.....	25,000	0	0
Stock in England by private individuals.....	30,127	10	0
Stock in United States by do	69,625	0	0
Stock in Lower Canada by do	13,825	0	0
Stock in Upper Canada by do	3,712	10	0
Stock in New Brunswick by do	500	0	0
	£405,855	11	2
Advanced this year by Parliament....	2,000	0	0
Total.....	£407,855	11	1

The report concluded by stating that £425,213 8s. 5d. had been expended, “less £100, which appears to be balance in hand 30th December, 1835.” No money was, however, obtained that session. But in November, 1836, the Directors came again before the House! Sir F. B. Head was then Lieutenant Governor. On the petition of the Company, a select Committee recommended that the Canal should be made strictly a public work; and that the Receiver General should issue debentures to the stockholders for their stock. An amendment was moved to the

report, limiting the expenditure to 'the money sufficient to keep the Canal in repair, but, although proposed by the Solicitor General, it was voted down by 31 against 27. On the 17th December, a second report was presented. It sets forth that the sum of of £814, 319 6s. 2½d. (*sic*) was the amount required to be paid by the Province to make the Canal "strictly a public work:" including the Provincial expenditure for stock taken, and for the several loans advanced to the Company. Of this sum £200,000 was estimated as necessary to complete the Canal permanently. The report did not recommend that the whole money should at once be paid: £100,000 would be ample for 1837, which would include £55,000 to replace the wooden locks by stone structures. The matter, in this position, came before the House on the 11th January, 1837. The first resolution was carried by a vote of 29 against 6. It affirmed the paramount importance of the Canal, the necessity of its completion in a substantial manner, and that stone locks should be substituted. The remaining resolutions appropriating the following sums were voted through with little opposition:—

£20,000 to purchase the Hydraulic Works sold.

£25,000 to enable the Company to pay its liabilities.

£200,000 to complete the Canal in a substantial manner.

£117,800 to purchase the stock of private individuals.

The Act embodying these resolutions was carried by large majorities. Indeed it was now apparent to all, that without the direct intervention of the Province, the Canal would experience fresh difficulty. Still the Legislature did not advance the full step of assuming the work. The £102,000, previously advanced on loan, was turned into stock, and the Government was authorized to subscribe £245,000 new Stock (\$980,000.) The Capital Stock of the Company was declared to be £597,800. The Directors were further limited to an expenditure of \$400,000 on the Canal, in full of repairs, new works, and old debts, during the year. The troubles of 1837 and 1838 prevented any further legislation, and no further steps were taken with regard to the shareholders until April, 1839, when a resolution was carried by a vote of 26 against 9, that the private stock should be purchased by the Province, in order that the Canal should become wholly the property and be under the management of the public. As above stated, the amount was £117,800, of which, in 1836, £31,712 10s. was owed in Canada. Of all legislation on this subject, this record is the most pleasing to read, for it was just and honest; and as the stock was not held in the Province, it was untinged by selfishness, while at the same time it was necessary and politic. The Bill was reserved for Her Majesty's pleasure. When the legislature met, later in the year, even the pressing business attending the Union Bill did not deter "the friends of the measure" from moving an address, asking her Majesty to give her assent. It was carried on the 25th of January, 1840 by 23 against 11. The bill, however did not become law until the 5th July, 1841, the first session of the United Parliament, when Lord Sydenham sent a message to the House announcing that Her Majesty had confirmed the Bill in Council on the 11th of September previous.

We have now arrived at that period in the history of the Province when the improvements were carried on systematically and simultaneously. In opening the

first United Parliament, 15th of June, 1841, Lord Sydenham dwelt on the improvements in the navigation, promising the Imperial guarantee to the loan required "to effect them. "The generous aid," continued his lordship, "which I have already announced to you; the determination which I am also empowered to state on the part of the Government, to devote annually a large sum for the military defences of the Province; the fixed and settled determination which I have the Queen's command to declare, that her North American possessions shall be maintained at all hazards, as part of her empire, are pledges of the sincerity with which the mother country desires to promote the prosperity of Canada, and to assist in the well-working of the new institutions which it has established." In conformity with this pledge, on the 20th of August a message was sent down to the House, enumerating, in one general plan, the different works demanded by the public voice. The total cost was £1,470,000 currency, to be expended in a period of five years. The sum named for the Welland Canal was £450,000. The resolutions confirming the expenditure were carried on the 7th of September, one member only voting against them.

Some efforts were made to increase the size of the Welland to that of the Saint Lawrence Canals. Lord Sydenham, however, shrunk from the expense. He considered that, with the present size of the locks, the Welland could sufficiently compete with the Erie Canal route. Nor was the military view of the question neglected, for a proposal was made to construct locks 56 ft. wide by 280 ft., with 10 ft. depth of water. Although this proposition was rejected, it was wisely determined to construct larger locks at both ends, so that in case of danger, steamers could enter and run some miles inland. The adoption of this plan led to the ultimate enlargement of the subsequent locks to St. Catherines, bringing that town within the navigation proper of the Saint Lawrence. The work was immediately commenced, and the enlarged line, by the way of the Grand River feeder to Port Maitland, was opened in 1845. Consequent upon the progress of the work, the main canal from the junction westward to Lake Erie was laid dry, to give the bottom a width of 26 feet, and to make Lake Erie the feeder. But the failure of several "sets of contractors, and the prevalence of sickness amongst the laborers, retarded the operations so much," says an official account, that this portion of the route was not opened until 1850. It was even then unfinished, and accordingly arrangements were entered into to complete the work by means of dredges. This operation was carried on until 1854, when the contractor abandoned it. In the meantime it was found that the width of 26 feet was totally insufficient for the trade, and it was determined accordingly to increase it to 50 feet. On the other hand, it has been seen that the Grand River supply year by year becomes less, and that the steadiness of that source can not be relied upon; that to keep the Canal so supplied was to run the risk of failure in the navigation; a contingency not even to be thought of without alarm, and against which there could only be one remedy, viz., to turn to Lake Erie as the supply. The consequence has been, that the work is nearly brought to a close, and that the canal throughout has been widened to fifty feet at the bottom, to a level admitting the Lake waters.

The total expenditure up to the 31st of December, 1863, is described in the Public Works Report for that year.

Expended prior to 31st December, 1841.....	\$1,851,427 77
Debentures issued under 7 Vic. c. 34, for payment of back interest on Stock.....	675,356 42
Amount expended under Department of Public Works, for enlargement, erection of permanent structures, and land damages	4,766,470 70
	<u>\$7,293,244 89</u>

"This sum however cannot be considered to represent the cost of the work. It is merely the aggregate of all the vouchers which have been charged to the account of the Canal. I now append a statement extracted from the Public Works Reports, of the sums paid for repairs and management for sixteen years. In some instances they are kept distinct, in others the total of the two are shewn. We learn from them, however, that for the last six years, the "management, &c.," averaged about \$40,000 per year, whereas in 1850 the cost was \$13,500. In the Report of 1849 it was estimated that the future expense of management would be £2,804 (\$11,216), and of repairs £2,600 (\$10,400).

Year.	Maintenance Repairs and Renewals.		Management.		Total Maintenance and Management.	
	\$	c.	\$	c.	\$	c.
*						
1847	Not given.		Not given.		48,623 00	
1848	do		do		Not given.	
1849	11,244	91	8,248	82	19,493 73	
1850	12,425	21	13,510	19	25,935 40	
1851	Not given.		Not given.		49,589 00	
1852	do		do		56,802 67	
1853	do		do		87,700 00	
1854	do		do		99,410 06	
1855	do		do		122,379 95	
1856	do		do		99,483 65	
1857	do		do		108,629 24	
1858	61,806	83	42,642	97	104,449 81	
1859	37,584	27	40,988	89	78,573 16	
1860	Not given.		Not given.		66,312 60	
1861	16,932	11	39,807	88	56,739 99	
1862	22,120	73	39,129	49	61,250 22	
1863	15,392	02	40,855	95	56,248 00	
					<u>\$1,141,620 57</u>	

"The inequality of these amounts does not admit of generalization. Where there are no details to guide, one would conceive it is not possible that maintenance

alone would in one year exceed \$80,000, and in another be a trifle above \$15,000. The inference is, therefore, quite legitimate, that there has been no well considered separation of what should be placed to permanent works and what to repairs, and it is hardly possible to apportion the amount fairly chargeable to capital. One has, therefore, to take an arbitrary mode of arriving at results. We have, however, the authority of the Report of 1863, for stating that about \$1,400,000 is chargeable to increasing the depth of water to ten feet on the mitre sills of the locks, and to widening and bottoming the summit level to admit the waters of Lake Erie as a feeder. As this amount has been expended since the Union, and \$2,526,884.19 was paid before the Union, we know positively that \$3,926,784.19 has been expended totally independent of the main work for the enlargement of the Canal and locks. The Canal may be looked upon as having been opened at the present capacity in 1846, and may be considered to have been in operation 18 years. Unfortunately, in the figures compiled, the greatest expenditures are precisely those, where no distribution has been made. The magnitude of the amounts itself suggests the idea, at the same time, that much has been included as repairs which really was a part of the cost of the construction. It becomes, to some extent, a matter of opinion what these statements really represent. If, however, for these 18 years \$50,000 be allowed for management and \$300,000 for repairs and renewals, which would be nearly at the rate of \$18,000 a year, the approximation arrived at, may claim to be at least theoretically just. The vouchers are still in existence, and those interested in the result can easily disinter them to prove what the repairs really were. Making this reduction of \$18,000 from \$7,293,244.89 will place the cost at \$6,493,244.89, or, in round figures, six and a half millions of dollars.

“The history of this Canal has been very fully given, for unmistakeably it affords its moral; and if there be teaching which in the conduct of public works should lead to the avoidance of error, it is here. We find a small clique of irresponsible men, with no special aptitude, taking possession and to no little extent enjoying all the fruits, of the management of a project, which was national in its character. Their earliest and great idea was definitely to establish the line, and we fear we must conclude that this choice was purely a matter of self-interest. There were no difficulties to bewilder the judgment. Once established the necessity of connecting the two great Lakes, which everyone recognized, and there was never a plainer or easier question to decide. It was to have made Lake Erie the feeder, to have selected the easiest descent from the upper to the lower level, and to have continued the most direct and best connections with the two Lakes. The Grand River Feeder was in no way necessary: that it should have been at all constructed seems only explained by the apparent economy of its choice, which would weigh with inexperienced men. The least disinterested examination of the ground, and an ordinary calculation of the consequences would have given an answer to the problem. The expense of the dam and the 21 miles of feeder, and additional cost of locks and the unnecessary lockage, ought to have suggested, even to a tyro, that the expenditure would have been greater than deepening by 7 feet, 14 miles of Canal already constructed. For some years past, the fashion has been to speak in complimentary terms, of the energy of those who were most immediately connected with this work. The writer, who traces its history dipassion-

ately, must hold the directly opposite opinion. It is mere assertion that it could not otherwise have been completed. On the contrary, it was a national necessity, and must have commanded attention from the Legislature. The very supposition is grossly unjust to the public men of that day, who, as a rule, warmly supported the work, and sustained it in all the crises through which it passed. The assistance given by Parliament sprung from no other cause than sympathy with the undertaking; and had the country not been taken by surprise, so that the control passed out of the hands of the Legislature into that of a Company,—which in a pecuniary and responsible sense was never anything but nominal,—this Canal must have been constructed by the Government, as the Cornwall Canal was a few years later. As it was, the work was virtually carried on by the Upper Canada Government so far as supplies went, for the total subscriptions to Stock were below £118,000. There cannot be a doubt that had this project been taken up by the Executive, as it ought to have been, both the Imperial Government and that of Lower Canada would have contributed. But this opportunity was forestalled by the few, who laid their grip upon the work only to delay it by incompetency and mismanagement. The consequence is that this work is incomplete at this day. Taking, for the sake of argument, even the present size of the locks as a finality, the Canal must be held as unfinished until Lake Erie is actually the feeder without risk of loss of supply, and there is at least 100 ft. width at bottom; whereas at this moment the width is but 50 feet. That slides and difficulties should have occurred at the "Deep Cut" was caused by want of knowledge. Any engineer knows, that by the help of good drainage and with banks of sufficient slope protected by sods, any cut may be secured; and so much heavy excavation would have occurred here, that it could have been done at a very low rate. The consequence has been, that the work has had to be performed year by year by dredging machines, at great cost, and very slowly, and is even now scarcely completed, forty years after its commencement. It may be asserted that this expense has been necessitated by no new view of the subject; a prudent and reflective mind would have seen its necessity, in the inception of the undertaking. The loss to the country by the recklessness of these men is immense. The Welland Canal has cost as much as the whole of the Saint Lawrence Canals; and it is no exaggeration to estimate that \$2,000,000 of money have been wasted in its construction. The locks are 200 x 45 feet against 150 x 26.6 feet, and the canal proper is just double the capacity.

"The present position of this canal is, that it is utterly insufficient for the trade which passes through it. That it must be widened and deepened, and that the locks must be enlarged, is admitted, if it is to become equal to the requirements upon it. Even should the policy of deepening the whole series of Canals be rejected, the Welland must be improved. The question is, to what extent should the enlargement be made? It is urged that much of the craft of Lake Erie cannot now pass the Canal to Lake Ontario; but the argument in this form has no great force. There is a navigation peculiar to Lake Erie which is not met with on Lake Ontario; and the limit to be applied to the Welland Canal must be sought in the navigation of the Saint Lawrence and not in the Upper Lakes—and here we have no identity of view.

Mr. Jarvis, in his Report on the Caughnawaga Canal, places the dimensions of the locks at 10ft. depth of water on sills.	230 x 36 x 10ft.
Mr. Walter Shanly, in his Ottawa Report, takes the "Iowa" as a representative propeller, and proposes..	250 x 50 x 10ft.
Mr. T. C. Clarke in his Report upon this Survey, names..	250 x 45 x 12ft.
Mr. Kivas Tully, in his Georgian Bay Report, advocates the recognition of 1000-ton propellers, and accordingly specifies..	265 x 55 x 12ft.

"Be the dimensions what they may, the necessity must be recognized, that two vessels navigating the Canal, may pass at any part of it: hence the width at the bottom must be at least 100 feet. The extent of the improvement will be argued, under the general head of the development of the Saint Lawrence navigation, necessary to command the trade of the Western Lakes. For the moment, all that need be said is, that the enlargement of the Welland is a mere question of extent and finance."

After thus discussing our existing canals, Mr. Kingsford devotes a large portion of his work to a consideration of the various schemes projected within the last few years for the improvement or extension of our canal navigation, generally. These schemes comprise: (1) The Ottawa and French River project; (2) the Chats Canal; (3) the so-called "lateral cut" of the Welland to the town of Niagara; (4) the Toronto and Georgian Bay Canal; (5) the Georgian Bay Canal via Lakes Simcoe and Skugog; and (6) the canal project by the River Trent. To these schemes Mr. Kingsford opposes many strong and apparently well-grounded arguments: holding that not one of these projects, if carried out, would have any extended influence on the trade of the Province. If we cannot accord to him our entire support on this question, we may at least admit that the deepening and general enlargement of our present canals should of necessity precede the execution of new and, in a measure, experimental projects. In a succeeding chapter, much valuable information is given on the present condition and future prospects of the Erie Canal, considered, more especially, in its opposing relations to the St. Lawrence route. The canal question in its more purely financial aspect is then discussed; and the subject of "Tolls, Revenue, and Tonnage" is illustrated by a series of tables, compiled, apparently with great care, from various official records. Finally, Mr. Kingsford concludes his book by a general review of our canal policy in all

its bearings. The length to which our present notice has extended, compels us to pass over this portion of the work; but we may commend it cordially to the reader's attention, both for its practical and unprejudiced views, especially in reference to our relations with the United States, and for the large amount of information which it offers in a condensed and exceedingly readable form. The main argument, advocated not only here, but throughout the entire book, may be summed up in the author's own words: "There is only one line of policy to be adopted with regard to our canals: a policy not simply beneficial to Western Canada, but one which will advance the well-being of the whole country. At this moment we have no one generally accepted view as regards the future. We see district struggling against district; the east endeavoring to obtain a monopoly of advantages; the west, sensible of an inferiority and taking no steps to remove it. There is no provincial policy which, without advocacy of local interests, would have in view the development of the material prosperity of the whole, and, at the same time, an increase of the revenue of the public works. Our course of action is suggested by the magnitude of the trade of the Western States, which if turned into its natural outlet, the St. Lawrence, would lead to the important results all yearn to effect. We can gain this trade, if we improve the St. Lawrence, and deepen the canals to 15 feet, and construct a chain of locks 250 feet by 45 feet wide. Here is the true policy for us to pursue. If we fail to follow it, we neglect every advantage, geographical and commercial, that we possess: we shall continue unchanged, and remain discontented and impoverished. If we develop it with ordinary skill and energy, we may hope for better days, for competence, prosperity, and contentment."

E. J. C.

THE INDIAN GRAVES OF PERU.

(From the *Panama Star and Herald*.)

The graves and monuments of the New World hitherto examined, unlike those of the Old, have thrown but little light on the ancient history of man. Along with the mummies of Egypt have lately been found a new roll of kings of Egyptian dynasties; while in a mound occupying the site of ancient Babylonia, an inscription has been interpreted relating to the Tower of Babel or Confusion of Tongues, in both cases affecting man's spiritual dignity and religious belief. The graves of the "untutored American Indians" when opened up to the sun show the past generations of living Indians to have been cunning workers in gold, silver, and precious stones, and finely woven textures of cotton cloth, dyed with brilliant hues. But as every Indian descended into the grave with the most precious of his worldly goods around him, we get an insight into his ideas regarding a future state. His favourite *chieha* and provisions suitable for the journey before him, were piously put within reach of his hand, together with various curiously shaped water jugs and coolers; in fact, everything befitting the same rank he must inscrutably occupy in the spirit world—the slaves with nothing, and the women along with the tools of her kitchen drudgery. Among other things of adornment or utility found upon or around the mummy in the graves opened in Arica, were some lenticular bodies, considered to be petrified human eyes, of brownish colour and pearl-like reflections. It is affirmed that they were to be found in the sockets of the eyes, and sometimes on the ground within the trunk. They have been eagerly sought for by all travellers who have visited that locality, and looked on as the curious results of the process of mummification used by these ancient Indians. They are formed of concentric cup-like lamina, peeling off like the coats of an onion on its convex side. While viewed in front, these lamina form concentric circles, diminishing to a round minute ball in the centre, while numerous fine lines run like radii from the centre to the circumference. The form is that of a plano-convex lens, with a diameter of 13-16 of an inch, and a vertical axis of 11-16; its substance is evidently organic, but in no other way has it any affinity to the human eye; with the difference that the striated lines run transverse instead of radial, it exactly resembles the lens of the eye of the shark. Having lately made a dissection of the eye of one of those animals, and hardened the lens in ascetic acid, it assumed almost exactly the appearance of one of those so-called "petrified eyes" which was shown me the other day. My notes made at the time leave no doubt on my mind that they are the lenses of some similar animal, either fossil or modern; any way, it is a question to be decided by the microscope and comparative anatomy. Such being the case, it is useless to discuss how or why it is that Peruvian mummies sometimes have their eyes in their heads and sometimes at their feet.

The following is an extract of a letter from a highly respectable and well known gentleman of Iquique, Wm. C. Billinghamurst, Esq., which we have just received, with some very perfect specimens:—

"On my part I have to state that when I was residing in Arica, I was a daily

visitor to the scene of the excavations in the Indian burial ground at the foot of the Morro, and witnessed the exhumation of the bodies, many of which were in a perfect state of preservation as mummies. The eyes were generally found in the vicinity of them, and in some instances were *attached to the sockets*, which I think is strong evidence to confirm the belief that they are human."

This letter is accompanied by a scientific report from Dr. Henry Wm. A. Coleman, M.A., of the same place, who is also a firm believer in the eyes being those of Indians. Dr. Coleman gives the following conclusions as the result of his experiment:—

"That they are human eyes in a state of petrefaction, the external tunics have become decomposed and obliterated by time, leaving only the vitreous humours with its membrana Hyoloidea, and having the crystalline embedded in its cup-like excavation or fossa Hyoloidea. By continuous boiling with water the lens becomes separated, and its compact membrane or capsule can be distinctly seen; the nucleus of the lens is easily distinguished; also the subdivisions of its substance showing its three layers concentrically arranged like those of an onion, which by minute examination can be seen to be closely aggregated fibres."—*Glasgow Morning Journal*, 23rd February.

THE PALMS OF WESTERN TROPICAL AFRICA.

The following extract, relating to the economical uses of the palms of Africa, is from a botanical account of the palms of Western tropical Africa, by Gustav Mann and Hermann Wendland, lately published in the Transactions of the Linnæan Society:—

"Throughout the tropics Palms are amongst the most useful plants to mankind; this is more especially the case among people so little advanced in civilization as the natives of West Africa, who obtain from them the source of many of their comforts.

"Foremost among the useful palms of tropical Western Africa stands the *Elæis Guineensis*, Jacq. The oil of the mesocarp of the fruit of this palm constitutes in most parts the chief food of the natives, who hardly ever take a meal in which it is not used in some way or other. It is nutritious and of an agreeable flavour—so much so, indeed, that it generally becomes a favourite dish with Europeans.

"Besides being used as food, the natives also use it for oiling their bodies, partly to keep away insects, and partly as a substitute for clothing, of which they are entirely destitute. The Bubis or Boobees of the Island of Fernando Po make an excellent poultice of it, which they apply when the hand of any person, found guilty of adultery, has, in accordance with the usage of these people, been cut off.

"Among the more civilized natives it is used, as with us, in the manufacture of soap; and it is also employed for lighting their huts, but the oil extracted from the kernel of the nut is generally preferred for this purpose.

"The exportation of the seeds of this palm is rapidly increasing, and already large quantities are shipped from Sierra Leone and its neighbourhood.

“Were there less jealousy and more energy among the European traders, and could they induce or force the natives of the coast to give up their monopoly, much larger supplies could be obtained at the chief sources of the trade, as at Bonny, Brass, and Old Calabar Rivers, and this oil would be found much superior to that now obtained from the mesocarp of the seeds.

“*Elæis* wine, a drink much liked by the natives, is obtained by cutting off the male flower-spike; this wine is also used by the Europeans instead of yeast in making bread. The main nerves of the pinna and the exterior of the petiole are used for basket-work, for the making of brooms, and similar purposes. Dr. Welwitsch says that at St. Paul de Loando the fibre at the base of the leaves, and also that of the spathe, is used for stuffing cushions, &c.; the soft centre of the upper part of the stem, consisting of the undeveloped petioles, is much relished as a vegetable. Finger-rings, bracelets, necklaces, and other ornaments are cut from the endocarp of the seed. Many as are the benefits derived from this palm by the natives, they are comparatively few compared with the uses made of its products by Europeans; of these we need not speak, as all must be more or less acquainted with them. It may, however, be worthy of mention that during the last three years 130,381 tons of palm oil, of the value of £5,605,913 have been imported into Great Britain.

“With regard to their utility to the natives, the various species of *Raphia* rank next to the *Elæis*. The petioles furnish the materials of which their huts and beds are made, while the pinnæ are used for roofing; and the epidermis of the leaflets gives the material from which their clothing is made. In places where the *Elæis* is scarce, the oily substance between the scaly exterior of the fruit and the kernel, although bitter, is eaten with yam, cassada, &c., and the oil pressed out of it is by the women thought superior to that of the *Elæis* for dressing their hair.

“The pleasant taste of the wine obtained from *R. Hookeri* has even been sufficient to overcome the innate idleness of the natives of Old Calabar, and has induced them to cultivate it. The wine is procured by cutting out the terminal inflorescence as soon as it makes its appearance; the wine is then produced in large quantities. The natives of Old Calabar manufacture cloths, &c., from the epidermis of the leaflets of this palm, and in the south, at St. Paul de Loando, *R. Welwitschi* is used for the same purpose, and the petioles of *R. vinifera* are employed as poles upon which to carry the palanquins. On the river Sherboro the natives make hammocks from the former material, as well as all sorts of basket-work, mats, &c. The roofing made of the leaflets of *R. vinifera* lasts for three years, while that made from *R. Hookeri*, it is said, requires to be renewed every year.

“Wine is also obtained from *Phoenix spinosa*, and the fruits of this palm are much liked by the natives. The very young leaflets, before the leaves expand, are used for the plaiting of hats and caps at Accra.

“The outer part of the stems of the climbing palms of Western tropical Africa is used for binding together the materials of which the huts are constructed. The Banfan people also make large cylindrical baskets of this in

which to carry the rubber manufactured by them, and the same people take large quantities of *Calamus (Ancistrophyllum) secundiflorus* with them as food when they go into the hills of the Sierra del Crystal to procure rubber. For this purpose they choose the extremities of the stem, cutting off the leaves to make the bundles more portable, and when required for use they simply roast the whole in the fire and then eat the soft central part, which is, however, rather bitter and tough for persons not accustomed to such primitive fare.

"The fruits of *Podococcus* are also eaten. The leaves of *Sclerosperma* are used for roofing and constructing the walls of the huts, being tied between the petioles of *Raphia*."

CANADIAN INSTITUTE.

ANNUAL REPORT OF THE COUNCIL FOR THE YEAR 1864.

THE Council of the Canadian Institute have the honour to present the following Report of the Proceedings of the Society for the past year:

I. MEMBERSHIP.

The present state of the Membership is as follows:—

Members, commencement Session 1863, 1864.....	445
New Members elected Session 1863, 1864	13
	—
Total	458
Deduct deaths.....	7
Withdrawn	21
Left the Province	11
For non-payment of Subscription	19
	—
	58
Total 30th November, 1864	400
Composed of Honorary Members.....	4
Life Members	32
Corresponding Members	6
Junior Members	1
Members	357
	—
Total.....	400

II. COMMUNICATIONS.

The following list of Papers, read at the Ordinary Meetings during the Session, will be found to contain many communications of value, and some of general interest:—

5TH DECEMBER, 1863.

Rev. Prof. W. Hincks, F.L.S., &c.: "Notice respecting *Welwitschia*, a newly discovered African plant; being an abstract of Dr. J. D. Hooker's paper in the Linnæan Society's Transactions, with a few remarks."

Prof. Chapman, Ph.D.: "On the detection of ordinary metals in mineral bodies, by aid of the common blowpipe, and other cheap, portable, and easily procurable apparatus, with illustrative experiments."

12TH DECEMBER, 1863.

Rev. J. McCaul, LL.D., President: "On ancient Glandes."

B. R. Morris, M.D.: "Exhibited and made some remarks on the insects captured during the last summer by him."

9TH JANUARY, 1864.

Rev. J. McCaul, J.L.D., President: "The President's Address."

Prof. G. T. Kingston, M.A.: "On the annual and diurnal distribution of the wind at Toronto."

16TH JANUARY, 1864.

A. M. Rosebrugh, M.D.: "On the Ophthalmoscope, a new instrument for viewing and photographing the deep structures of the living eye, with illustrations."

J. B. Clarke, Mus. Bac.: "On a new method of propelling steam vessels and canal barges."

23RD JANUARY, 1864.

Rev. Prof. W. Hincks, F.L.S.: "Continuation of observations on the systematic position and affinities of certain tribes of birds. The Fissirostral group."

James Hubbert, Esq., B.A.: part of a paper "On the latex and laticiferous vessels of plants."

30TH JANUARY, 1864.

Rev. H. Scadding, D.D.: "Remarks on the Greek and Roman coins in the collection of the Institute."

6TH FEBRUARY, 1864.

D. Tucker, M.D.: "On certain modern views concerning the ordinal arrangement of the higher mammalia."

13TH FEBRUARY, 1864.

Prof. E. J. Chapman, Ph.D.: "Comparative anatomy and geological relations of the Archaeopteryx."

20TH FEBRUARY, 1864.

Prof. E. J. Chapman, Ph.D.: "A short communication on the Allanite."

Rev. J. McCaul, LL.D., President: "Remarks upon the Roman army of occupation in Britain."

27TH FEBRUARY, 1864.

Prof. G. T. Kingston, M.A.: "On the abnormal variations of the meteorological element at Toronto, and their relation to the direction of the wind."

5TH MARCH, 1864.

Prof. D. Wilson, LL.D.: "On some of the supposed traces of human art in the post pliocene strata."

12TH MARCH, 1864.

Prof. E. J. Chapman, Ph.D.: "On a peculiarity connected with the presence of phosphorus in iron wire."

Prof. E. J. Chapman, Ph.D.: "On certain distinctive characters of the Rhizopoda."

19TH MARCH, 1864.

Prof. G. T. Kingston, M.A.: "On the relative duration of different winds during

rain or snow. derived from the Toronto observations, in years 1853 to 1859, inclusive."

Rev. Prof. W. Hincks, F.L.S., &c.: "Additions to Canadian Flora."

Prof. J. B. Cherriman, M.A.: "On the geometrical trisection of an angle."

2ND APRIL, 1864.

Rev. H. Scadding, D.D.: "On Errata Receipta, written and spoken."

9TH APRIL, 1864.

U. Ogden, Esq., M.D.: "On quackery, and a novel remedy for the treatment of certain chronic diseases."

16TH APRIL, 1864.

D. Tucker, Esq., M.D.: "On secluded tribes of uncivilized men."

A. M. Rosebrugh, Esq., M.D.: "On a modification of the Ophthalmoscope."

Prof. D. Wilson, LL.D.: "On the Canadian type of the French skull."

A P P E N D I X .

DONATIONS OF BOOKS, MAPS, &c., SINCE LAST ANNUAL REPORT

Marked thus (*) not bound, or pamphlets.

FROM HON. J. M. BRODHEAD, WASHINGTON, D. C., U. S.

Report on the construction of a Military Road from Walla-Walla to Fort Benton. By Capt. John Mullen, U.S.A. Washington, 1863	1
Diplomatic Correspondence, year 1863. Parts 1 and 2.....	2

FROM JOHN LOVELL, PUBLISHER, MONTREAL.

The North British Almanac, and annual record for 1864. Vol. I	1
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FROM THE ROYAL GEOGRAPHICAL SOCIETY, LONDON.

*The Quarterly Journal, Vol. 18, Nov. 1st, 1862, No. 72, part 4	1
" " Vol. 19, Feb. 1st, 1863, No. 73, part 1	1
" " " May 1st. 1863, No. 74, part 2	1
" " " August, 1863, No. 75, part 3	1
" " " Nov., 1863, No. 76, part 4	1

*List of Members, Nov. 1, 1862.....	1
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*Charter and By-Laws	1
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FROM THE ROYAL ASIATIC SOCIETY OF GREAT BRITAIN AND IRELAND.

*Journal of, Vol. 20, part 1; Vol 20, part 2	2
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FROM THE SOCIETY.

*Transactions of the Royal Society of Edinburgh, Vol. XXIII., part 2. session 1862-63.....	1
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FROM THE SECRETARY OF STATE FOR INDIA.

Magnetical and Meteorological Observations. Bombay, 1861.....	1
" " " Bombay, 1862.....	1

FROM CLERK OF LEGISLATIVE ASSEMBLY OF CANADA.

Journal of the House of Assembly, Nova Scotia, 1863	1
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*Transactions of the Nova Scotia Institute of Natural Sciences	1
--	---

The Statutes of Canada, 1863	1
------------------------------------	---

Statutes of Canada, 1864	1
FROM THE NATURAL HISTORY SOCIETY OF CHICAGO.	
Transactions of the Illinois State Agricultural Society. Vols 3 and 4.....	3
Abstract of a Report on Illinois Coal. By J. G. Norwood, M.D.S., Geologist.	1
FROM THE SOCIETY, SCOTLAND.	
*Proceedings of the Royal Physical Society of Edinburgh. Sessions 1858-9, 1859-60, 1860-61, and 1861-62.....	2
FROM THE REGENTS OF THE UNIVERSITY OF THE STATE OF NEW YORK.	
Sixteenth Annual Report. Appendix D. Copies.....	
FROM THE SMITHSONIAN INSTITUTE, WASHINGTON.	
Report for 1862	1
Contributions to Knowledge. Vol. XIII.....	1
*Miscellaneous Collections. Vol. V.....	1
*Verhandlungen der Kärntnerisch-Komglischen Zoologisch-Botanischen Gesell- schaft in Wien, &c., 1863. XIII. Band	1
Meteorologische Waarnemingen in Nederland in Zyne Bezittingen in afwy- kingen van Temperature en Baromete stand op vele Plaattsen in Europa, uitgevere door het Konrdelijk, Nederlandsch Meteorologisch Institut, 1862.	1
FROM SIR W. LOGAN, F.G.S., MONTREAL.	
The Geology of Canada, 1865	1
FROM JAMES HUBBERT, ESQ., M.A.	
Ancient Gems, from the collections of Earl Percy, Hon. C. T. Greville, T. M. Slade	1
FROM THE AUTHOR.	
Chapman's Minerals and Geology of Canada.....	1
FROM PROF. G. T. KINGSTON, M.A., SUPT. OF THE MAGNETIC OBSERV., TORONTO.	
Abstracts of Meteorological Observations made at the Magnetical Observatory, Toronto, C. W., during the years 1854 to 1859, inclusive.....	1
Results of Meteorological Observations made at the Magnetical Observatory, years 1860, 1861, and 1862.....	1
FROM THE COMMISSIONER OF PATENTS, D. FOLLOWAY, WASHINGTON.	
Patent Office Reports, 1861. Vol. I.—Arts and Manufactures.....	1
Vol. II.— Do do Illustrations ..	1
Introductory Report of Commissioner of Patents for 1863.....	*1
FROM CHIEF SUPERINTENDENT OF EDUCATION, LOWER CANADA.	
Journal de l'Instruction Publique, years 1862 and 1863.....	2
Journal of Education, Lower Canada, years 1862 and 1863	2
FROM THE AUTHOR, LIEUT.-COL. GRAHAM, U. S. TOPOGRAPHICAL ENGINEERS.	
Report for 1857 on Lake Harbors, &c.	1
Do 1858 do do	1
Report on Mason and Dixon's Line	*1
Do of the Topographical Bureau for year 1863.....	*1
Do Annual, 1860, Lake Harbors, Improvements, Geographical Positions, Lake Lunar Tides.....	1

FROM PATRICK MCGREGOR, ESQ, BARRISTER, TORONTO.

Traite de la Résolution des Equations Numériques de Tous les Degrés. Par
J. L. Lagrange. 1826..... *1

FROM LITERARY AND PHILOSOPHICAL SOCIETY, LIVERPOOL.

Proceedings of, 1862-63. No. XVII..... *1

FROM LITERARY AND PHILOSOPHICAL SOCIETY, LEEDS.

Transactions, Vol. I., Part 1, 1837..... 1

Reports of the Council from 1825-6 to 1862-3 *30

Proceedings of, from 1840 to 1862..... *23

Sensorial Vision, a paper by Sir J. F. Heachett, Bart., 30th September, 1858. *1

China and its Trade, a paper read by John Crawford, F.R.S., 17th Nov. 1858. *1

The Physical Condition of the People, a paper read by the Right Rev. R. Bick-
ersteth, D.D., F.R.S., Bishop of Ripon, 17th Jan. 1860 *1

Laws and Regulations of the Society, 1862 *1

The Relations of Science to Modern Civilization, by Professor Hennessy, 7th
January, 1862 *1

Inaugural Address by Professor Owen, F.R.S., 16th December, 1862 *1

FROM THE LINANN SOCIETY.

Journal of the Proceedings, Botany, Vol. VII., Nos. 27 and 28; Vol VIII.,
Nos. 29 and 30 *4

Do do Zoology, Vol. VII., Nos. 27 and 28; Vol. VIII.,
No. 29 *3

The Annual Address, 1863 and 1864 *2

List of the Society for the year 1863 *1

FROM THE GEOLOGICAL SURVEY OF INDIA, PER DR. OLDHAM.

Memoirs Palæontologia Indica, 3, 2-5. The Fossil Cephalopoda of the Cre-
taceous Rocks of Southern India (Ammonitidæ), by F. Stoluzka, Ph.D... *1

3-1 do do do do do ... *1

2-6, The Fossil Flora of the Rajmahal Series, Rajmahal Hills, by Thomas Old-
ham, Superintendent of Geological Survey of India, and J. Morris, Pro-
fessor of Geology, University College, London *1

The Annual Report of the Geological Survey of India, 1862-3..... *1

DONATIONS OF PAMPHLETS, SHEETS, &c.

FROM T. C. WALLBRIDGE, M.P.P.

Le Bougesome en Canada ... 1

Explorations de Quebec et Lac St. Jean. Par J. Perrault 1

Correspondence, Documents, Evidence, and Proceedings in the Enquiry of
Messrs. Lafrenaye and Doherty, Commissioners, into the office of the Clerk
of the Crown and Clerk of the Peace, in Montreal..... 1

Supplementary Catalogue of the Library of Parliament—Books added to the
Library, since 12th February, 1863 1

List of Bills introduced in the Legislative Assembly, or brought from the
Legislative Council, during last Session (1st Session, 8th Parliament) with
a statement of the stage at which Proceedings were suspended at the Pro-
rogation 1

Supplementary Catalogue of the Library of Parliament—Pamphlets.....	1
History of the Grand Trunk Railway of Canada. By T. S. Brown. 1864 ...	1
Fifth Annual Report of the Montreal Fish and Game Protection Club, March, 1864	1
Report of the Trade and Commerce of the City of Montreal for 1863	1
Four Parliamentary Papers, Toronto Esplanade, &c.....	4
Reasons against the Bill respecting the Ottawa and Prescott Railway Com- pany.....	1
Catalogue de la Bibliotheque, &c., de Sir L. H. Lafontaine, Bart., Juge en chef, &c	1
Report of the Select Committee on Reporting the Debates of both Houses of the Provincial Parliament.....	1
Census of the Province of New Brunswick, 1861	1
FROM J. W. DAWSON, F.G.S., THE AUTHOR.	
Synopsis of the Flora of the Carboniferous period in Nova Scotia.....	1
Further observations on the Devonian Plants of Maine, Gaspé, and New York	1
FROM HARVARD UNIVERSITY, CAMBRIDGE, U.S.	
List of Nebulæ and Stars-clusters seen at the College, Observatory 1847-1863.	1
On the new Form of the Achromatic Object Glass introduced by Steinheil. By G. P. Bond, Director of the Observatory	1
Report of the Committee of Overseers, 1863.....	1
The Right Ascension of the Pole Star. By T. H. Safford, O.H.C.....	1
Catalogue of the Officers and Students of Harvard University, 1864-5, 1st Term	1
FROM MR. EDWARD ALLEN, LONDON, PER DR. OGDEN, TORONTO.	
Catalogue of Curious and Rare Books.....	7
Do do do	3
FROM NATURAL HISTORY SOCIETY OF NEW BRUNSWICK.	
Fourth Annual Report of the Board of Agriculture of the Province of New Brunswick	1
FROM EDUCATION OFFICE, TORONTO.	
Jugement Errone de Ernest Renan, sur les langues Sauvages. Par N. O.....	1
FROM PROFESSOR CHERRIMAN, M.A.	
The Total Eclipse of July 17, 1860. Published under authority of the Hon. Isaac Toncey, Secretary of the Navy, by the Nautical Almanack. 1860.	1
FROM A. M. ROSEBRUGH, M.D.	
A new Ophthalmoscope for Photographing the Posterior Internal Surface of the Living Eye, with an outline of the Theory of the ordinary Ophthalmo- scope	1
FROM MCGILL COLLEGE, MONTREAL.	
The Faculty of Medicine, years 1864-5.....	1
McGill University, Montreal, 1864-5.....	1
FROM THE GEOLOGICAL SURVEY OF INDIA, PER SMITHSONIAN INSTITUTE.	
Memoirs of Survey of India, Part 3, Series 2....	1
Do do Part 4, Series 2.....	1
Do do Part 5, Series 2.....	1

FROM REV. S. HAUGHTON, M.A., F.R.S., AUTHOR, PER SMITHSONIAN INSTITUTE.	
Essay on Comparative Petrology, by M. J. Durocher. Translated	1
On the Phenomenon of Diabetes Mellitus	1
Account of Experiments made to determine the Velocity of Rifle Bullets commonly used	1
The use of Nicotine in Tetanus and cases of Poisoning by Strychnia.. ..	1
On the Form of Cells made by various Wasps and by the Honey Bee, &c....	1
Experimental Researches on the Granites of Ireland, Part III. Donegal.....	1
Rain Fall and Evaporation in Dublin, year 1860.....	1
On the Deviation and Force of the Wind in Leopold Harbor.....	1

FROM LAVAL UNIVERSITY.

Annuaire de l'université Laval pour l'Anne academique, 1864-5	1
---	---

FROM THE AUTHOR, GEORGE LAWSON, Ph.D.

Synopsis of Canadian Ferns and Filicoid Plants	1
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FROM B. WORKMAN, Esq, M.D.

Report of the Provincial Lunatic Asylum. Toronto, 1863	1
--	---

FROM DAWSON BROTHERS, MONTREAL.

The Northern Kingdom. By a Colonist	1
---	---

UNKNOWN.

Charles Desilvers' Descriptive Catalogue of Books, Philadelphia	1
---	---

FROM BERNARD QUARITCH, LONDON.

Catalogues of Works of Art and Curious and Rare Books.....	10
The Crown and the Confederation. Three Letters to Hon. J. A. Macdonald. By a Backwoodsman!	1

FROM OFFICE OF ROUTINE AND RECORD.

Report of the Select Committee on Immigration.....	1
--	---

FROM PROFESSOR KINGSTON, PER ROYAL SOCIETY, LONDON.

Bericht liber die Thätigkeit der St. Gallischen Naturwissenschaftlichen Gesells- chaft während des Vereinsjahres, 1862-63. Redaktor Prof. Dr. Wartman	1
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FROM THE SOCIETY.

The Transactions of the Nova Scotian Institute of Natural Science. Vol. II. Part 1. 1864.....	1
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IN EXCHANGE FOR JOURNAL.

The Journal of Education for Upper Canada, 1864 (Duplicate.)	1
The Journal of the Franklin Institute, Philadelphia, 1864.....	1
The Antijan, London, 1864.....	1
The Journal of the Society of Arts, 1864 (Duplicatory).....	1
Silliman's American Journal, 1864.....	1
Canadian Naturalist and Geologist, 1864	1
Proceedings of the Boston Natural Historical Society, 1864.....	1
Proceedings of the Academy of National Sciences, Philadelphia, 1864.....	1
Historical Recollections of the Essex Institute, 1864.....	1

Annals des Minns, &c., France.

Tome IV. 5 Liv. de, 1863	1
6 Liv. de, 1863	1
V. 1 Liv. de, 1864	1
2 Liv. de, 1864	1

Bulletin de la Société Géologique de France.

Deuxieme Série Tome Dix-Huitieme Feuilles 7-12 (17 Dec., 1860—3 Fev. 1861	1
Deuxieme Série Tome Vingtieme Feuilles 6-12 (1 Dec., 1862—12 Jan., 1863) ..	1
Do do do 13-20 (12 Jan.—13 April, 1863)..	1
Do do do 21-30 (13 Avril—18 Mai, 1863)..	1
Do do do 31-48 (18 Mai—22 Juin, 1863)..	1

List of Members, 1st May, 1863. 1

Proceeding of American Antiquarian Society Boston, April 7, 1864. 1

Annals of the Lyceum of Natural History, New York, 1864. 1

Journal of the Board of Arts and Manufactures, 1864. 1

Proceedings of the Natural History Society, Dublin.

Vol. 3, Part 1, 1859-60	1
“ 3, “ 2, 1860-62	1
“ 4, “ 1, 1862-63	1

Anthropological Review, 1864
 1 |

The Journal of the Royal Dublin Society, Nos. XXIX, April, 1863. 1

XXX., July, 1863. 1

XXXI., Oct., 1863.—July, 1864 .. 1

The Journal of the Geological Society of Dublin, Vol. IX., Part 2, 1861-62.. 1

Vol. X., “ 1, 1862-63.. 1

Transactions of the Literary and Historical Society Quebec, New Series, Part 2, 1863-4
 1 |

Transactions of the Royal Scottish Society of Arts, Vol. VI., Part 3, 4 March, 1864
 1 |

BOOKS PURCHASED.

Words and Places. By Rev. J. Taylor. 1

Coins, Medals and Seals, Ancient and Modern. Illustrated. Edited by W. C.

Prime. 1

The Works of Francis Bacon. Vols. 8, 9 and 10. 3

DONATIONS RECEIVED FOR THE MUSEUM.

PRESENTED BY THE GOVERNOR OF N. BRUNSWICK, PER S. FLEMING, ESQ.

“ Albertite ” found in Albert County, New Brunswick,—Specimens. 1

“ Gypsum ” do do do do
 1 |

“ Iron Ore ” from Acadian Mines, Nova Scotia. do
 3 |

PRESENTED BY J. LAIDLAW, ESQ., PER S. SPREULL, ESQ.

“ Coal ” from Durm Mountain, New Zealand.—Specimens
 1 |

PRESENTED BY S. FLEMING, ESQ., CIVIL ENGINEER.

“ Gypsum ” from Tobique River, New Brunswick.—Specimens. 1

STATEMENT OF THE GENERAL ACCOUNT OF THE CANADIAN
INSTITUTE FOR THE YEAR 1863-64, FROM 1ST DECEMBER, 1863,
TO 30TH NOVEMBER, 1864.

Dr.

Cash balance last year.....	£221	19	1
“ received from Members.....	152	0	1
“ “ for Journal.....	46	5	0
“ “ for Interest.....	46	10	0
“ “ for Rent.....	20	7	6
“ “ Don. for Building.....	0	5	0
“ “ Parliamentary Grant.....	187	10	0
“ due by Members.....	430	1	3
“ due for Old Journals.....	28	11	3
“ “ New Journals ..	10	16	3
	<hr/>		
	£1144	5	4

Cr.

Cash paid on account of Journal, 1863 ...	£118	15	6
“ “ “ “ 1864.....	110	7	3
	<hr/>		
	£229	2	9
“ “ “ of Library and Museum.....	50	12	8
“ “ “ of Sundries.....	191	0	7
“ “ “ of Building.....	57	14	6
“ due on account of Journal 1864.....	50	0	0
“ due on account of Sundries.....	25	0	0
“ due on account of Library.....	1	0	0
Estimated Balance.....	539	14	10
	<hr/>		
	£1144	5	4

*The Treasurer in account with the Canadian Institute, year 1863-1864, from
1st December, 1863, to 30th November, 1864.*

Dr.

Cash Balance last year.....	£221	19	1
“ Interest received on Loans.....	46	10	0
“ From members.....	152	0	0
“ on account of Journal.....	46	5	0
“ on account of Rent.....	20	6	6
“ on account of Building Fund.....	0	5	0
“ Parliamentary Grant.....	187	10	0
Securities.....	775	0	0
	<hr/>		
	£775	0	0

Cr.

Cash paid on account of Journal, 1863	£118 15 6	
“ “ “ “ 1864	110 7 3	
		£229 2 9
“ “ “ of Library and Museum	50 12 8	
“ “ “ of Sundries	191 0 7	
“ “ “ of Buildings	57 14 6	
Securities	775 0 0	
Balance in Bank	146 6 1	
		£1449 16 7

Statement of the Building Fund.

Dr.

Balance last year	£1569 2 5
Interest on Loan, £775, @ 6 per cent.	46 10 0
Donation from Capt. Walker, Barrie	0 5 0
Rent, 15th February to 15th September, 1864	23 6 6
Subscriptions (not collected)	534 15 0
	£2173 18 11

Cr.

Repair of House	5 14 6
Commission, £23 6s. 6d., Rent collected	1 3 5
Taxes paid back to Mr. Haxworth	1 15 9
Insurance, \$1800, to 18th Sept. 1865	9 0 0
J. Smith, Architect, for plans, specifications, and receiving tenders for proposed New House	40 0 0
Freeland & Whitley, for leasing House to Mr. Reid	3 0 0
Balance	2113 5 2
	£2173 18 11

Toronto, 29th Nov., 1864.

Vouchers compared with Cash Book, and found correct. Balance due by Treasurer, one hundred and forty-five pounds.

SAMUEL SPREULL, }
G. H. WILSON, } *Auditors.*

MEDICAL SECTION.

Since January 13th, 1864, ten meetings have been held, at which the following communications were read by the respective authors.

1. "On the Variola, Varioloid and Vaccination."—Dr. Agnew.
2. "On the Therapeutic action of the Alkalies in Inflammatory Diseases."—Dr. C. B. Hall.
3. "On the Ophthalmoscope."—Dr. Rosebrough.
4. "On the complications of Pertussis."—Dr. Tucker.
5. "On the Views of Brown Sequard regarding the quantity of Fibrine in the blood."—Dr. Barrett.
6. "On some difficulties of Diagnosis."—Dr. C. B. Hall.
7. "On the treatment of Pertussis by Bromide of Ammonium."—Dr. O'Dea.
8. "On a new method of treating the Peduncles of Ovarian Tumours."—Dr. Lizars.
9. "On the treatment of Cholera Canadensis by Hyprodermic Injections of Morphia."—Dr. Ross.

REPORT OF THE EDITING COMMITTEE OF THE CANADIAN JOURNAL.

To the Council of the Canadian Institute:—Your Committee can make but little variation on the form of Report which has been presented in previous years, the method of conducting the Journal having undergone no change during the present year of publication. They trust that its reputation has not been diminished, nor its usefulness impaired; and they are led to believe, from the notices of it by European publications, and the enquiries made for it in Europe, that it is becoming increasingly known and appreciated beyond the limits of the Province. The number of original communications printed has been twenty, many of which the Committee believe to be of permanent value; and while the department of REVIEWS has not been neglected, a further extension has been given to the translation of articles of general interest from foreign scientific periodicals, which are not accessible in their original form. In this department the Committee thankfully acknowledge their obligations for valuable services rendered by the following gentlemen: M. Barrett, Esq., M.D., Thos. Moss, Esq., M.A., and J. Campbell, Esq., of University College, Toronto.

In accordance with the recommendation of the Council, the issue of the Journal has this year been reduced to 500 copies, and this, together with other circumstances, has led to a diminution of the cost of publication to the extent of about \$400, the total expense for the year having been \$886. The issue is, however, still in excess to the requirements of the Institute; and your Committee would respectfully suggest to the Council a consideration of the propriety of closing the present series of the Journal, which has now extended over nine years, and of placing the publication thereof on a different footing.

All which is respectfully submitted,

J. B. CHERRIMAN, *General Editor.*

REPORT OF THE LIBRARIAN ON THE CANADIAN INSTITUTE, FOR
THE YEAR 1864.

No changes have been made in the arrangement of the Library during the year. Accommodation more ample for the annually increasing number of volumes will be provided in the building to which the Institute purposes shortly to remove. The additions to our shelves by purchase, indeed, have not been many, our resources available for that purpose being limited; but the collection continues to be enlarged and enriched by the transmission to it of the valuable publications periodically put forth by scientific and literary societies in Europe, British America, and the United States. These consist, this year, of about forty unbound volumes or parts, including especially four late Reports of the Geological Survey of India, with very fine illustrative plates; and about thirty pamphlets to which are to be added (in parts) a set of the Annual Reports of the Leeds Philosophical and Literary Society, from 1830 to 1863; also a set (in parts) of the Proceedings of the Geological and Polytechnic Society of the West Riding of Yorkshire, from 1840 to 1862; and ten parts of the Journal of the Proceedings of the Linnæan Society, completing the set in the possession of the Institute to 1864. The Reports and Transactions just enumerated are principally in exchange for the Journal published by the Canadian Institute.

Several parliamentary and public official documents have also been forwarded to the Institute, by the kindness and attention of Members of the Provincial Legislature.

The volumes of the Library, to which reference was made in the last Annual Report as having been too long out on loan among the members of the Institute have, in the majority of instances, been returned.

In conclusion, the Librarian has pleasure in adding that he has prepared a new catalogue of all the pamphlets in the possession of the Institute. In it, he has classified them by subjects, leaving spaces for the entry of future acquisitions. This will facilitate their being bound up in volumes at some subsequent time.

H. SCADDING, *Librarian*.

November 26, 1864.

In presenting their last Report, the Council had occasion to express their regret at the loss of the services of their Recording Secretary, Patrick Freeland, Esq., through severe illness. They have now to perform the melancholy duty of reporting his death, which occurred in May last, [1864] and, in doing so, they desire to record the deep sense which they entertain of the loss sustained by the Institute in the death of so valuable an officer, and of one who always manifested so warm an interest in its welfare.

The Council have also to record their regret that George A. Wilson, Esq., who was appointed the successor of Mr. Freeland, was also compelled to resign his office through illness. The Council thereupon appointed Mr. W. M. Clark to discharge the duties of Secretary, *ad interim*.

REMARKS ON TORONTO METEOROLOGICAL REGISTER FOR APRIL, 1865.

COMPARATIVE TABLE FOR APRIL.

NOTE.—The monthly means do not include Sunday observations. The daily means, excepting those that relate to the wind, are derived from six observations daily, namely at 6 A.M., 8 A.M., 2 P.M., 4 P.M., 10 P.M., and midnight. The means and resultants for the wind are from hourly observations.

Highest Barometer.....30.156 at 6 a.m. on 9th } Monthly range =
 Lowest Barometer.....28.980 at 8 a.m. on 12th } 1.176 inches.
 { Maximum Temperature } 62.25 on 18th } Monthly range =
 { Minimum Temperature } 23.90 on 9th } 39.35
 Mean maximum Temperature 50.67 } Mean daily range =
 Mean minimum Temperature 31.93 } 15.74
 Greatest daily range 30.70 from a.m. to p.m. on 18th.
 Least daily range 6.8 from a.m. to p.m. of 20th.
 Warmest day 6th } Mean temperature..... 51.95 } Difference = 20.37.
 Coldest day 8th } Mean temperature 31.28 }
 Maximum Solar 103.70 on 13th } Monthly range =
 Radiation } Terrestrial 15.90 on 9th } 88.0
 Aurora observed on 4 nights, viz:—15th, 16th, 17th and 18th.
 Possible to see Aurora on 14 nights; impossible on 16 nights.
 Snowing on 6 days; depth 2.1 inches; duration of fall, 6.6 hours.
 Raining on 17 days, depth 1.2 inches; duration of fall 72.8 hours.
 Mean of cloudiness = 0.64.
 Most cloudy hour observed, 2 p.m.; mean = 0.31; least cloudy hour observed,
 p.m.; mean, = 0.46.

Sums of the components of the Atmospheric Current, expressed in miles.
 North. East. West.
 1374.60 1723.60 3236.53
 Resultant direction N. 84° W.; Resultant velocity 2.11 miles per hour.
 Mean velocity 8.39 miles per hour.
 Maximum velocity 41.3 miles, from 1.30 to 2.30 p.m. on 12th.
 Most windy day 12th. Mean velocity, 19.49 miles per hour. } Difference =
 Least windy day 15th. Mean velocity, 0.41 ditto } 18.99 miles.
 Most windy hour noon. Mean velocity, 12.93 ditto }
 Least windy hour 5 a.m. Mean velocity, 4.99 ditto. } 7.96 miles.

3rd. Solar halo.—5th. Thunderstorm at 1 p.m.—6th. Rainbow at 6 p.m.—12th. Very
 violent squalls of wind from west during the day.—19th. Solar halo during fore-
 noon.—21st. Sheet lightning.—24th. Ice quarter of an inch thick.—26th. Solar
 halo in morning; sheet lightning during evening.—28th. Very stormy night.

The month of April, 1865, was comparatively warm and wet, while the velocity
 of the wind and cloudiness, although slightly in excess, closely approximated to the
 average.

Year.	TEMPERATURE.				RAIN.		SNOW.		WIND.		
	Mean.	Excess above average	Max. observed	Min. observed	Kan fcs.	No. of days.	Inches.	No. of days.	Inches.	Resultant Direction.	Mean Force or Velocity.
1844	22.4	+ 1.4	65.0	23.3	40.6	14	3.420	2	...	...	...
1845	19.2	+ 1.4	62.0	22.1	40.8	8	1.374	3	...	...	0.51 lbs.
1846	23.1	+ 2.1	89.5	21.0	67.9	8	3.744	2	...	...	0.57
1847	10.9	- 0.1	70.0	15.1	54.3	7	3.182	3	0.1	...	0.45
1848	17.5	+ 6.4	74.5	17.2	57.3	10	1.517	1	Imp	...	0.24
1849	22.1	+ 1.1	66.0	14.8	51.2	11	3.204	4	1.5	...	1.00
1850	14.0	+ 3.4	79.4	24.3	55.0	10	1.306	2	1.3	...	0.55
1851	19.2	- 1.8	65.6	8.4	57.2	8	2.876	2	4.0	...	0.59
1852	11.3	+ 0.3	65.4	26.5	38.9	5	1.455	1	0.5	N 77° W	1.46
1853	19.0	+ 2.6	70.9	23.2	47.7	10	2.637	2	1.7	N 43° W	3.14
1854	17.9	- 3.1	63.2	18.2	45.0	7	4.726	2	1.1	N 39° W	1.12
1855	11.3	+ 0.3	59.2	23.8	33.4	11	2.297	3	1.2	N 14° E	2.52
1856	18.2	+ 2.8	53.8	19.8	34.0	6	1.991	4	9.4	N 43° E	2.41
1857	11.0	+ 0.9	65.7	27.0	38.7	12	2.027	1	1.0	N 12° W	1.95
1858	11.0	+ 0.4	65.1	22.3	42.8	12	2.087	4	2.7	N 50° E	2.57
1859	12.4	+ 1.4	63.8	12.2	51.4	8	2.031	3	1.6	N 39° W	3.99
1860	15.4	+ 1.6	69.8	15.1	54.7	13	2.781	3	0.1	N 29° E	1.61
1861	12.3	- 5.4	51.9	10.0	41.9	10	1.754	11	12.9	N 60° W	4.15
1862	11.5	+ 0.5	61.5	23.8	37.1	13	1.612	2	0.1	N 14° W	1.61
1863	19.5	- 1.5	62.1	19.9	38.2	9	2.527	8	1.2	N 36° W	2.33
1864	19.5	- 1.5	60.7	23.7	41.0	11	1.282	6	0.3	N 37° W	4.10
1865	22.0	+ 1.0	62.3	23.2	36.1	12	1.611	4	6.9	N 37° E	2.31
1866	19.6	+ 1.4	64.1	2.1	44.6	10	2.235	4	0.2	N 50° E	2.48
1867	22.0	+ 1.0	67.7	3.9	58.8	8	2.210	4	1.6	N 14° E	3.75
1868	10.9	- 0.1	58.3	29.5	28.8	16	3.653	3	3.5	N 41° E	3.39
1869	13.1	+ 2.1	60.5	25.2	35.3	17	3.977	6	2.0	N 84° W	2.11
1870	10.96	...	35.57	20.01	45.53	9.7	2.433	3.3	2.40	N 7° W	2.07
Exc +	...	...	5.07	+5.16	10.23	7.3	1.539	2.7	0.40	.....	...
for 1865.	2.14	...	...	...	...	...	...	...	...	.....	0.33

MONTHLY METEOROLOGICAL REGISTER, AT THE PROVINCIAL MAGNETICAL OBSERVATORY, TORONTO, CANADA WEST, -MAY, 1865.
Latitude—43 deg. 39.4 min. North. Longitude—5 h. 17 m. 33 s. West. Elevation above Lake Ontario, 108 feet.

Date	Barom. at temp. of 32°		Temp. of the Air.		Excess of mean above Normal.	Tens. of Vapour.			Humidity of Air.			Direction of Wind.			Result. Direc- tion.	Velocity of Wind.			Rain in inches.	Snow in inches.							
	6 A.M.	10 P.M.	6 A.M.	2 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	29.525	29.535	33.5	45.0	38.8	1.00	5.42	182	211	186	198	78	70	79	76	N N W	W N W	W S W	W S W	10.4	4.0	1.0	3.38	4.56	0.015		
2	.641	.645	37.1	50.4	40.7	43.43	3.30	162	188	170	181	72	50	66	63	Calm.	S S W	Calm.	Calm.	0.0	5.0	0.0	1.18	2.52	...		
3	.808	.779	33.8	52.0	41.0	44.50	2.53	152	219	192	193	75	52	75	67	N N W	S S W	Calm.	Calm.	1.2	9.0	0.0	6.10	3.74	...		
4	.728	.692	41.7	44.3	44.6	43.78	3.63	216	230	218	217	79	83	81	81	E N E	E N E	S E B E	S E B E	0.0	9.4	6.5	6.06	6.68	0.185		
5	.363	.367	44.2	39.2	43.4	42.251	4.25	314	314	337	300	80	66	86	77	E N E	E N E	S E B E	S E B E	2.0	1.0	8.0	2.70	3.79	...		
6	.463	.390	.515	.4572	49.3	41.3	47.08	0.05	343	352	221	205	89	91	76	87	Calm.	S W B E	N N W	N N W	0.0	7.8	16.0	6.96	8.46	0.700	
7	.573	.467	.447	.432	44.4	41.4	43.308	—	244	308	—	87	72	72	74	W B S	S S W	S W B S	S W B S	2.0	17.0	4.9	8.64	8.95	...		
8	.243	.321	.373	.3153	49.3	48.6	33.13	4.35	288	285	312	237	82	97	97	S W W	N W B E	Calm.	Calm.	2.8	9.0	0.0	4.48	5.69	...		
9	.463	.521	.611	.5363	45.7	44.6	48.53	0.82	230	269	236	235	75	58	71	63	N	S	Calm.	Calm.	5.0	4.8	0.0	2.80	5.61	...	
10	.597	.659	.637	.5937	45.7	44.4	41.045	3.68	259	303	275	254	92	73	92	53	E b N	E b N	N b W	N b W	10.5	0.5	18.4	6.18	8.16	0.355	
11	.654	.687	.692	.6708	39.6	45.4	38.1	9.78	184	143	143	137	75	47	41	53	N W	N W	N W	N W	12.8	9.0	8.5	8.76	8.31	...	
12	.716	.614	.582	.6308	37.0	50.0	41.043	0.72	141	144	184	162	65	46	71	53	N W	S E B S	S S W	S S W	2.5	9.2	6.2	4.68	5.32	...	
13	.558	.675	.740	.6610	43.5	46.4	50.45	0.12	246	253	212	230	85	55	67	69	Calm.	S E B S	S E B E	S E B E	0.0	6.2	1.0	0.51	4.91	0.010	
14	.814	.855	.855	.843	50.8	43.2	50.8	—	227	262	—	81	70	—	67	60	60	Calm.	E b N	Calm.	Calm.	0.0	9.5	0.0	2.88	2.98	...
15	.900	.950	.876	.9305	51.1	60.1	52.2	3.62	278	243	264	254	74	46	67	70	Calm.	S b W	Calm.	Calm.	0.0	7.0	0.0	3.63	3.77	...	
16	.809	.603	.601	.6940	49.7	68.4	58.3	8.17	278	447	333	367	77	45	56	88	S W W	N W B W	E b N	E b N	1.0	8.0	15.8	4.84	7.36	2.220	
17	.543	.641	.605	.5622	62.7	62.7	47.9	7.27	471	530	321	431	84	93	84	73	E N E	E N E	E b N	E b N	6.5	8.0	16.0	10.69	10.78	0.280	
18	.706	.729	.670	.6972	48.2	49.7	52.9	1.93	268	219	338	270	79	69	81	84	E N E	E N E	E b N	E b N	11.4	9.0	4.0	6.43	6.44	0.125	
19	.627	.643	.612	.6197	48.0	53.3	54.7	0.20	317	371	353	355	91	92	81	80	E b N	E b N	E b N	E b N	1.5	5.2	6.7	5.14	3.37	...	
20	.539	.509	.533	.5073	52.9	68.4	56.2	7.18	381	533	428	457	97	76	95	88	E b N	E b N	E b N	E b N	2.3	5.7	0.1	2.10	3.51	0.030	
21	.344	.179	.—	.—	49.0	67.0	—	—	337	449	—	97	76	—	—	—	—	E b N	E b N	N W	N W	10.0	11.8	16.0	6.59	7.53	0.105
22	.246	.289	.420	.3202	58.3	65.1	45.4	1.98	333	452	225	310	68	88	74	74	Calm.	W b N	N N W	N N W	0.0	8.0	0.0	3.58	5.33	...	
23	.493	.493	.522	.4995	42.1	65.1	44.3	5.67	178	269	230	225	66	61	70	66	N N W	S S W	Calm.	Calm.	14.0	8.0	0.0	6.43	6.44	0.285	
24	.500	.447	.561	.5600	45.0	54.7	53.3	2.52	241	272	312	273	74	61	70	66	Calm.	Calm.	N N W	N N W	0.0	0.0	7.2	1.82	3.52	Inp.	
25	.570	.594	.587	.5873	52.6	60.9	55.1	2.22	5.3	238	339	308	78	56	73	67	N	S	N N W	N N W	11.2	3.2	8.5	4.00	5.89	...	
26	.664	.595	.555	.5933	52.3	66.5	54.4	0.68	184	248	186	209	45	52	45	45	N	N	S S W	S S W	3.8	5.0	10.0	4.64	7.65	...	
27	.349	.435	.390	.4625	52.2	67.0	58.7	3.47	255	170	191	211	57	26	37	43	N	N b W	N b W	N b W	7.0	11.4	8.2	7.12	8.13	...	
28	.602	.420	.—	.—	56.5	61.2	—	—	356	273	—	78	50	—	—	—	—	S E B S	Calm.	N N W	N N W	0.0	6.0	0.0	2.17	2.99	...
29	.517	.548	.606	.5615	58.3	67.7	60.9	6.12	262	348	234	291	54	50	43	51	N b W	S S W	S S W	S S W	3.0	9.0	9.0	6.0	6.0	8.21	
30	.697	.716	.711	.7085	53.8	69.5	50.8	7.37	335	329	392	328	43	45	76	56	N W	S S W	S S W	S S W	3.0	9.0	0.5	1.48	2.70	...	
31	.730	.677	.669	.6830	56.2	76.0	68.4	11.87	232	552	437	411	51	59	60	57	Calm.	S S W	N W b N	N W b N	0.0	2.5	2.5	0.58	2.32	...	
M 29	59.55	29.5769	29.5885	47.93	57.51	49.77	52.20	0.81	251	304	266	278	74	62	73	69	—	—	—	—	4.15	6.72	5.46	—	—	5.48	1.00

COMPARATIVE TABLE FOR MAY.

NOTE.—The monthly means do not include Sunday observations. The daily means, excepting those that relate to the wind, are derived from six observations daily, namely, at 0 A.M., 8 A.M., 2 P.M., 4 P.M., 10 P.M., and mid night. The means and results for the wind are from hourly observations.

	YEAR.	TEMPERATURE.				RAIN.		SNOW.		WIND.	
		Excess above Average	Maximum Observed	Minimum Observed	Range.	No. of days	Inches.	No. of days	Inches.	Direction.	Force or Velocity
Highest Barometer	1840	+ 2.1	74.5	30.8	43.7	9	4.150	0	...	...	...
Lowest Barometer	1841	— 1.2	76.2	26.6	49.6	11	2.350	1	...	...	0.35 lbs
Maximum temperature	1842	— 2.6	74.3	30.0	44.3	7	1.275	0	...	...	0.53 "
Minimum temperature	1843	— 2.6	70.6	28.9	50.7	5	1.570	0	...	...	0.30 "
Mean maximum temperature	1844	+ 1.9	77.7	29.4	48.7	14	5.670	0	...	...	0.55 "
Mean minimum temperature	1845	+ 3.8	78.1	31.3	43.8	9	4.375	0	...	...	0.46 "
Greatest daily range	1846	+ 2.7	72.5	27.8	44.7	12	2.010	6	...	...	0.29 "
Least daily range	1847	+ 2.4	74.5	31.9	46.6	13	2.520	0	...	...	4.93 ms
Mean daily range	1848	+ 3.7	72.5	32.7	39.8	16	5.115	0	...	...	5.33 "
Warmest day	1849	— 4.1	76.3	31.1	45.2	7	0.545	1	...	...	6.32 "
Cooldest day	1850	— 0.4	73.2	28.7	44.5	12	2.950	1	...	...	6.34 "
Maximum Solar Radiation	1851	+ 1.5	69.0	27.6	41.4	1	1.125	1	...	...	4.00 "
Terrestrial Radiation	1852	+ 0.8	78.4	40.0	38.4	17	4.420	1	...	...	5.16 "
Aurora observed on 5 nights, viz:—on 13th, 16th, 19th, 25th, and 26th.	1853	+ 1.4	74.8	33.9	40.9	6	2.565	2	...	...	5.93 "
Possible to see Aurora on 20 nights; impossible on 11 nights.	1854	— 1.2	80.1	35.5	44.6	14	4.580	1	...	...	9.81 "
Raining on 11 days; depth 4.005 inches; duration of fall, 55.0 hours.	1855	+ 2.8	72.5	27.9	44.6	15	4.145	1	...	...	8.13 "
Mean of cloudiness = 0.53; Most cloudy hour observed, 2 p.m.; mean = 0.66; least cloudy hour observed, 12 p.m.; mean = 0.40.	1856	+ 1.5	69.0	27.6	41.4	17	4.630	0	...	...	9.30 "
	1857	+ 1.4	74.8	33.9	40.9	15	6.367	0	...	...	5.70 "
	1858	— 2.8	72.5	27.9	44.6	16	3.367	0	...	...	7.17 "
	1859	+ 3.5	76.2	41.5	34.7	11	3.110	0	...	...	7.17 "
	1860	+ 3.8	73.2	35.6	37.6	12	1.815	0	...	...	7.87 "
	1861	+ 4.2	72.0	29.1	42.9	16	3.380	1	...	...	5.89 "
	1862	+ 0.5	77.8	38.1	39.7	8	1.427	0	...	...	5.64 "
	1863	+ 2.6	77.1	38.1	39.0	14	3.365	1	...	...	5.48 "
	1864	+ 3.1	74.2	35.3	38.9	18	4.070	0	...	...	6.59 "
	1865	+ 6.6	76.0	33.8	42.2	11	4.005	0	...	...	1.46 "
Results to 1864	...	...	74.98	32.47	42.52	111.6	3.206	0.4	0.09	N 6 W	1.46
Exc. for 1865	+ 0.02	+ 1.02	+ 1.83	— 0.32	0.5	0.799	0.4	0.09	...	...	— 1.11

May, 1865, may be characterized as a month whose differences from the average of the previous 25 years, are so slight as to be unnecessary quoting.

Highest Barometer 30.003 at 8 a.m. on 15th. } Monthly range =
 Lowest Barometer 29.179 at 2 p.m. on 21st. } 0.824 inches.
 Maximum temperature 79° 0 on 31st. } Monthly range =
 Minimum temperature 30° 0 on 12th. } 49° 0
 Mean maximum temperature 61° 21 } Mean daily range = 17° 60
 Mean minimum temperature 43° 65 }
 Greatest daily range 27° 0 from a.m. to p.m. of 31st.
 Least daily range 3° 0 from a.m. to p.m. of 6th.
 Warmest day 31st. Mean Temperature 68° 42 }
 Coldest day 11th. Mean Temperature 40° 12 } Difference = 28° 30
 Maximum Solar Radiation 12° 40 on 31st } Monthly range =
 Terrestrial Radiation 18° 40 on 12th } 105° 4
 Aurora observed on 5 nights, viz:—on 13th, 16th, 19th, 25th, and 26th.
 Possible to see Aurora on 20 nights; impossible on 11 nights.
 Raining on 11 days; depth 4.005 inches; duration of fall, 55.0 hours.
 Mean of cloudiness = 0.53; Most cloudy hour observed, 2 p.m.; mean = 0.66; least cloudy hour observed, 12 p.m.; mean = 0.40.
 Sums of the 20 elements of the Atmospheric Current, expressed in Miles.
 North. South. East. West.
 1092.31 766.23 1146.55 1211.96
 Resultant direction, N. 3° W.; Resultant Velocity, 1.65 miles per hour.
 Mean velocity 5.48 miles per hour.
 Maximum velocity 20.5 miles, from 7 to 8 p.m. on 6th.
 Most windy day 18th—Mean velocity 10.78 miles per hour.
 Least windy day 14th—Mean velocity 0.15 miles per hour.
 Most windy hour, 1 p.m.—Mean velocity, 6.85 miles per hour.
 Least windy hour, 3 a.m.—Mean velocity, 3.84 miles per hour.
 2nd, Thin ice. 3rd, Hoar frost. 5th, Lunar halo.
 6th, Paint rainbow at sunset. 7th, Hoar frost.
 8th, Solar halo. 9th, Solar halo.
 11th, Solar halo. 12th, Thin ice.
 17th, Heavy thunder storm; very stormy night.
 20th, Rainbow; dense fog at night.
 21st, Thunder storm; fine rainbow. 23rd, Thin ice.