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CONTENTS.

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SOME LAPSED NAMES IN CANADIAN LOCAL NOMENCLATURE. BY REV. HENRY SCADDING, D.D.

(Read November 28, 1896.)

It is a matter of some curiosity to notice the vicissitudes which have taken place, in several instances, in the names of places, rivers, and other natural objects, during our short history here in Canada. In some cases, names imposed by royal proclamation, or other competent authority, have failed to be used, or have been displaced by terms and titles, resting solely on popular usage. It may be considered a matter of some interest to recall some of these now disused, or, as we may say, lapsed names, and to review very briefly their history.

The name of our own capital, Toronto, itself covers a lapsed name, so to speak.

When first laid out as a town, Toronto, as we all know, bore the name of York, and was so known for a period of forty years. It was then, viz., in 1834, incorporated as the City of Toronto, which, singularly enough, was a return to a name which had lapsed, the locality having been for a considerable time previous to 1794, known by the appellation Toronto, of Indian origin. This, again, was a name, which there is good evidence to show, had fallen into disuse elsewhere, and had been adopted here. In the time of La Salle, 1680, the lake which we know as Lake Simcoe was known as Lake Toronto, while the site of our city was marked as Ti-ai-a-gon on the maps, a name which La Salle also employs. This word Ti-ai-a-gon, I am assured, signifies a landing, and it here denoted the landing place for voyageurs, bound for Lakes Toronto and Huron, via a trail or portage well known.

When the Wyandotte population, inhabiting between Lakes Toronto and Huron, was extirpated by the Iroquois, the name Toronto came to be gradually attached solely to its Ti-ai-a-gon, or landing place on Lake Ontario, where it survived. And here, again, we have a glimpse of another lapsed name.

The trading post at the landing had been officially named "Fort Rouillè," in honor of the then Minister of Marine of that name in Paris, but the popular use having become familiar with the word Toronto as applied to the landing, failed to adopt the expression, Fort Rouillè, and employed only that of "Fort Toronto" instead. Hence the survival of the beautiful word Toronto, hereabouts, to this day.

It may here be conveniently added that the neighboring Humber River is given in the first Gazetteer of Upper Canada, dated about one hundred years back, as "St. John's River," from a French settler named St. Jean, who had a wayside inn, or place of entertainment, at its mouth. "Humber" displaced a long and rather uncouth Indian name, which appears on the maps; at the same time "Don" replaced an equally unmanageable Indian name, describing the river at the eastern end of our harbour. The interpretation of these two lapsed Indian names I am not able at present to give, but doubtless they were both significant. At the same time that the names "Humber" and "Don" were imposed upon these two streams, the name "Nen" was, by authority, given to the next river to the eastward, previously known as the Rouge or Red River. "Nen," however, became a lapsed name, and the Rouge retained, and still retains, its original appellation. "Nen," like "Humber" and "Don," was the name of a river in Yorkshire. It was the evident aim of the authorities to Anglicise the river names, and the notable river, still known as the Grand River, entering Lake Erie from the north, was enjoined to be known only as the "Ouse," another Yorkshire river name; but again popular usage prevailed, and "Ouse" became another instance of a lapsed name. "Grand River," of course, had nothing distinctive in it, and every river of a considerable size was, amongst the French, a "Grande Riviere." The Mississippi was so par excellence among the Indians, such being, in an emphasized way, the signification of that word.

A widely-received French appellation for our Canadian Thames was La Tranche, until forcibly over-ridden by royal proclamation.

More than one lapsed usage in regard to the River Niagara may be in place here. Wherever the name occurs in early English verse, the metre obliges us to make the penultimate syllable long in quantity, showing that such was the prevailing pronunciation at the outset. Further, it appears from the early records, that an O has been dropped off from the beginning of this word, as has happened likewise in the case of other Indian appellatives; thus we have Miami and Omiami, Swegatchie and Oswegatchie, Chouegon and Ochouegon (the modern Oswego), Mimico and Omimico, Chippeway and Ochipway, Tessalon and Otessalon, and some others. So Niagara was once Oniagara, a form of the word now entirely lapsed. There is reason to think that a like clipping off of an O has taken place in "Toronto," together with the suppression of a final N. Sagard, in his Huron, or rather Wyandotte vocabulary, gives both "Toronton" and "Otoronton." The expression signifies a large quantity, whether of human beings or of provision for their sustenance, both O and N probably representing a nasal sound very familiar to us in former days, in Indian viva-voce utterances. Another substitution in modern times of a short A for a long one in an Indian name, seems to be shown in Moore's "Uttawa's Tide" (read Uttah-wa's tide) meaning the River Ottawa, the first syllable of which name he evidently caught as U and not O.

We are slowly becoming accustomed to the style and title of "Niagara-on-the-Lake," used in modern times for the purpose of distinguishing the old town of Niagara from what is now designated as Niagara South, meaning thereby Drummondville, which is expected hereafter to become a lapsed term, although, of course, it will take a long time to bring that about. Old Niagara might have fallen back upon a lapsed name of its own, viz.: Newark, the name borne by its site when the first Parliament of Upper Canada was held there. The place we now call Queenston was known aforetime as the "Carrying Place," the place of debarkation for the "Grande Portage" round the Falls of Niagara, in the voyageurs' route between Lakes Ontario and Erie. Another lapsed name for Queenston, in the same regard, was the "Lower Landing."

Burlington Bay, at the head of Lake Ontario, received that name by proclamation on July 16th, 1799. Previous to this date it had strangely borne the name of Geneva Lake; so we are informed by the first Gazetteer of Upper Canada. The lapsed name, we may suppose, arose from the picturesque beauty of the sheet of water indicated.

On the north shore of Lake Ontario, close to Burlington Bay, a name has lapsed into disuse within the past few years. I refer to Wellington Square, now known as Burlington. The word "Square," I believe, referred originally to a square tract of land granted to the Indian chief, Joseph Brant, at this spot. Wellington, of course, referred to the Iron Duke, but we already had a memorial of him in the name of the County of Wellington, in Western Ontario. A general name for Burlington Heights, and the whole range of high land on the west side of Lake Ontario, appears to have been "Dorchester Mount," when D. W. Smith's Gazetteer was constructed, but that expression has now long since ceased to be heard. A familiar name for the swamp now traversed by the Des Jardins Canal, leading from Burlington Bay to Dundas, was "Coote's Paradise," an expression now fallen into disuse. Coote was an officer in the regular army, an enthusiastic sportsman, who found in the wild fowl and other game frequenting this marsh a never-failing means of indulging his favorite pursuits.

Two grand thoroughfares were marked off and partially cleared out, at the very outset, through the Province of Upper Canada, one named Dundas street, and the other Yonge street. The latter continues as a well-defined highway, leading from Toronto to the Holland Landing, and thence virtually across the country, via Shanty Bay and Penetanguishene, to Lake Huron and the far West.

I fear the railway authorities are doing something to render Penetanguishene a lapsed name, or at all events, partially so. They are encouraging the practice of writing and printing "Penetang," instead of Penetanguishene." The name, thus mutilated, can have no complete sense, the whole word being descriptive of a landmark at the entrance to the Bay, consisting of a bank where the sands run down.(1)

Dundas street as a grand thoroughfare has, unhappily, not retained its name throughout. For a long time the whole route, from Chatham to Dundas, and thence to Toronto, was pretty generally known as Dundas street. The popular name for a portion of it, among settlers in the west was, for a while, and, perhaps may continue still to be, the Governor's Road, and it will be remembered, possibly, by many of us, that what is now called Queen street in Toronto, was, in its western portion at least, styled Dundas street, although "Lot street" was its more customary designation, as it passed on eastward to the River Don, from which point the leading thoroughfare became better known as the Kingston Road ; but in well-engraved early maps the line of road eastward is to be seen marked as Dundas street, all the way to where it strikes the Ottawa, a few miles from the entrance of that river into the St. Lawrence.

The whole route from Chatham, in the west, to the Ottawa, in the east, was designated a street, with allusion to the great Roman roads (viae stratae), remains of which are traced everywhere in the Island of Great Britain and throughout the Continent of Europe—paved roads securing an easy transit for armies, arms and ammunition, and at later periods for merchandise. A noted instance of these is Watling street, reaching from Dover all the way to Chester, and passing through London, where a fragment of this same Roman highway is still known as Watling street. It is to be regretted, perhaps, that our "Dundas street" has become a lapsed term in so much of its route, but, happily, Yonge street still remains to us an interesting reminder of the past. On this street, six miles to the north of Toronto, "Hogg's Hollow" has been changed to the more euphonious expression, "York Mills." Of these mills, Mr. Hogg was the original builder and proprietor. Along the great thoroughfare, originally known as Dundas street, proceeding eastward from Toronto, we meet every now and then with lapsed names.

In connection with Toronto itself, two may be mentioned, in addition to those already given. The township in which the city stands was, and is still named York, but previously, strange to say, it seems to have borne the name of Dublin. Thus, in our old, oft-quoted Gazetteer, we have, at page 55, "Dublin, now called the Township of York : which see." No further explanation is given. It was expected, per-

(1) Other lapsed names besides "Lake Toronto" are covered by Lake Simcoe's present name. The French styled it for many years Lac aux Claies (Hurdle Lake), from some arrangement for the capture of fish at the Narrows, a name sometimes corrupted by the English into Lac le Clie. Two islands in this lake have likewise lost names once borne by them : Francis Island (so called by Governor Simcoe from the name of his son), and Darling's Island (commemorative of a favorite aide-de-camp of the Governor's), are now respectively known as Grape Island and Strawberry Island.

haps, to be attractive to the Irish settler, but it quickly became a disused term. Previous to the setting off of Upper Canada as a Province, the region about here had been known as the District of Nassau, and various localities to the eastward had designations sounding very German-like given them, such as Charlottenburg, Lunenburg, Osnabruck, etc. Such names were simply compliments to the reigning Hanoverian family, or might be expected to attract German settlers ; but if not actually become lapsed terms, they have ceased to draw. The other lapsed name in connection with Toronto is "Gibraltar Point," meaning the western portion of the Island in front of Toronto, and having a humorous allusion to the solitary Block House, erected there for the defense of the harbour and protection of a commissary storehouse. "Gibraltar Point" has lapsed into disuse, although we still occasionally hear Blockhouse Bay for one of the inlets at the "Point."

On the lake front of the Township of Whitby there was, for a time, the town of Windsor, on Windsor Bay, where it appears, thus named, on the engraved maps of Canada a few years since. Windsor is now a lapsed name, obliterated, possibly, by the greater importance of the western Windsor on the Detroit River. Its site is included within the limits of the modern town of Whitby. In passing, it may be mentioned that the site now occupied by Port Hope is marked on some of the old maps Ti-ai-a-gon, which, as we have already seen, simply meant "a landing," this having been a distinguished landing place for Indians and voyageurs en route to the waters to the north, entitled by us Rice Lake. (2)

The name "Cobourg" is not, as might have been supposed, a survival of one of those German-sounding names prevalent in Canada just after the taking of Quebec. Like Guelph, it appears to have been a modern compliment to the reigning Hanoverian family. It alluded, probably, to the husband of the lamented Princess Charlotte, Prince Leopold of Saxe-Cobourg. The place, we are told, was for a short time good-humoredly styled "Hard Scrabble," by settlers near the locality, but this was simply a transient jest.

At Kingston we have to recall the now lapsed names of Cataraqui and Fort Frontenac. An attempted Latinized form of "Kingston"—Regiopolis—was for a time heard of in ecclesiastical quarters, but, mongrel as it was, between Latin and Greek, it is now dropped. As to the name "Bay of Quintè"—the original word was an Indian one—Kentè or Kanti. French pronunciation produced the form Quintè, conveying some notion of "five or fifth." While passing Gananoque on our way east, it should be recalled that, strange as it may sound, the river which enters here and bore the name of Gananoque, was at a very early period styled the Thames. This we learn from a proclamation by Lord Dorchester, better known as Guy Carleton, bearing date July 24th, 1788, wherein he speaks of a boundary line running north and south, and intersecting the mouth of the River Gananoque, now called "The Thames." This seems to have become a lapsed name at the time when the Province of Upper Canada was set off and separated from the old Province of Quebec, when the previous arrangement of the region into four distinct sub-divisions was dropped, and the terms District of Lunenburg, District of Nassau, District of Mecklenburg, District of Hesse ceased to be heard. The town of Cornwall, just below the Long Sault Rapid, was formerly known as New Johnstown, from the name of a neighboring township. For the inhabitants of Cornwall the lapsed name, New Johnstown, must, of course, possess some interest.

In regard to the Long Sault Rapids, Guy Carleton, in the proclamation just above referred to, makes use of a good English word, now fallen somewhat into disuse. He speaks of "rifts," meaning thereby interruptions in the navigation of the

(2) The river at Port Hope still bears the homely name of "Smith's Creek." The Indian name of the stream, rightly treated, would have had a finer sound. Major Rogers, in his journey westward from Fort Frontenac to Toronto, in 1760, passed two rivers bearing respectively the names of "The Grace of Man" and "The Life of Man," according to the somewhat fanciful translation which he gives of their Indian appellations. It is not easy to identify these streams, but Smith's Creek may have been one of them. "Lyons' Creek," a little to the west of Smith's Creek, was once known by an Indian term signifying "the river of easy entrance."

river. He describes the mouth of the River Gananoque as being situated "above the rifts of the St. Lawrence." In early maps of Canada and North America generally, the term rifts is to be seen at the several points of a river, where now we should see the word "portage" used, indicating thereby that the navigation at that point was interrupted by cataracts or dangerous rapids. Apropos of rapids, it may be subjoined that a certain swift portion of the St. Lawrence, not far from Cornwall, used to be designated by an English-speaking lumberman, "The Mill Rush," thereby barbarizing the neat expression, "Les Mille Roches," used by the French when speaking of the same spot in the river. The same lumberman has made Bobcaygeon out of some such Indian term as Baba-kad-juan, descriptive of the lockage between Pigeon and Sturgeon Lakes.

We now approach Montreal and Quebec. The Indian term for the former place is stated to have been Hochelaga, and of the latter Stadacona. These two can scarcely be termed lapsed names, as they still maintain a good standing in the primitive and poetic accounts of Canada. The ecclesiastical title of Montreal, Ville Marie, like that of Regiopolis for Kingston, is now seldom employed by the English-speaking portions of the community. The name of a town, situated at the mouth of the River Richelieu, on the St. Lawrence, a short distance from Montreal, must be mentioned. This is Sorel, which is another instance of the prevalence of popular usage over authoritative decrees. The name imposed on the spot by the English-speaking authorities was William Henry, a compliment to a Prince of the Royal Family, but the earlier French name of Sorel has survived, as being doubtless the fittest.

I here bring to a close my list, after all, not by any means perfect, of lapsed local names in Canada. To enter upon the changes that have taken place in street names in our cities and towns would be an undertaking too large for the present occasion. I cannot refrain from remarking, however, a usage which I observe to be growing, in regard to the name of one great, conspicuous thoroughfare in Toronto. A few years since it was universally known as Spa-dee-na Avenue. Dr. W. W. Baldwin evolved out of some such Indian expression as Eo-pa-dee-nong, the quite elegant and shapely name of S-p-a-d-i-n-a (pronounced by himself and all his belongings, Spa-dee-na). It denotes, I am assured, a rise of land, and has reference to the slight ridge which bounds the site of Toronto on the north side. A considerable portion of this ridge was owned by Dr. W. W. Baldwin, and here was situated his family residence, Spadina House, exactly at the extreme northern terminus of the great avenue, bearing to this day the fine, modified Indian title just spoken of, the polite pronunciation of which seems to be threatened, although it is to be confessed that Regina, Carolina, etc., certainly favor the innovation. Below the shield of arms on Dr. Baldwin's book-plate is to be seen "Baldwin, of Spadina, in the County of York, Upper Canada."

One word in regard to the names of two outside cities, with which, in Canada, we are sometimes brought into very near relations—Buffalo and Chicago. In some respects it seems a pity that these names have not lapsed and been replaced by others of a more becoming form, and nobler significance. Buffalo took its name, no doubt, from the accidental circumstance that the stream, at the mouth of which its first buildings began to arise, was named Buffalo Creek, in French, Riviere des Boeufs, that is, the river of the Buffalos or Bisons. If the word Buffalo had to be retained in the composition of the place-name, it should have been furnished with some customary prefix or suffix, to denote the fact that it was a place-name. We have, in classical geography, the city or town of Elephantine. The termination denotes that it was the city or town of the elephas or elephant. The founders of the place would have had scruples as to calling it Elephas (Elephant) pure and simple. So, another rather famous classical name—Bucephala—really meant the city of Bucephalus, that is, the city rendered famous as being the burial place of Alexander's steed, Bucephalus. It would have doubtless been thought very anomalous to have called the place Bucephalus, wholly unchanged. The name of the city of Buffalo might have been a modification of the native Indian term for the bison or buffalo, showing, by an affix or final syllable, that it was the name of a place, and not of an animal. In regard to Chicago, the name, it is sad to say, intrinsically has a significance somewhat ill-savored. It involves as its root element the Otchipway Jikag, which denotes a polecat or skunk, as Baraga informs us in page 572 of his Otchipwe Dictionary, Cincinnati, 1853. If Chicago should ever become a lapsed name, it is to be hoped that its place will be taken by one constructed on an entirely different basis. We hear of this city sometimes as the Windy City. Let now good Otchipwe be found for Windy City, and let that be transformed by a committee of experts into a euphonious place-name for the great capital of Illinois.

The Origin of the Salishan Tribes of British Columbia and Washington. By John Campbell, LL.D.

(Read January 16, 1897.)

So little of the nature of history attaches to the aboriginal races of Canada as to make a survey of them a mere study of the baldest anthropology. Yet even mere anthropology is not biology; its object is man possessed of a soul and a soul's record. It is hardly probable that a race has passed through the four thousand odd years of post-diluvian history without taking some part in its historic events. The modern Chinese are supposed to be the descendants of the ancient Babylonians. The degraded Yeniseians and the ambitious Japanese are equally derived from those Hittite tribes that conquered Egypt and overthrew Assyrian Monarchy. In Mexico, the native Aztecs or Nahuatl are most of what remain of the Nahiri of Mesopotamia, who contended in ancient days with the Thothmes and the Tiglaths; while Homer's Dardanians, the expelled Toltecs from that same American state, are now to be found in the aborigines of Peru. The records of the League, which we term the league of the Iroquois, are engraved on the rocks of the Sinaitic Peninsula, some of them in characters as old as the patriarch Isaac. Old inscriptions and old books tell part of these stories, but most of them lie hidden in language, in proper and common names, in grammatical constructions, as well as in legends and traditions of the past. Just as old families fall into decay and poverty by the misbehavior of ancestors, so nations that once ruled the world become pariahs; *exempli gratia*, Amalek, the first of them all, whose name now lives in the Amalig-mut of the Eskimo. There are very ancient families with far more than sixteen quarterings among our most degraded tribes.

I have looked into the antecedents of the Salishans, not because I know anything of them personally, but because they live largely on Canadian soil, and because I know their grammar, and can thus reason back into their past history. If you would like to become acquainted with the books that treat of them, get the late James Constantine Pilling's "Bibliography of the Salishan Languages," published by the Bureau of Ethnology at Washington, and Major Powell's "Indian Linguistic Families," in the report of the same bureau for 1885-86. If language be your quest, consult the vocabularies of Gibbs, Tolmie, and Mengarini in the first volume of "Contributious to North American Ethnology," published by the United States Geographical and Geological Survey of the Rocky Mountain Region; and "Comparative Vocabularies of the Indian Tribes of British Columbia," by Drs. Tolmie and Dawson, given out by the Geological and Natural History Survey of Canada. According to Major Powell, the Salishans of the United States number 5,500, and those of Canada, that is, of British Columbia, 12,325. Of the latter, the larger number are connected with the Fraser River Agency, but the Kamloops Agency overlooks over 2,500, and others report to the Williams' Lake, Cowichan, Okanagan, and Kootenay Agencies. Major Powell gives the names of no fewer than sixty-four septs or tribes belonging to this family. The earliest record of them is that of Alexander Mackenzie, in his "Voyages from Montreal Through the Continent of North America," published in 1801. On page 257 he gives a brief vocabulary of the Atnah sept, and, on page 276, a shorter one of the Friendly Village Indians. The Salishans have erroneously been called Flatheads, a term that applies to their neighbours, the Tsinuks.

In attempting to affiliate the Salishans, I rely altogether on language. It has two parts—the grammar and the vocabulary. Father Mengarini's grammar I have not seen, but the "Niskwalli Dictionary" of Dr. George Gibbs exhibits the Salishan grammatical system sufficiently for comparative purposes. That system is preposing. It makes use of prepositions, not of postpositions. It also places the governing word before its genitive, the adjective before its noun, the temporal index before the verb. In these and in other particulars, Salishan grammar is not that of Northern Asia, as are Iroquoian, Dakotan, Muskhogean, etc., nor that of Melanesia as the Haidah is, but that of the Malay-Polynesian area. Seventeen years ago I exhibited, in a paper read before the Institute, the relation of the Algonquian dialects to that same Malay-Polynesian family. It is not easy to draw a line between what is Malay and what is Polynesian, either in grammatical forms or in vocabulary, yet the Algonquian dialects may be called more Malay than Polynesian. This appears most prominently in the word for man, which in Malay is *oran* or *ulun*, whence the Ilinoans of Borneo have their name. But in America, the Delawares are the *lenni Lenape* or the Lenape men, the State of Illinois was so called after the Algonquian *Illeni*, and the Micmac calls himself *ulnoo*, a man. The Polynesian, on the other hand, terms himself *tangata* or *tamata*, and that seems to be the original of the Salishan *tamihu*, *tamekhw*, *tumikh*, *temokh*, *tobesh*, and *stobush*. If, therefore, a line is to be drawn between Malay and Polynesian, it may be inferred that the Salishans are more Polynesian than Malay.

In comparing the vocabularies, I have restricted myself, so far as the Salishan dialects are concerned, to the Niskwalli. This is not for lack of material, since I have vocabularies of over twenty other dialects, but for the sake of brevity and clearness. The Niskwalli is that of Dr. George Gibbs, and the Malay-Polynesian terms are taken from Crawford, Wallace, Belcher, Hale, and a variety of other sources too numerous to mention. The words compared are the commoner nouns and adjectives, a few verbs, the personal pronouns, the numerals, and some particles, altogether over 150 in number. The evolution of the Salishan term from the standard Malayan or Javanese is sometimes quite easy to follow, but in other cases my comparative vocabularies have failed to present all the links desired. Most of the distinctive Malay terms are conspicuous by their absence from the Niskwalli vocabulary, such as *kapala* head, *muka* face, *mata* eye, *talinga* ear, *idung* nose, *mulut* mouth, *lidah* tongue, *tangan*, *lima* hand, *langit* sky, *ayer* water, *api* fire. But there are many evident Malay analogies, as of the Niskwalli *kobatil* axe, to the Malay *kapak*; *toligwut* blood, to *darah*; *tus* cold, to *tijok*; *eluks* end, to *alos*; *ashuts* fear, to *coquet*; *silels* forehead, to *alis*; and *tsoks* seven, to *tujuh*. He would be a bold philologer who would identify the Niskwalli *skwallup* ashes, with the Malay *abu*; but *abu* becomes the Bali *habu*, the Sunda *labbu*, the Bouton *orapu*, and the Mysol *gelap*. A far more extraordinary metamorphosis is that of the Malay *kasih*, to give, into the Niskwalli *abshits*. It first becomes the Bali *sukahake*, then the Bisayan *maghatag*, next the Iloco *pannangted*, the Biajuk *manenga*, in another Bali dialect *bahang*, afterwards the Tagala *bigai*, the Tahitian *evaha*, the Hawaiian *hoatu*, and the Tobi *wacito*, which is not *abshits*, but is near enough to it for all practical purposes.

The Salishan dialects disguise their relationship with prefixes and affixes, the meaning of which is little known. Take, for instance, the words for moon and sun. The moon is *slok-walm*, in which the latter syllable is plainly the almost universal Malay-Polynesian *wulan*, *bulan*, *fulan*, *hulan*, the moon. The sun is *klok-wall*, and here again the second syllable is the Malay-Polynesian *mataari*, *matalo*, *watalo*, *batalo*, the sun. What *slok* and *klok* or *slo* and *klo* mean, the dictionary does not state. The peculiar progress from labial to sibilant and guttural through the aspirate effectually obscures the unity of roots. This is apparent in *chetla*, the

Niskwalli word for a stone. The Malay form is *batu*, the Timuri *fatuk*, the Javanese *watu*, the Fijian *vatu*, the Rotuma *hathu*, the Maori *kowatu*. But the *l* of *chetla*, which otherwise might arise between *hathu* and *kowotu*, appears in the Biajuk *batro*, and, out of place, in the Malagasy *varto*. A strange word is the Niskwalli *stoduk*, a slave. Its original was the Malay *budak*, which assumes in Javanese the form *abdi*, recalling the Semitic *ebed* and *abd*. The *b*, thus made non-initial, dropped out in the Bugis and Macassar *ata*, and in the Malagasy *andavo*, at first, probably, after the fashion of the Bouton *otuko*, a post runner. Some other law of the permutation of letters than that of Grimm must be found to enable the student to trace out Malay-Polynesian derivations in America. The term for nose in Malay, Javanese, Madura, and Lampung is *idung*, *irung*, *elong*, *egong*. This is paralled by the Cree of Moose Factory, the Plains, English River, and the East Main, whose relative word for man is *ililew*, *ininew*, *ithinew*, and *eyiyew*. The derivation of the Niskwalli *muksn*, the nose, from the Malay *idung* proceeds through the Lampung *egong*, the Bali *kunguh*, the Bugis *ingok*, the Bali ceremonial *hungas-un*, and the Samang *muk*, with the *san* of the preceding.

The Malay-Polynesian character of the Niskwalli numerals is incontestable, yet that denoting 5, namely *tsahats*, which means "the fingers," is utterly unrepresented by the various forms of *rima* and *lima*, which indicate the hand and five. It is probably derived with inversion of parts from the Tambora *roma-toha*, 5, answering to the Lariki *lima-hatu*, finger. Here *toha* and *hata* are governing words, and in true Malay-Polynesian, as opposed to Melanesian, order should stand first. The Tongan word corresponding to them is *cow*, and *cow-nima* denotes the fingers. Then the Tambora *toharoma* must by degrees have become *toharon* or *tohalon* and afterwards *tohalot*. In some vocabularies the Tambora word for five is given as *kutelin*, which is just an inverted form of the Lariki *lima-hatu*, with the *lima* fallen to *lin*. The Tidore *runtoha*, 5, exhibits the same phonetic decay, and restored to Malay structure, would be *toharun*. As *lima*, 5, becomes *lib* in one of the dialects of the Caroline Islands, *lin* might become *lit*, dental replacing dental in some other dialect. I confess, however, that I have not yet come across an instance of such conversion of *lima*, the numeral, within the limits of the Malay-Polynesian area. The nearest to it is the *lok* of the Lampung *chiu-lok*, the hand. To one conversant with Lower Canadian patois, who has heard *omelette* and *patate* pronounced as *omelaque* and *pataque*, the transition from *chiulok* to *ts-alats* will not appear strange.

The Salishan name is probably derived from that of the inhabitants of the Sooloo, or more correctly the Suluk, Archipelago, between Borneo and the Philippines, who are represented in the vocabulary by twenty-two words. The dialect under consideration, namely the Niskwalli, seems to be that of Mysol, which lies between Ceram and the north-western corner of New Guinea. It is represented by seventeen words, many of which closely resemble those of the Niskwalli. These might be largely increased. For instance, the Mysol name for man is *mot*, which in Salibabo becomes *tomata*. If, therefore, we find Niskwalli in Mysol, we may be justified in finding two other Salishan tribes, the Shwoyelpi and the Skoyelpi, in the people of the Salibabo Islands, between Gilolo and the Philippines. The *mot* of Mysol and the *tomata* of Salibabo furnish a beginning of the Polynesian word for man, as differentiated from the Malay, and that is the original of the Salishan term. The Mysol *motni*, belly, is probably the original of the Niskwalli *smukha*; *bit*, black, of *hitotsa*; *kachun*, boy, of *chachas*; *wai*, child, of *bibad*; *patoh*, cold, of *tus*; *yem*, dog, of *komai*; *gaf*, feather, of *stokw* (in Skoyelpi it is *stakapısten*, and in Salish proper, *skapussel*); *kanin*, hand, and *kaniuko*, finger, of *chalesh* and *shalatshı*, by *l* replacing *n*; *wamut*, flesh, of *beyets*; *kasebo*, finger-nails, of *kohwachi*; *gakawatu*, root, of *aspud*; *umblo*, soft, of *esmetlin*; *jiyu*, wife, of *chugwush*; *lu*, two, of *salew*; *fut*, four, of *bos*; and *tıl*, seven, of *tsoko*. These 17 words are additional to the 17 of the comparative vocabulary, and thus furnish evidence of the common origin of the Niskwalli, of the south-west corner of British Columbia, and of the natives of Mysol, in the Malay Archipelago.

The Salish are regarded by Latham and other writers as an inland people, although some of them, such as the Niskwalli, dwell on the sea coast and on islands. They are, however, to a certain extent, cultivators of the ground, as are the inhabitants of the Malay Archipelago. The latter use the word *jagung* to denote maize, but the absence of that English term in all my vocabularies of the Salishan, save the Niskwalli, forbids the tracing of *jagung* to this continent. The Niskwalli word for maize is *stulels*, and this is undoubtedly the Saparua *halal*, the Liang *allar*, the Wahai *allan*, the Cajeli *halai*, and the Batumerah *allau*, which mean rice. In Polynesia the term is applied to the chief article of vegetable food, the *Colocasia esculenta*, called *taro* in Maori, *talo* in Tonga, and *talaa* in Rotuma. The Niskwalli *stulels* is an indication of a bread-making people, who are of necessity husbandmen. The principal Salishan deity seems to have been Dokwibutl. The first part of this word resembles *dugwe*, thou, and may thus represent invocation. Among the Dyaks of Borneo the chief god is Battara; the Tagalas worshipped Bathala Meycapal; and the people of Tobi called their divine progenitor, Pitakat. According to the Samoans, the first man was the product of the male principle Fatu and the female, Ele-ele, whence his name, Fatu-ele-ele. It is likely that these forms conceal the name of some eponym of the Malay-Polynesian people, or, at least, of a portion of them. In Sanchoniatho's Phœnician History, the second son of the ancestral Ouranus is called Betylus, and many things favour the derivation of the Malays from Canaanites of Semitic speech. Crawford says that Batara Guru, whom the people of Celebes call the first of their kings, is a local name of Siva. This statement is worthy of more than doubt.

Indian invasions of the Malay Archipelago, both Buddhist and Brahman, took place in or before the twelfth century, and, towards the close of the fifteenth, the Mahometans followed. These invasions caused great displacements of population for it is the warlike code of the Pacific Islanders to offer the conquered party the alternative of expatriation or extermination. Doubtless such alternatives were offered prior to the Asiatic invasions. It is clear, however, that the Salishans have not been displaced since they reached the American coast, while the Algonquins, of similar origin, have been driven into the far East, even to the shores of the Atlantic. The immigrants from Northern Asia reached British Columbia and Oregon as early as the beginning of the eighth century, and, finding the Algonquins there before them, drove them inland and eastward. The tide of northern Asiatics, called Toltecs and Aztecs, Otomis and Chichimecs, Sonora and Pueblo Indians, Muskhogeans, Iroquois-Cherokees and Dakotans, continued to flow by Behring's Straits and the Aleutian chain for fully a century, so that the Salishans cannot have settled in America before the ninth century, and may not have settled before the fifteenth. No trace of either Sanscrit or Arabic appears in their language to shew that their period of emigration from the Malay Archipelago was posterior to the dominance of Hindoos and Mahometans. The divergence of their forms of speech from those of the present occupants of their ancient homes suggests a time when Malay forms were not so firmly rivetted in speech as has been the case since Europeans first knew the Pacific Islanders. It is likely that all our Indian tribes of oceanic derivation found their way to the shores of America before its coasts were known to Columbus and his followers. It is, of course, a guess in the form of a compromise, but it may be suggested, that the Salishans have been on this continent since the thirteenth century. The Maya-Quiches, of Yucatan and Guatemala, and the Algonquins must have preceded them some six hundred years.

The Rev. S. J. Whitmee, an authority on matters Polynesian, leaving the Malay Archipelago proper out of sight, has proposed a three-fold division of the insular area. The people of negrito features and a postposing grammar in New Guinea, New Caledonia, the New Hebrides, Australia, etc., who have been termed Melanesian, he classifies as Papuan. The other islanders he divides into two groups. Those of Eastern Polynesia and New Zealand he calls the Sawaiori, a name compounded of the words *Sa*-moa, Ha-*wai*-i, and Ma-*ori*, denoting three representative peoples belonging to the race. To those of the north-western islands he gives the title Tarapon, from *Tara*-wan and *Pon*-ape, representative islands in the Gilbert and Caroline groups. A judgment based on partial vocabularies can hardly be a definite one; still a court must decide on the evidence before it, and render a verdict liable to revision should fuller testimony afterwards be forthcoming. At present the Malay element in the Niskwalli is represented by 51 Javanese, 45 Malay, 22 Sulu, 21 Sunda, 17 Bali and Mysol, 15 Tagala, 14 Bugis, 12 Bisayan, Madura, Wahai, and Tidore words. This decides nothing but the general fact of the Malay-Polynesian origin of the Salishans, save that in Tagala, Bugis, Macassar, Mysol, Menado, Salibabo, Saparua, Awaiya, Camarian, etc., the *tamata* or Polynesian form of the word for man appears, which is also Salishan. The Tarapon or Micronesian division of the South Sea Islands has but a small representation of some thirty words. But the Sawaiori division counts 51 Maori, 30 Tonga, and other verbal equivalents, showing that the Salishan stock is Sawaiorian. It has also verbal affinities to the languages of the Pelew islanders and the Malayan aborigines of Formosa, which suggest the route by which the Niskwalli and their brethren passed from the Malay Archipelago to the Hawaiian Islands and thence to the American coast.

The Malays have been called the Phœnicians of the East, and I have already hinted that Phœnician blood is in them. The enterprise that carried them to Madagascar in the west, and to Easter Island in the east, which sent them to the fishing grounds of Australia and to the ports of China, which pirate-wise swept the seas with hundreds of large war prahus and well-provisioned craft of many sails; that enterprise which brought to Central America the culture of the Maya-Quiches, and overflowed into the West India Islands long before Columbus reached their shores, became paralyzed when European voyagers, headed by the Portuguese, invaded their domain. Before they came, Hindoos, Arabians and Mongols had effected large displacements of population, but till late in the Sixteenth Century, fleets of three hundred sail, carrying fifty thousand combatants, were not unknown in their eastern seas. Of the Malay-Polynesian tribes, however, there is no such thing as continuous history. Their traditions blend with their mythology, and it is little to be wondered at that they and their widely-separated relatives should have preserved no record of their migrations, when the same is true of some of the most highly civilized nations.

Like the Malay-Polynesians, the Salishans are not scalpers, but decapitators or head-hunters, as were the extinct Beothiks of Newfoundland. Their canoes, also, are dug-outs, as originally were those of all tribes of insular origin. They tattoo the jaw and wear scanty clothing. When first met with they were not hunters and looked upon venison with disgust. Their fish-hooks, made of wood or bone, were similar to those of the South Sea Islanders. In regard to their mortuary customs, Dr. Franz Boas says: "The face of the deceased is painted with red and black paint. * * * A chief's body is put in a carved box, and the front posts supporting his coffin are carved. His mask is placed between these posts. The graves of great warriors are marked by a statue representing a warrior with a war club. * * * After the death of husband or wife, the survivor must paint his legs and his blanket red. At the end of the mourning period, the red blanket is given to an old man, who deposits it in the woods." The Salishan lament of a mother over her dead child is, "*Ah stahb! shedda buddah ah ta bud! ad-de-dah!*" or, "Ah chief, my child is dead! Alas!"

So, one of the verses of a Tonga mourning is, "*O iaooe! gooa mate e!*" or, "Alas! he is dead!" The funeral customs of the Maoris of New Zealand, so far at least as chiefs are concerned, are, as described by Von Hochstetter, similar to those of the Salishans, even to the erection of a wooden image of the deceased over the grave and clothing it with his favorite articles of dress.

There are 18,000 Salishans in Canada and the United States, the result, it may be, of six centuries' development. Supposing their population to have gone on doubling within the reasonable rate of a century, or three generations, they must have landed on the Pacific Coast a little over 280 strong. Now, it is related that a Tonga chief set sail for the Fiji Islands, with two hundred and fifty followers in three large canoes, carrying also provision for the voyage. Four such canoes would have been ample accommodation for the Salishan immigrants, from whatsoever point they directed their course to the American shore. Their numbers can hardly have been less, in order to protect themselves from destruction by hostile tribes or incorporation in a stronger nationality. They do not seem to have come into contact with tribes of Northern Asiatic derivation to any extent, for their peculiar arts such as the birch canoe and the fabrication of pottery, were unknown to them. There is, therefore, nothing to traverse the testimony of language, which brings the Salishans from an ancient seat in the northern part of the Malay Archipelago.

COMPARISON OF NISKWALLI WITH MALAY-POLYNESIAN.

English.	Niskwalli.	Malay-Polynésian.
adze	kwalius	galeleh *Salibabo* (axe)
all	bokwi, bebkw	kabeh *Java*, *Madura*; fooabe *Tonga*.
ant	mitchilola	misisin *Massaratty*, mosisin *Cajeli*, pokoma *Maori*, mokohoola *Tonga*.
arm	chalesh	kaligh *Formosa*.
arrow	shauks	tkugh *Formosa*.
	nokwed	anakpanah *Malay*, gnahow *Tonga*, ngasau *Fiji*.
ashes	skwallup	gelap *Mysol*, orapu *Bouton*, labbu *Sunda*.
axe	kobatit	kapak *Malay*, *Sulu*; badog *Sunda*, badi *Baju*, beda *Ahtiago*.
bad	kullub	hala *Java*.
belly	kwiyukh	awak *Bali*, *Sunda* (body), hatuaka *Liang*.
	smukha	cheong *Samang*, nanaka *Liang* (body).
	klatch	troké *Malagasy*, raga *Bali* (body), kaleh *Salayer*, kalakalath *Pelew* (body).
bird	stlekelkub	kakep, tekayap *Mysol* (fowl), topatopa *Maori*.
(water)	skwakwelush	walilis *Sunda* (teal).
black	hitotsa	hitam *Malay*, hidung *Sunda*, kokotu *Tidore*, kitkudu *Gani*, kokotu *Sahoe*.
blanket	salitza	klosso *Java*, kalasa *Gani* (mat).
blue	hitotsa	kotteetow *Pelew*.
blood	toligwut	darah *Malay*, gute *Java*.
boat	kelobit	yalopei *Teluti*, lopi *Salayer*, *Bugis*.
	klai	saloi *Borneo*, hol *Teor*.
body	dautsi	dada *Morella*.
bone	sblauyu	balung *Java*.
bow	tsatsuts	tito *Atui*.
boy	chachas (little)	cheka *Sahoe*, ichi ichi *Ternate* (little).
bread, food	satld	telaa *Rotuma*.
to break	ohwutl	patah *Malay*, whawhati, ngawhere *Maori*.
breast	skubo	uma *Maori*.

English.	Niskwalli.	Malay-Polynesian.
to burn	ohod	joting, *Bali*, tahù *Maori*, katia *Fiji*.
child	miman	ninana *Sulu*.
	bibad	bibigi *Tonga*.
cloud	skwushub	hapas *Rotti*, hambubu *Bali*, kapua *Maori*, yabbath *Pelew*.
cold	tus	tiis *Sunda*, toe *Atui*, tijok *Malay*.
to come	atla, utla	haere *Maori*, iraua *Formosa*, alowei *Awaiya*, dirawoei *Java*.
crab	beskwu, beskhu	papaka *Maori*, bokoti *Wahai* (prawn).
	hawetsa	kapiteng *Java*, *Bali*.
	hauwilo	ulai *Cajeli* (prawn).
day	slahel	allo *Salayer*, alli *Moluccas*, lileẁ *Teor*, kluh *Mysol*, kila *Teluti*, kaseiella *Wahai*, malal *Gah*, liar *Massaratty*, ari *Malay*.
dog	kobai	kapuna *Menado*, kafuni *Gah*.
	komai	kamia *Rotuma*, segawon *Java*.
door	shugwtl	batal *Mysol*, yebuteh *Gah*.
ear	kwillade	herenatia *Amblaw*, karin *Teor*.
earth	swatekhwten	cootoom *Pelew*, thanthan *Rotuma*.
to eat	oatld	tauri *Fiji*.
egg	oos	gosi *Tidore*, hua *Maori*.
end	eluks	alos *Malay*, hilianga *Tonga*.
eye	kalus	karu *Maori*, lau *Tidore*, lako *Galela*.
face	satzus	sotyo, socho *Java* (eye), gati *Sanguir*.
father	man	amana *Bouton*, mam *Mysol*.
	bad	pito *Java*, medua *Tahiti*.
fear	ashuts	takut, coquet *Malay*.
	ashekwub	magtahap *Bisayan*, hopohopo *Maori*.
feather	stokw	hokai *Maori*, dokoi *Sanguir*, gogo *Tidore*.
field	makwob	twawfa *Tonga*, kabun *Sulu*, sabah *Lampung*, sawah *Java*.
finger	shalatchi	jariji *Bali*, garikih *Madura*, saranga *Bouton*, koroiti *Maori*.
fire	hod, hot	hatete *Maori*, kidjaik *Mille*.
		nggatu *Fiji*, putun *Sanguir*.
flesh	beyets	paa *Tagala*, mbithi *Fiji*, wat *Formosa*, waouti *Awaiya*.
flower	sekaisim	puspo-kusumò *Java*, kaotutun *Massaratty*, sekar *Java*.
fly	hwaio	tawon *Java* (bee), tuiau *Maori* (flea), owei *Mysol* (mosquito), guphu *Tidore*.
foot	shid	siki *Sulu*, kadan *Wahai*, hoots *Malagasy*, wed *Gani*, oweda *Matabello*.
forehead	silels	alis *Malay*, lae *Tonga*, *Fakaafo*.
girl	chachas slane	lehani *Rotuma* (daughter).
to give	abshits	haweh *Java*, wacito *Tobi*, evaha *Tahiti*, annabookeeth *Pelew*.
to go	ookh	iigkau *Sulu*, jog *Mysol*, iko *Wahai*, ako *Ahtiago*, wiko *Massaratty*.
	ohob	bo *Mysol*, aou *Wahai*, taboi *Borneo*, ngawa *Maori*.
good	klob, tlob	malopi *Saparua*, rap *Tarawan*, taloha *Galela*, rawe *Maori*.

English.	Niskwalli.	Malay-Polynesian.
grasshopper	kekowuts	kakopi *Liang*, kohati *Wahai* (butterfly),
grease	swus	gososo *Galela*.
great	hekw	agang *Malay*, daco *Bisayan*, koiwi *Maori*, jackabey *Malagasy*, bagewa *Salibabo*.
hair	skadzo	hutu *Tidore*, *Galela*.
beard	kwed	couder *Malay*.
hand	chalesh	chiulok *Lampung*, ala *Awaiya*, harau *Java*, ngalan *Tagala*, arsiu *Rotuma*.
hard	swagwil	hagal *Madura*, mukola *Wahai*.
	klukhu	karas *Lampung*, kereh *Kiisa*, kras *Malay*, laselasea *Fiji*.
head	shaiyus	chetuk *Madura*, jahe *Mangarei*, kahutu *Mysol*, oyuko *Teluti*.
heaven	shukh	hakoso *Java*, shurga *Sulu*.
hot	skwul, otsgulla	wera *Maori*, vela *Tonga*, pelah *Mysol*, asala *Alfuros*.
	nuskwullum	mogall *Pelew*.
house	alal	balay *Bisayan*, fale *Fakaafo*, falle *Tonga*, are *Raratonga*.
husband	chesthu	as-auah *Tagala*, essah *Salibabo*, heieiti *Wahai* (man), tahu *Maori*.
insect	slitlalkub	lalangow *Borneo*, ralugoh *Menado* (fly).
iron	snokw	saloko *Java* (silver).
kettle	sialt	kwali *Malay*, quall *Pelew*, gooloo *Tonga*.
knee	lakalotsid	lukut, lutut *Malay*.
leaf	chuboba	chafen *Teor*, lai obawai *Amblaw*.
life	hale, halikh	ara *Tahiti*, ora *Maori*.
louse	beskchad	okutu *Bouton*.
maize	stulels	halal *Saparua*, allar *Liang* (rice).
man	stobsh, stobush	taowe *Bugis*, tumata *Saparua*, tomata *Salibabo*, taumata *Menado*, tamata *Fiji*.
chief	siab	sau *Rotuma*, *Fiji*, how *Tonga*.
people	atsiltelmu	tiyang-jalmi, jalmo *Java*, jalama *Sunda*.
mat	kot	katini *Massaratty*, junguto *Galela*.
	skwegwut	savata *Sulu*, moamata *Tarawan*, takapau *Maori*, *Tonga*.
moon	slokwalm	wulan *Java*, hulani *Batumerah*, hulan *Wahai*, allong *Mille*.
mosquito	kwad	seugeti *Massaratty*, suti *Cajeli*, kias *Borneo*.
mother	skoi	koka *Maori*, nggei *Fiji*, yaiya *Tidore*.
mountain	skwatutsh	vohitcht *Malagasy*.
	spokwab	chubuk *Samang*, buguid *Bisayan*, waukein, *Formosa*, eothiva, *Fiji*.
mouth	kadhu	igad *Sulu* (lips), gnootoo *Tonga*. nhoutou *Ticopia*, ngutu *Fakaafo*, ngutu *Maori* (lips).
nails	kohwachi	kuku *Malay*, kuyat *Gani*, wuku *Gah*, oggok *Mille*.
name	sda, sdas	wasta, *Java*, yatha *Fiji*.
neck	kaiukhkwa	kaki *Maori*, kia *Rotuma*, gia-*Tonga*.
night	klakh, sklakh	galap *Malay* (dark), marok *Mille* (dark).
	slakhhel, sklakhel	garagaran *Gah*, kloowaizeris *Tobi* (dark).
no	hwe	hea *Tonga*, akea *Tarawan*.
nose	muksn, mukshid	muk *Samang*, hungasan *Bali*.

English.	Niskwalli.	Malay-Polynesian.
old	lolutl	kolot *Sunda*, lakalaki *Cagayan*.
	tusak	tuhak *Samang*, tuah *Malay*, tawhito *Maori*, tuha *Lampung*.
prawn	boluto	burowi *Tidore*, filuan *Ahtiago*.
	saikh	kasaua *Mysol*.
rain	skal	kull *Pelew*, ulah *Amblaw*, hura *Galela*, karu *Tarawan*, golim *Mysol*.
rainbow	kobatshid, komachin	kuwung *Java*, *Bali*.
rat	skad	tikus *Malay*, tikuti *Massaratty*.
	pelkutchi	warset *Java*, barut *Sunda*, balawu *Bugis*, blaha *Salayer*.
red	hekwetl	kula *Fakaafo*, *Fiji*, desoella *Galela*, kohori *Tidore*, coola-coola *Tonga*, whero, towhero *Maori*, habrit *Java*.
river	stolukw	laialak *Rotti*, walungan *Sunda*, ylog *Tagala*, lungei *Borneo*.
root	aspud	gamut *Sulu*, aiwaht *Ahtiago*, eiwaati, *Morella*, aiwaat *Lariki*, owati *Amblaw*, hatimootoo *Tidore*.
saliva	kwulotsid	ludah *Malay*, tohulah *Saparua*, tehula *Liang*, haware *Maori*.
salt	kakam	garam *Malay*, asin *Bisayan*, teisim *Alfuros*, asing *Menado*, masima *Tonga*, *Fiji*.
sea	hwultsh	wolat *Gani*, belot *Mysol*, olat *Cajeli*, alud *Borneo*, lajit *Mille*.
to see	olabit	liat *Malay*, lewa, lelewa *Fiji*.
to sit	gwuddel	kuduk *Borneo*, tuturu *Maori*.
slave	stoduk	ata *Bugis*, budak *Malay*, taurereka *Maori*.
snake	betsuts	taksoko *Java*, ngata *Fiji*, tekoss *Gah*, katoun *Menado*.
	wekhpush	ekeb *Samang*, savha *Bouton*, pok *Mysol*, dipa *Borneo*. tofagin *Matabello*.
snow	bako	huka *Maori*.
skin	hudzamit	usam *Wayapo*, usum *Cajeli*, asava *Batumerah*, mot-kehin *Mysol*.
small	miman	moemoe *Tonga*, meamea *Rotuma*, nohinohi *Maori*, anaanin *Alfuros*.
	mimad	munti *Tagala*, umit *Borneo*, mohintek *Belang*.
	chachas	cheka *Sahoe*, ichi-ichi *Ternate*, chiyut *Java*.
soft	esmetlin, asbetlil	lam-but *Malay*, lem-but *Madura*, malumu *Wahai*, mamalin *Ahtiago*.
sour	ochapab	dakiopi *Galela*, mateibi *Gah*, pep *Mysol*, asam *Java*, kawa *Maori*.
to speak	ohothot	kata *Malay*, taitai *Tarawan*, whakatu *Maori*.
spear	tseakwuts	wahos *Java*, tawaki *Amblaw*, sagusagu *Tidore*, hoata *Maori*, tcao *Rotuma*, kwukeou *Fiji*, bakabota *Tarawan*, taofotoi *Tonga*.
	tatl	tara *Tarawan*, golo *Java*, titė *Wahai*, galagala *Teor*.
	stetkwub	tuba *Ahtiago*, tabi *Tarawan*.
squirrel	skadzu	katek *Java* (monkey), keso *Amblaw*, kesoi *Cajeli*, kesi *Awaiya*, kuyad *Borneo* (monkey).

English.	Niskwalli.	Malay-Polynesian.
star	chusud	chetu *Atui*, tahwettu *Tahiti*, tuitui *Tarawan*, tokun *Teor*, hetu *Paumotua*.
stone	chetla	selo *Java*, batro *Biajuk*, batu *Malay*, wahto *Formosa*, hathu *Rotuma*, kowata *Maori*.
sun	klokwatl	matalo *Macassar*, lacloh *Rotti*, adlao *Bisayan*, matalou *Borneo*, kaliha *Sanguir*, kluh *Mysol*, wolch *Gah*, yaro *Tobi*, komaru *Maori*.
sweet	okwagwab	masoma *Camarian*, masuma *Lariki*, mosuma *Saparua*.
teeth	dzadis	gigi *Malay*, isi *Sanguir*, *Bugis*, ngisi, *Menado*, ngedi *Sahoe*, ngutu *Savu*, dongito *Bolanghitam*, danto *Java*.
tongue	klalap	lila *Bugis*, *Macassar*, hilat *Bali*, lilah *Sulu*, kelo *Garam*, alelo *Sandwich*, lella *Malagasy*, elelo *Tonga*, alele *Rotuma*.
tree	tsukhwul	tangkhal *Sunda*, garager *Pelew*, kalu *Sanguir* (wood), ngahere *Maori* (wood).
	stukhum	pohon *Madura*, ayun *Timuri*, chuk *Samang*, cago *Iloco*, tawhao *Maori* (wood).
water	ko	chai *Sunda*, hoi *Timor*, aki *Ratahan*, akei *Menado*, aki *Sanguir*, *Tidore*, komo *Paumotua*.
white	hokokh	puteh *Malay*, maydac *Batan*, babut *Ahtiago*, botcibotc *Tobi*, savasavu *Fiji*, kowse *Pelew*.
wind	shukhhum	angin *Malay*, kanging *Bali*, kalm *Bali*, hangin *Tagala*, matangi *Marquesas*, kohengi *Maori*, koyyoou *Pelew*.
wing	tsetsal	teyholi *Awaiya*, keheil *Wahai*, tula *Sanguir*, wakul *Gah*,
wife	chugwush	sawah *Sulu*, sawa *Sanguir*, saua *Borneo*, sowom *Cajeli*, sengwedo *Java*, ahehwa *Matabello*.
woman	slade, sklane	lanjang *Sunda* (girl), lehani *Rotuma* (daughter), rin *Mille* (wife), leva *Fiji*, erire *Paumotua*, elwinyo *Amblaw*, lako *Baju* (wife), gallu *Java*. loh *Bali*, lubawe *Biajuk*.
yellow	hokwats	bahendak *Biajuk*, koothoo *Pelew*.
young	babaad	muda *Malay*, punua *Maori*.
I	atsa, kets, chid	aku, saya, *Malay*, kito *Java*, gita *Tonga*, atu *Tahiti*, tia *Tarawan*, zaho *Malagasy*.
Thou	dugwe, kats, chu	diko *Java*, dika *Madura*, kowe *Java*, *Ponape*, kow *Pelew*, kwe *Mille*, coy *Tonga*, koe *Maori*, sia *Sunda*, iko *Bugis*, go *Tarawan*.
He	tzil, tzinil	ini *Malay*, anre *Macassar*, kania *Sulu*, tena *Tarawan*, diri, sandiri *Malay*.
	shi, sha	dia *Malay*, iya *Lampung*, siya *Sulu*, yca *Tagola*, izi *Malagasy*.
We	debetl	giwotoloo, *Tonga*, kendaru *Fiji*.
	sutshid	kita *Malay*, *Sulu*, *Ponape*, tatou *Tahiti*, *Paumotua*, *Maori*.
	shil, chitl	kula *Java*, sira *Batan*, tautolu *Tonga*, derro *Mille*, ara, ngaira *Tarawan*.
You	gullapo	kowe *Java*, korua *Maori*, *Paumotua*.
They	detl, tsataditl	nautolu *Tonga*.

English.	Niskwalli.	Malay-Polynesian.
	ulgwa, delgwa	eris *Kotuma*, la, latou *Samoa*, raua, ratau *Tahiti*, *Paumotua*, *Maori*.
1	dutcho, asdutcho	tadday *Cagayan*, tatsaat *Formosa*, tasi *Fotuna*, *Fakaafo*, tahi *Maori*, *Uea*, *Marquesas*, taha *Tonga*, tot *Caroline*, tseekaee *Malicollo*.
2	assale, salew	kaleh *Java*, serou *Papua*, dalaua *Tagala*, kalae *Tambora*, rua *Lampung*, golu *Tobi*, heluk *Yengen*, oroo *Pelew*, erooa *Otaheiti*.
3	klekhw, asklekhw	telu *Java*, kolu *Sandwich*, atlo *Philippine*, tatlu *Tagala*, gatil *Sulu*, kal *Kissa*.
4	bos, asbos	pat, papat *Java*, opat *Sunda*, epat *Biajuk*, éffats *Malagasy*, upat *Sulu*, *Bisayan*, opats *Bugis*, pobits *Yengen*, ebats *Malicollo*.
5	tsalats	luwi *Malagasy*, k[illegible]lin *Tambora*, lailem *Mille*, delima *Salibabo*.
6	dzelachi	loacha *Uea*, chalemen *Lifu*, dildjino *Mille* laeu Rotti, *Timuri*, hol *Caroline*, gurum *Tuham*.
7	tsoks	tujuh *Malay*, tuju *Sunda*, tik *Papua*, tuju *Sambawa*, tujuh *Samang*, tujoh *Salayer*, hiku *Sandwich*, iko *Kissa*.
8	tkachi	hasto *Java*, kutus *Bali*, tofkangi *Ternate*, koneho *Tambora*, gatahua *Sulu*, tufkangi *Tidore*, itupangi *Galela*.
9	hwul	jalatien *Biajuk*, asera *Bugis*, lali *Tambora*, siwer *Teor*, sior *Malagasy*.
10	paduts	sadasu *Java*, dasa *Bali*, painduk *Yengen*, putusa *Serang*, manud *Tuham*, mackoth *Pelew*, boto *Cajeli*, hutusa *Awaiya*, hutu *Teluti*, fotusa *Alfuros*, huta *Teor*.
20	salachi	kalehdoso *Java*, calohaan *Bisayan*, oloyuck *Pelew*, ruatekau *Maori*, sisarone *Tambora*.
100	sumkwachi	sangagasut *Iloco*, hangutoos *Sulu*, sangdaan *Tagala*, usakagatos *Bisayan*, magatu *Cagayan*, mahasu *Menado*, *Sanguir*.
this, that	ti	itu *Malay*, eta *Sunda*, heto *Biajuk*, tudeh *Samang*, taua *Maori*.
	ki, kwi	iki, ika, *Java*, iyak *Sunda*, iya *Batan*.
	la, le, til	reyah, rowa, girowa *Madura*, yari *Tagala*, raua, tera *Maori*.
who?	gwat	sinten *Java*, yewe *Biajuk*, isiu *Sulu*, siapa *Malay*, kohai *Tonga*.
here	hwulte	hiriki, diriki *Bali*, korini *Bugis*.
there	todi, altodi	ditu *Bali*, disitu *Malay*, ditu *Sunda*, disah, kahdisah *Madura*, didto *Bisayan*, didtoo *Sulu*, dita *Iloco*, etonai *Tobi*.
near	chicht	jauh, dakat *Malay*, chadak, *Java*, asideg *Iloco*, tutatu *Maori*.
far	lel, lalel	bela *Macassar*, mabela, *Bugis*, halayo *Bisayan*, arayu *Cagayan*, malayo *Tagala*.
above	shishukh, shikabuṭs	asa *Bugis*, atas, *Malay*, kepeng *Samang*, ybabao *Tagala*, saitaas *Bisayan*, haṭaas *Sulu*, ḥage *Tonga*.

English.	Niskwalli.	Malay-Polynesian.
behind	lak, tulak	licuc *Cagayan*, licudan *Iloco*, licurran *Tagala*, blakang *Malay*, iligan *Mille*, tukalek *Tobi*, tuara *Maori*.
below	klep	ngandap *Java*, dibawah *Malay*, andap *Sunda*, rawa *Macassar*, oleeakem *Pelew*, gilalo *Tonga*, lausilopo *Rotuma*, kabawah, *Sulu*, sulib *Tagala*.
by	twul	ulih *Malay*, ri *Bugis*.
from	tul	dari *Malay*, *Madura*, huleh *Bali*.
in	dekhw	di *Malay*, *Sunda*, *Lampung*.
to	ta, tud	dateng *Java*, tako *Java*, di *Batan*, atoo *Tonga*.
	tul, gwul	wor *Tobi*.
with	twul	karo, kalih *Java*, kalawan *Lampung*, barang *Bali*, *Madura*.
within	dekhw	dalam *Malay*, *Madura*.
without	shalbekhw	salebetting *Java* (within), saliwang *Bugis*.

MOSS LITTER. BY THOMAS W. GIBSON, ESQ., BUREAU OF MINES.

(Read January 30th, 1897.)

Agriculture and mining are the chief members of a group of arts which lie at the base of all others—without which, indeed, none others could exist. Agriculture supplies the primal necessities of man by giving him food and clothing, and both together furnish him with the raw materials for that wonderful and complex series of manufactures, with which his ingenuity strives to gratify his tastes or satisfy his wants—tastes and wants which enlarge with his expanding civilization. They have both the same arena—the capacious bosom of Mother Earth—and both strive to turn to advantage the substances which nature there has placed. One enlists in her service those vital forces which draw the atoms of inorganic matter from air and soil, and which raise them from the mineral into the vegetable, and from the vegetable into the animal kingdom ; the other deals directly with the mineral substances themselves, and by the mere act of changing their situation and separating them from one another, rescues them from inutility and makes them subservient to the wants of man. One may be called an adaptive industry, whose processes, if rightly conducted, move in a circle, and appear capable of being carried on for all time ; the other may be termed a destructive industry, concerned with large, yet strictly limited quantities of material, which, once brought into play, are forthwith made subject to decay and waste, and are scarcely, if at all, capable of being restored to their original condition. Agriculture and mining touch each other at many points. The farmer feeds and clothes the miner ; the miner warms the farmer, supplies him with fertilizers, keeps him in ploughs and harrows, and puts gold and silver into his purse. No market is worth so much to the tiller of the soil as a mining camp in full blast. Miners usually want the best, and are quite willing to pay for it.

There are processes performed on the surface of the ground which, in their nature, seem intermediate between agriculture and mining, and to partake of the character of both. One of these is the reclamation of peat bogs, and the utilization of the material of which such bogs are composed. As agricultural operations, such processes restore to cultivation considerable areas of land, previously lying waste and barren, while, viewed as incidents of mining, they convert to man's use actual portions of the earth's crust unchanged except by a certain amount of manipulation.

The origin of peat bogs is well understood. They are found chiefly in the colder parts of the globe, where evaporation goes on less actively than in the more tropical regions, and occur in low situations, or where some natural or artificial obstacle impedes the drainage. The abundant moisture favors the growth of a low order of plants, such as the sphagnum mosses, of which some fifty or sixty varieties are known. This plant is distinguished above all others by its capacity for absorbing and storing water, for which its peculiar structure eminently fits it. The epidermis of the stalk and the leaves of the plant are mainly composed of large, empty cells, into which the water is drawn through a number of small holes. The cells are provided with ring or spiral-formed thickenings on their inner sides, which keep them from collapsing. They are consequently always distended, and always ready for use. Smaller cells occur between the larger ones, which contain chlorophyl and supply the plant with nourishment, but these occupy comparatively little space. The whole arrangement is that of an aggregation of reservoirs in successive layers, which are kept filled by the force of capillary attraction, even when the plant itself is above the water level.

It is curious to note that the properties of the sphagnum moss, which render it so well adapted for living in a low and moist situation, tend also to bring its existence to an end. It requires a constant supply of moisture, yet it is continually pumping up to the surface of its tufts the water in which it stands, thus promoting evaporation ; while at the same time, by regularly decaying at its roots, it deposits the detritus which adds to the solid contents of the bog. This process continues until the bog is raised above the level of the surface water, when the sphagnum vegetation ceases, having exhausted the conditions which made it possible. In this way bogs of considerable depth are formed in process of time. As the mass increases, decomposition takes place in the lower portions, which become consolidated into a black or dark-brown earthy substance, that in various parts of the world is extensively converted into fuel. The usual method of utilizing it as such is to dig up the peat in cakes, or blocks, and dry them by exposure to the wind and sun, after which they are stored and used as required. Hand labor is generally employed, though numberless attempts have been made to facilitate the process by the introduction of various kinds of machinery. The great difficulty in the economic employment of mechanical processes is the tenacity with which the peat retains the degree of moisture remaining after it has yielded all that naturally evaporates in the air. Pressure and artificial heat have been resorted to in order to overcome this difficulty, but, while the end aimed at is capable of achievement, it has usually been attained at too great an expense for economic results. A process which would put us in possession of a good and cheap peat fuel would be a national benefit to Ontario, destitute as the Province is of workable beds of coal.

It is these absorptive properties of the sphagnum moss which have led to its employment as litter, or bedding for cattle, in lieu of straw or other materials commonly used for such purposes. Its suitability for litter was doubtless recognized at an early date by people living in the vicinity of bogs, but it was as late as 1880 that the preparation of moss litter as an article of commerce was first begun by Hollman at Gifhorn, in Hanover. Since that time it has come rapidly into use in the countries of Continental Europe, and in Great Britain, as well as to some extent in America. The advantages claimed for the litter are that it affords drier and healthier bedding for horses and cattle than any other material ; that by reason of its great power of absorbing moisture, it binds the valuable portion of the animal excrements, and consequently yields the best manure ; that it acts as a disinfectant and improves the air of the stable, and that a smaller quantity of it is required than would be needed if straw were used. Experience with the litter in European countries seems to show that the claims made for it are well founded, and that it is the best article for the purpose yet introduced.

The cells of the sphagnum moss in the manufactured article retain much of their power of attracting and holding water, and the litter is in consequence able to take up ten or fifteen times its own weight of moisture. It has the faculty of absorbing gases as well, and hence fixes the ammonia always present to a greater or less degree in the atmosphere of buildings in which animals are confined and fed. The soft, springy, elastic moss litter forms a more comfortable bed for cattle than straw, and greatly facilitates the task of keeping the animals and stables clean, a fact which has an important bearing on the welfare of man, as in the case of milch cows whose product is used as an article of human diet.

Careful trials of moss litter in army stables in Germany, where formerly straw was employed, showed its superiority in the following respects : dry beds, and dry, fresh air, free from ammonia ; the ceilings, walls and leather trappings remained free from moisture and mould. If proper care was taken to remove those portions of the litter which became charged with moisture, to shake it up every day and fork it from one part of the stall to another, the horses found their quarters very much improved. Their skins remained clean and in activity, catarrhs of the nose and eyes, generally the result of bad air in stables, were less frequent ; wounds on the legs healed more speedily ; colic was almost eliminated ; inflammations of the glands seldom occurred, and rotting of the frog was almost entirely prevented. In cases of contagious disease, the litter proved of great value, and surpassed all other disinfectants. In other cases, too, moss litter, mixed with superphosphate, has had the effect of protecting cattle from foot and mouth diseases, even while the infection spread to an alarming extent on neighboring farms. This property would doubtless make it valuable for use in railway cars employed in the transportation of live stock. Many cases have been known in which disease was introduced or spread by cars in which infected animals had been carried.

The manurial value of moss litter, after it has served its purpose in the stable, is greater than that of straw, for the reason that there is less evaporation of the liquid and volatile constituents. It would appear that no greater proportion of the potash, lime, or phosphoric acid is recoverable by means of the litter, but the easily-soluble nitrates are retained to a much larger extent than in the straw, which allows of their escape in the form of ammonia. As the agriculturist well knows, the nitrogen thus rendered available for plant food is a most valuable element of manure.

In the manufacture of moss litter, as carried on in Europe, a fine dust is sifted out at a certain stage of the process, which, as well as the litter itself, is used as a deodorizer and absorbent of sewage and fecal matter, especially in small cities, where no proper systems of sewerage or drainage exist. Accumulation of noxious matter of this sort often gives rise to epidemic and infectious diseases. The use of moss litter and peat dust not only remedies this evil, but actually transforms deleterious waste into valuable fertilizers. The absorbent properties of the litter check the growth of bacteria, and retard the decomposition of organic substances. Fresh fish, fruit, and vegetables are all said to have been preserved in excellent condition for a long time by being packed in peat moss. There are many other uses to which moss litter is put, such as raw material for coarse textile fabrics, a non-conductor of heat or noise in house building, paper pulp, etc., with greater or less success.

The peat bogs of Canada, and of Ontario in particular, are of vast extent. By virtue of their immense stores of carbon, they constitute a potential source of fuel supply when the right process of manufacture shall have been invented and applied. Meantime, a beginning has been made in the utilization of these bogs in the manufacture of moss litter. In the townships of Wainfleet and Humberstone, in the County of Welland, between the feeder of the Welland Canal and Lake Erie, and about five miles from the town of Welland, lies a peat bog of some 5,000 acres, owned by the Canadian Peat Fuel Company of Toronto. At the northern edge of this bog the company has erected a plant for the manufacture of the litter, according to a process which in some respects differs from that prevailing in Europe. The upper layer of the bog consists of undecomposed sphagnum moss, varying in depth from 18 inches to 4 1-2 feet, is said to be free from sand or inorganic material, and to be well fitted for litter. The works have been erected and put in operation, and a considerable quantity of product has been turned out. The first stage of the process is to cut the moss into pieces about eighteen inches square, which are piled together in rows on the surface of the bog. When the moisture has sufficiently evaporated these blocks are gathered and wheeled in small cars, over a portable tramway, to the storing sheds. They are then passed through the picking machines, two of which stand side by side. These are provided with heavy revolving cylinders, armed with strong teeth, which act upon similar teeth set in the concave surface of a breast, against which they work. In the pickers the moss is torn and loosened apart, the object being to separate the fibres, rather than break them. The pickers discharge the moss upon moving carriers, three in number, to each machine, ranged above one another, which carry it horizontally through a drying chamber, or tunnel, 116 feet in length, 8 feet high, and 16 feet wide. These carriers travel against a current of hot air, drawn through the tunnel by a disc fan revolving at the farther end, the object being to remove the greater part of the moisture remaining in the moss. The heat for this purpose is generated by a furnace, situated parallel to the tunnel, whence the hot air is drawn by the suction of the fan into a mixing chamber, where the temperature can be regulated by the admission of cold air. The hot blast, after passing over the moss, emerges, laden with moisture, into a wooden shaft, and so into the outer air. At the end of the drying tunnel the moss falls into a conveyer, from which it is elevated into a weighing bin, or hopper, situated above a baling press, or packer. The hopper works automatically, and as soon as a sufficient weight is received it deposits its load in the press, which is a machine of peculiar design, worked by steam power. On a revolving circular platform are four stout wooden moulds In one of these wooden slats are placed to assist in securing the bale after it is pressed; it passes under the press, the workman above moves a lever, and a plunger descends with a pressure of 200 tons, forcing the moss firmly into the mould. The platform makes a quarter revolution, and while the second mould is being filled, number one is being secured with wire, and at the third turn the finished bale is removed, ready for shipment. The weight of a bale is 250 to 260 pounds. A knuckle-joint press is subsidiary to the steam press, but is seldom required. The bales are stored in the sheds, whence they can be shipped as called for, over the Michigan Central Railroad, a spur of which runs into the property.

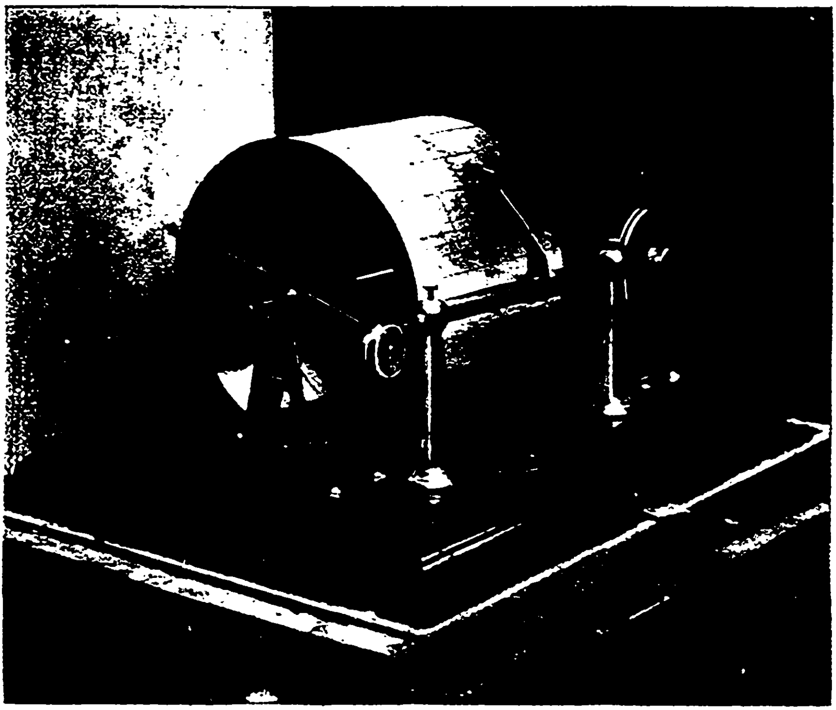
In the finished state the litter contains about 30 or 35 per cent. of moisture, and in this condition it goes into use. It is said to take up liquids more readily in this state than when the cells of the plants are completely deprived of water, and it is not so easily broken up under the feet of horses. The output of the factory is about 40 tons per day of ten hours, but can easily be increased. The consumption in America is about 18,000 tons a year at the present time, and the article has hitherto been imported exclusively from Europe. New York, Brooklyn, Boston, Baltimore, Philadelphia, Chicago, and other large cities, are the chief places of use in the United States, but the market for litter is rapidly growing. It is employed in the stables of milk and transportation companies, liverymen, and other large owners of cattle and horses, and even in the stables of many private individuals. The Canadian Peat Fuel Company has entered into a contract for supplying an average quantity of 22,000 tons per year, for five years, in the United States. They do not anticipate any trouble in marketing this quantity. One difficulty in the way of a more general use has been the cost of storing cargoes at the point of importation. Moss litter is a bulky article, and the rates charged for storage in large cities are high. These will be evaded in the case of the Welland factory, as the litter can be kept on hand there and shipped only as required to customers. The price at which it retails in New York is $15 per ton. In London, England, it sells at 35 shillings per ton. The factory at Welland is the only one of the kind in America. The machinery used in it is from the designs of Mr. A. A. Dickson, the President of the company, and is patented in Canada, the United States, Great Britain, Germany, and other countries of Continental Europe. Beneath the layer of moss suitable for litter on the Welland bog, lies a very large quantity of dark, decomposed peat, which it is the intention of the company to manufacture into fuel. The depth of this peaty section varies from a foot or two at the edge of the bog to 20 feet in the centre. The process of converting the crude peat into fuel is also one patented by Mr. Dickson, and, as now perfected, does away with the use of artificial heat. The peat is cut and air-dried, after which it is pulverized by being passed through a picker and automatically deposited in a hopper, which feeds a steel tube about two inches in diameter, and fifteen inches long. The pulverized peat is forced through this tube by pressure and formed into cylindrical blocks about three inches in length, almost equal in density to anthracite coal. This part of the business has not yet been brought into operation. Below the bed of peat lies a deposit of clay, which experiments have shown to be of fine quality for the manufacture of vitrified brick, pottery, etc. The prospect is that a very large business will be done by the company in the manufacture of moss litter, and, perhaps, eventually also in peat fuel. In the utilization of such dormant resources this company by its operations is really adding to the wealth of the community, and whether it can command success or not, it certainly deserves it.

The Great Lakes as a Sensitive Barometer. By Napier Denison, Esq., Toronto Observatory. [Illustrated.]

(Read February 6th, 1897.)

For many years fishermen and sailors upon our Great Lakes have noticed, with intense interest and curiosity, the rapid rise and fall of the water, most marked at the head of shallow lagoons, as at our Island, and have considered it to be an inexplicable phenomenon. While in the vicinity of Lake Huron last summer the writer's attention was attracted by what appeared to be a regular ebb and flow, at rapid intervals, at the mouths of rivers. At Kincardine, by means of a special float, a set of readings were taken, and a variation of level of over three inches obtained, averaging nine minutes (that is, eighteen minutes for a complete undulation); the float moving up stream at the rate of a mile and one-half per hour. Upon returning to Toronto, by permission of Mr. Stupart, Director of the Meteorological Service, a simple in-

FIG. 1.



strument was devised for automatically recording upon paper these peculiar oscillations, and was set up at the mouth of the Humber river.

The following is a brief description of this instrument (Fig. 1). It consists of a recording cylinder 24 inches in circumference and six inches wide, placed horizontally, which by means of clockwork completes one revolution every 24 hours, the hour intervals being, therefore, each one inch. Resting upon this cylinder is a self-inking pen, attached to an arm, which slides freely upon a horizontal tubular guide. To one side of this arm is fastened a silk line, which is attached to and wound several times around a small grooved pulley, which is part of one four times its diameter. Upon the grooved circumference of the larger pulley is fastened another line, which, after several turns around it, passes down through the case to a float, enclosed in a special shaft, so constructed as to admit the water only through several small holes, and thus to prevent any sudden movement of the float being caused by local wave motion. To the other end of the sliding arm is fastened another line, which, after passing over a small grooved pulley (shown at the left of the illustration), descends through the case, and has attached to it a weight sufficient to balance the float. The record is obtained in the following manner: As the float rises and falls, the pen correspondingly moves up and down upon the paper, which is revolving at the rate of one inch per hour.

The ratio of movement between pen and float is as 1 to 4, so that an actual rise of one inch of water level corresponds to a movement of one-fourth of an inch upon the paper on the cylinder. To facilitate the measuring of these traces, one-quarter inch squared paper is used, the vertical lines marking fifteen-minute intervals, and the horizontal, one inch change in water level. To prevent the water from freezing in the shaft during the winter months, oil was used, which had the effect of depressing the water level below the frost line.

In order to increase the value of these records, a similar instrument was set up at the Burlington Canal last September. Before bringing before you some interesting tracings taken from these instruments, permit me to summarise previous investigations in other countries.

This phenomenon had been noted by Duillier as early as 1730, upon the Swiss lakes, where it obtained the name of seiche, owing to the apparent "drying up" or recession of the water upon one side of the lake, when rising at the other. In 1779 De Saussure remarks that he believes local variations in the air pressure may be the cause. In 1804 Vaucher published his researches on the subject. His conclusions are briefly as follows:—

(1) Seiches more or less considerable occur in all lakes.

(2) They occur at all seasons and at all hours, but most frequently in spring and autumn.

(3) The condition of the atmosphere is the governing cause; the more settled this is the less are the seiches, and the more variable it is the more marked are they.

(4) Although most frequent in spring and autumn, the greatest oscillations always occurred in July, August, or early in September.

(5) Although the duration of these seiches is extremely variable, their intervals do not exceed 20 to 25 minutes, and are frequently less.

(6) They varied much in amplitude at different points on the lake shores, being on the Lake of Geneva greatest at the mouth of the Rhone.

Vaucher supposed that the atmospheric pressure diminished over one part of the lake, while over another it remained constant or increased. If this change in pressure occurred suddenly, the water which had thereby been set in motion would not come to rest again until after a number of oscillations.

Professor Forel agrees with this theory, which has also been accepted by Studer, Meyer and Favre. From 1854 to 1856 an important series of observations were made by six observers, placed at different points on the shore of Lake Geneva, who, using a system of signals to warn each other of the approach of an oscillation, noted the variations of the barometer and of the lake level. As Professor Forel in his article entirely disregards these barometric observations, they do not appear to have been published. In 1870 Professor Forel studied the seiches at the

Harbour of Morges, upon Lake Geneva, and obtained a mean of 4 min. 24 sec. for their total duration. At Geneva Vaucher's observations give a mean duration of 26 1-2 minutes. De Saussure and Duillier refer to seiches of 1 1-2 metres in amplitude, and M. Venie mentions one at Geneva of 2.14 metres, but usually they vary from about four inches to one foot. He (Forel) suggests that these are not true waves or progressive undulations of the water surface, but a movement of "oscillation of balance," or fixed oscillation, which may be both longitudinal and transverse. (Archives des Sciences Naturelles, Geneva, 1874.)

In 1876 Forel set up an automatic instrument to register these movements, and from records extending over four months, he deduced the existence of three variutes; intermediate, duration 25 minutes.
eties of seiche, viz: transverse, duration 10 minutes; longitudinal, duration 70 min-

Upon this instrument he also observed movements of what he terms "vibration," caused (1) By steamers. The interval between these is fro[illegible] to 60 times greater than that between ordinary waves, and they preceded the approach of a vessel by about 25 minutes, or when it was 9 1-2 kilometres distant, continuing for two or three hours afterwards.

(2) By wind, having no regular time or rhythm, and varying in amplitude from nothing to 10 millimetres, and in duration from 45 seconds to three or four minutes. He remarks that "sometimes there are little or none with a strong wind."

It may be mentioned that Guthrie has experimented upon this movement of oscillation, or balance in water, using, however, vessels in which the depth exceeded half the length, thereby eliminating the influence of depth altogether. (Proceedings Phys. Soc., Vol. I., 1875).

Lord Kelvin gives a theoretic law for the duration of these seiches in any lake, viz.: the semi-period of an oscillation is equal to the time that a body, travelling at the rate which it would acquire in falling from a height equal to half the mean depth of the lake would take to traverse the length of the lake. Thus, the duration of a seiche is proportional to the length of the lake, and inversely proportional to the square root of its mean depth. (Archives des Sciences Naturelles, Geneva, 1876). Applying this to Lake Ontario, and assuming the mean depth to be 300 feet, we obtain a theoretical duration for a longitudinal seiche, of over five hours. As will be shown later, the mean interval between the longest undulations, as taken from the Humber traces, is about 4 hours and 49 minutes.

In 1880 Professor Forel, in a letter, states that the smaller and more rapid oscillations may be accounted for by dividing the lake surface into more than one nodal point. (Archives des Sciences Naturelles, Geneva, 1880).

That you may more fully understand the following illustrations, it is necessary to become somewhat familiar with the movements of the upper atmosphere, where the chief cause of these lake oscillations is to be found. Permit me to quote a few lines from the late Professor Helmholtz, of Berlin (although previously cited in an earlier paper), who made a special study of atmospheric waves from theory, and analogy with ocean waves: "As soon as a lighter fluid lies above a denser one, with well-defined boundary, then, evidently, the conditions exist at this boundary for the origin and regular propagation of waves, such as we are familiar with on the surface of water. This case of waves, as ordinarily observed on the boundary surfaces between water and air, is only to be distinguished from the system that may exist between different strata of air, in that in the former the difference of density of the two fluids is much greater than in the latter case. Since the moderate winds that occur on the surface of the earth often cause water waves of a metre in length, therefore the same winds, acting upon a stratum of air of 10 degrees difference in temperature, maintain waves of from two to five kilometres in length. Larger ocean waves, from five to ten metres long, would correspond to atmospheric waves of from thirteen to thirty kilometres, such as would cover the whole sky of the observer, and would have the ground at a depth below them less than that of one wave-length." He also states that "waves of smaller and smallest wave-length are theoretically possible."

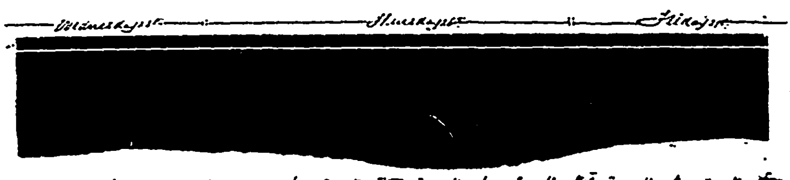
His theory is borne out by observations taken at the Blue Hill Observatory, near Boston, by Mr. Clayton, who has found that the larger waves, as marked upon the barograph traces, have a maximum frequency with northeasterly winds, and a minimum frequency when the wind is from the south-west, and also that the greatest number occur during the winter months.

Too much importance cannot be placed upon the above statements, as they are likely to prove of inestimable value in helping us to a better knowledge of the mysterious forces at work in the upper atmosphere.

In the accompanying diagram the upper, or poleward current, is represented as moving approximately from the south-west to the north-east, in its spiral course around the globe. Its average velocity is 60 miles per hour in summer, which increases to 112 miles per hour during the winter months.

The heavy lines indicate the lower stratum of air as travelling in an opposite direction to the upper current, which would be the case during the approach of a storm from the south-west. At the upper surface of this lower stratum huge atmospheric waves, or billows, are set up, due to the rapidly moving, opposing, upper poleward current of a lesser density. The influence of these huge waves often extends to the earth's surface, where they have been recorded upon barograph traces. The lighter lines represent a second form of wave movement in the lower stratum of air (say cumuli level), caused by the two subsidiary strata of the lower air travelling at different velocities and directions to one another, as is often observed during the approach of an important storm centre. These waves also extend to the earth's surface, where the larger ones are found recorded upon the barograph traces as short and rapid oscillations. These are well shown upon the Observatory photographic trace, now before us (Fig. 2), which is a record during

FIG. 2.

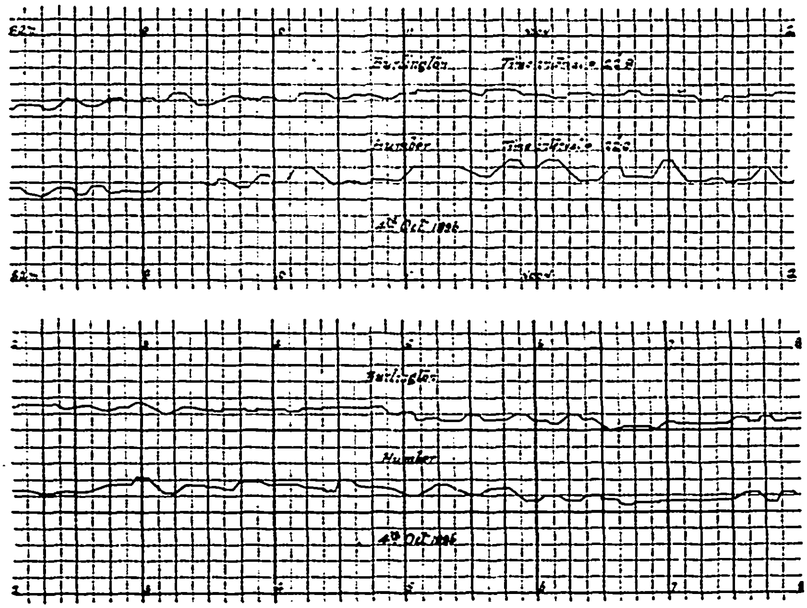


the approach of a storm from the south-west, upon which you will observe the larger undulations begin before the barometer falls, and are evidently caused by huge billows, set up at the boundary surfaces of the upper poleward current and the lower air stratum, which, owing to the position of the storm centre, would be rapidly moving in opposite directions. As the storm approached the undulations become more rapid, with a marked time interval of 10 minutes. These appear to correspond with the waves set up along the still lower, or cumulus level. As well as from the barometric record, the existence of these atmospheric waves, under certain conditions, may often be observed in the formation of the clouds above us: for instance, during fine, anti-cyclonic weather, one has frequently noticed great parallel bands of cirri appear in the west, and rapidly extend eastward, in advance of a cyclonic area, then over the Southern States. These represent the crests of the larger billows mentioned by Helmholtz, and are caused by the lower, denser stratum of air being forced up into a lighter and colder level, where condensation takes place. The following illustrations plainly demonstrate the existence of air waves found along the cumulus level. These forms, no doubt, are familiar to all present.

and, as you will observe, in the second one they are of such a regular character as to be commonly termed "roll cumulus."

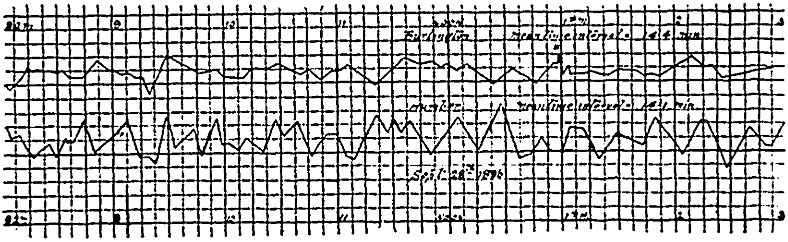
Let us now examine the Burlington and Humber records for the 4th of October, 1896 (Fig. 3), during fine settled weather throughout the continent, plotted upon the same time sheet. As previously mentioned, these squares, when

FIG. 3.



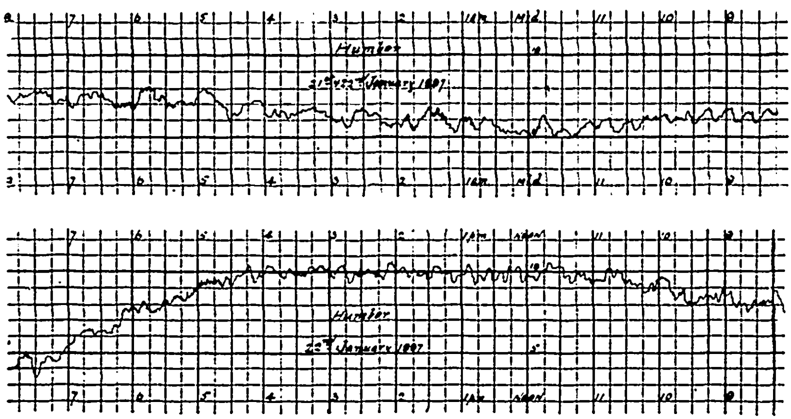
measured vertically, correspond to one inch change of water level, and, horizontally, to every fifteen minutes of time. It is interesting to note, not only the marked coincidence of these undulations, but the agreement of their time intervals, viz.: 22.8 and 22.0 mins. The greater amplitude of the Humber trace is due to the configuration of the adjacent shores and shallowness of the Bay. To obtain an idea of the prevailing atmospheric conditions, let us look at the morning and evening synchronous weather charts for this day. At 8 a.m. you will observe an important high area over Northern Ontario, while to the west of Lake Superior there is a well-defined area of low pressure. The weather is fine, and the direction of the wind northerly, throughout the lake region, but immediately to the westward the winds are from the southward. At 8 p.m. the high area has moved eastward, while the western low is dispersing over Lake Superior. As the winds have become southerly, the upper and lower strata of air are moving approximately in the same direction, therefore, according to Helmholtz, the upper atmosphere should be in an undisturbed condition. As a fair type of rapid undulations upon the lakes, during light winds and fine weather preceding a severe storm, let us take the Humber and Burlington traces from 8 a.m. to 3 p.m. of the 28th of September, last (Fig. 4). Here, again you will observe a decided coincidence between the two traces, and a wonderful agreement of time intervals, being 14.4 and 14.1 minutes respectively: also, the oscillations are much more rapid than when preceding settled weather. The movements upon the Humber instrument appear to be about double those upon the Burlington one. On the latter trace at 1 p.m. a peculiar rapid rise and fall of over an inch is seen, due to the passage of the Hamilton boat. In fact all vessels, large and small, are duly registered upon this instrument. You see by this chart for 8 a.m. of the 28th that the centre of the storm which is causing these violent lake undulations is over the State of Florida, a distance of 1,300 miles from Toronto.

FIG. 4.



The lowest isobaric line, when drawn to tenths of an inch within this disturbance, was only 29.90, but owing to this time of year being favourable for the northerly movement of West India hurricanes, a careful watch was kept upon it by our forecast officer, who, finding after completing the 8 p.m. chart a slight development of this depression, warned all our lake stations for a heavy easterly gale. This chart for 8 a.m. of the 30th of September shows how the storm centre travelled slowly but directly to the lake region, where it caused a severe gale and a heavy general rainfall. To illustrate the value these lake instruments are likely to prove when studied in conjunction with the daily weather chart for assisting in the successful forecasting of precipitation as well as wind storms, let us examine the chart for 8 p.m. of the 19th of January last. Approaching the lake region from the north-west is a well-defined low area (centre about 29.70), while to the far south-west there is what appears to be a minor depression (centre about 30.00). Under such conditions it would be of great value to know if this latter area were going to develop and move towards us, as then it would be an easy matter to predict easterly winds with precipitation for the lake region, while, on the other hand, one would base their prediction upon the approaching north-west low, which usually gives southerly winds and fair milder weather. In this case, upon looking on the chart for 8 a.m. next day, you will observe the south-western low had developed, and was rapidly moving up the Mississippi valley, while the north-west low was quickly dispersing. The 8 p.m. chart for the 20th shows a still further development of the southern low, which has moved to the State of Ohio (centre 29.70), while the northern depression appears to have completely dispersed, or to have been absorbed by the former. At 4 p.m. of this day it began to snow, and continued till next morning, when over six inches had fallen at Toronto, and a general snowfall prevailed throughout the lake region. A few days later, upon receiving the Humber records, marked abnormal oscillations were noticeable during the night of the 19th: also similar but minute undulations were found upon the Observatory photographic barograph trace. These records prove that, although the surface air was moving from the south, the upper or boundary surface of the lower air was rapidly moving southward, that is, in opposition to the superincumbent upper poleward current, therefore causing atmospheric waves or billows upon its boundary surface of sufficient magnitude to disturb the air nearest the earth. These lake records appear to prove conclusively, some time before the ordinary mercurial barometer and direction vane showed the change, that the southern low area was developing and the northern one dispersing. As the atmospheric conditions for the next few days are very much disturbed, and are followed by a most pronounced anti-cyclone and great cold in the North-west Territories, which eventually extended to the lakes, we shall look at a sequence of weather charts in conjunction with some very interesting Humber records. As will be seen (Fig. 5) the trace began to rise at midnight of the 21st, and continued till noon of the 22nd, when it had risen over five inches; during this period large undulations of forty-five minutes' interval and from one and a half to two inches in amplitude are very marked. From noon to 4.15 p.m. the water level remained

FIG. 5.



stationary, while the oscillations became more rapid; then the water commenced to fall quickly, reaching its lowest point, a distance of nine inches, at 9.30 p.m., that is, in five hours and fifteen minutes. From this hour you will observe a decided undulatory curve, not merely due to the small rapid oscillations, but marked large undulations, whose average height from trough to crest equals three inches, with a mean time interval between crests of four hours and forty-nine minutes. (Fig. 7.) As previously stated, these appear to be the longitudinal "seiches" for our lake. From a careful study of the lake records from their beginning in July last this phenomenon is not to be found except at a time preceding or during tremendous atmospheric disturbances, similar to those at which we are about to look. In the present case this curious phenomenon lasted for three days, and was the precursor of a heavy northerly gale, which at this time of the year also means intense cold.

Let us hurriedly look at the weather charts during this period. At 8 p.m. of the 21st the low area which had given us snow had moved eastward, causing a snowstorm throughout the Maritime Provinces, while another depression lay east of Manitoba. In the far North-west an important high area, or anti-cyclone, had appeared. Qu'Appelle reported 10 degrees below zero and a heavy gale blowing. The water of the lake began to rise at midnight. By 8 a.m. of the 22nd the storm centre was over the State of Michigan, causing a high southerly wind with snow throughout Ontario, while the North-west anti-cyclone had developed and extended eastward, Winnipeg reporting 18 degrees below zero and a gale of forty miles per hour.

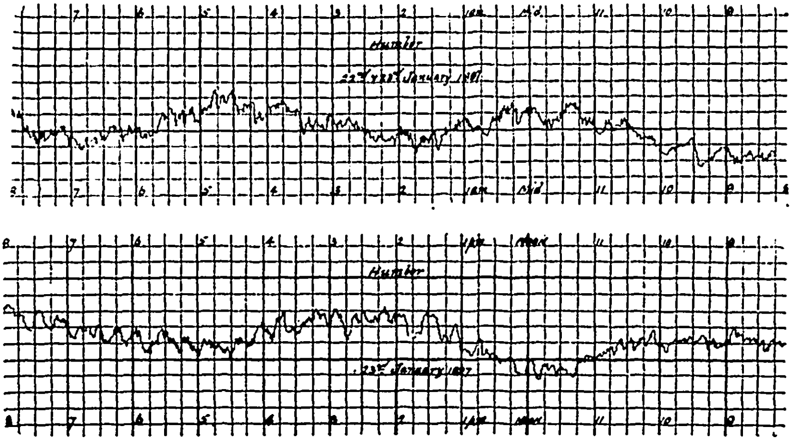
At 8 p.m. of the 22nd the wind was westerly in the lake region, but blowing a heavy gale. At 9.30 p.m. the water had reached its lowest point. At this hour these large undulations, or longitudinal "seiches," appeared, and were noticeable during the following three days. In the North-west the pressure was increasing and the temperature falling, while a heavy north-westerly gale prevailed from Manitoba to the lake region.

At 8 a.m. of the 23rd a north-westerly gale still was blowing over Ontario, while in the North-west the barometer had risen to over thirty-one inches, and the temperature fallen to 40 degrees below zero.

At 8 p.m. of this day Medicine Hat reported 52 degrees below zero. On the 24th and 25th the cold wave, though greatly diminished by lake influence, had reached Toronto, giving a minimum temperature of 8 degrees below zero.

After carefully measuring and tabulating the duration of the larger wave intervals taken from a great number of these lake records, it was surprising to find a

FIG. 6.



marked 20-minute interval. There appears to be a correspondence between these time intervals and those marked upon the barograph records for the same period.

Professor Forel suggests that the smaller, and more rapid oscillations observed upon the foregoing traces, may be due to the lake surface becoming divided into many nodal points of rest, similar to the nodes upon a violin string, when set vibrating. Although these researches cover too short a time to make any definite assertion, there seems to be a wonderful correspondence between the lake waves, as recorded at the Humber, and those found upon the Observatory photographic barograph traces. To illustrate this, let us look at the Humber record, plotted with the photographic barograph trace, during a thunderstorm on the 29th of July last. Here you will observe a marked coincidence between the two; that is, as the atmospheric pressure varied, so did the water rise and fall. The smaller and more rapid movements are not recorded upon the barograph, as it is not sufficiently sensitive. The sudden fluctuations and great range of water level preceding and during thunderstorms, are almost beyond conception until graphically shown, as before us. Here you will note, shortly after 4 p.m., a rise of water of five and a half inches in six minutes, followed by a fall of six inches in five minutes; the rise almost exactly corresponding to the crest of a decided barometric wave. This certainly points to local action, which would not be of sufficient extent to set the whole surface of the lake into multi-nodal vibrations.

These peculiar oscillations appear to be probably due to the action of atmospheric waves or billows, in passing over the surface of the lake, which tend to form minute undulations upon the surface, corresponding in length to these billows, and as they move farther into the bay, become magnified as they reach narrower and shallower portions, until, finally, they assume the proportions recorded upon the instrument. If not thus, how are we to account for the secondary undulations found upon the ocean tide gauges situated at the end of bays, where the shores cannot encircle the disturbed body of water, save at three sides at most? (1)

(1) "A Probable Solution of the Secondary Undulations Found Upon Tide Gauges." Read 16th January, 1897. Supra, p. 28.

As neither the ordinary mercurial nor aneroid barograph is sufficiently sensitive to record the more rapid and smaller atmospheric waves, I have devised, by Mr. Stupart's permission, a simple form of self-recording air barometer, which is seventeen times more sensitive. Most interesting results are now being obtained from this instrument, which may furnish material for a future paper.

To form some idea how sensitive even the photographic barograph is, you will notice two large and well-defined atmospheric undulations upon the trace before us. These are due to a great atmospheric wave, which was formed over Krakatoa, in the Indian Archipelago, during the tremendous eruption there, which caused such fearful loss of life and property in its vicinity. This catastrophe is vividly recalled to our memory by the brilliant red sunsets observed here for many months afterwards, caused by the volcanic dust in the air. This wave reached Toronto in fourteen hours, on its way to the antipodes of Krakatoa, from whence it was reflected back, repassing Toronto on its return, 8 hours and 20 minutes later. It was reflected back and forward, between its point of origin and antipodes, several times, leaving in all seven traces upon our barograph record.

Finally, permit me to draw a few conclusions in connection with what has been brought before you to-night. Meteorologists are unanimous that further advance or improvement in weather forecasting is not to be expected without a better knowledge of the movements of the upper atmosphere. The foregoing investigations seem likely to prove of service in this direction. In connection with the international system of cloud observations, now being carried on throughout the world, interesting and useful results might be obtained by careful observations of the undulatory forms assumed by clouds, and probably due to atmospheric billows, of the kind to which reference has been made to-night.

Since these peculiar undulations almost certainly occur upon all waters and lakes, large and small, if simple instruments, similar to that in use at the mouth of the Humber, were placed at several points on the shores of our great lakes: or, still better, if it were possible to have them in different parts of the world, and especially along a western seaboard, such as that of Great Britain, or our own British Columbian coast, results of great interest might be expected, and our knowledge of the extent, direction, and rate of movement of these atmospheric waves very greatly increased.

Fishermen also would find such instruments of great service, since their records furnish approximate indications of the probable force and direction of an approaching high wind. Already, those fishermen who live near the Humber have learned the advantages of consulting the records before going out to set their nets. A rise of the water level at the west end of the lake precedes, by many hours, the arrival of an easterly storm; as, on the other hand, a coming westerly wind is marked beforehand by a fall.

These phenomena are evidently due to differences of barometric pressure over the extremities of the lake, although, of course, at a later stage, the change of level is augmented by the direct action of the wind.

Mineralogical Notes on Sudbury Anthracite. By G. R. Mickle, B.A.

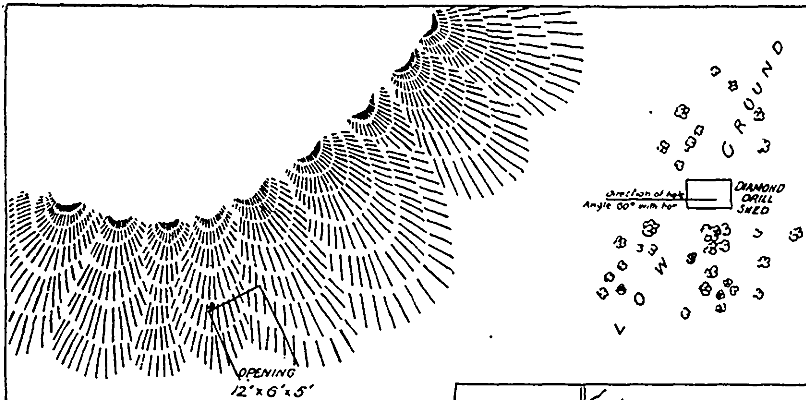
(Read February 27, 1897.)

On the map of the Sudbury District, published by the Geological Survey Department, an oval area about 8 miles wide and 30 miles long will be observed. This oval area is made up of a central part of "dark argillaceous and gritty sandstones" and a border of "blackish, siliceous volcanic breccia and black slate in places." The rocks found in this area are possibly Cambrian, but no fossils have been found to determine the age definitely. The deposit, or vein, which will be here described, is in the border. Another deposit or vein has been found about five miles further west, near the shore of Vermillion Lake.

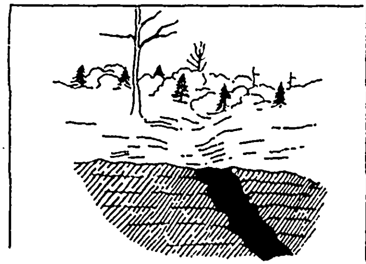
The writer's attention was first called to this occurrence of coal-like substance early in June last year, when he made some preliminary tests on this peculiar mineral, which showed that it acted like anthracite. Shortly after this the surface soil was stripped off, and when visited by the writer, early in July, there was a considerable quantity of this mineral in sight. During the summer the vein was uncovered for about 70 feet, the average width being probably about 9 feet. The strike is about N. 20 degrees W., and the dip apparently about 45 degrees to E. Intermixed with the coal there is in places a considerable amount of quartz, and occasionally a little iron pyrites. The quartz forms, sometimes, a network, in which rectangular fragments of coal are imbedded: in other places the coal is almost free from quartz. If one of these rectangular fragments is partially burnt, and then examined by a glass, minute veins of quartz can be seen traversing it.

The mineral has a lustre like anthracite, only higher. Its hardness is between 3 and 4. This is considerably harder than ordinary anthracite, which is given as 2—2.5. The specific gravity, as determined by Mr. Lawson, is 1.865, the specific gravity of anthracite being 1.4—1.7: the average of ten commercial samples from the western middle coal fields of Pennsylvania was found to be 1.658; from the other coal fields of that State it was less (Penn. Geol. Survey, 1895, p. 1929). Some Rhode Island anthracite has specific gravity 1.81 (Dana). A mineral closely resembling this one was found in the Huronian formation near Lake Onega, in Russia. The lustre is described as adamantine metallic; hardness, 3.5-4; specific gravity, 1.84, and chemical composition similar to the Sudbury mineral (Naumann Mineralogie). The hardness and specific gravity of this interesting mineral from Sudbury are, therefore, on the extreme outer limit of anthracite. Another coal-like substance, which is shown in the sketch, is classed by Mr. Miller, of Kingston, as anthraxolite. Mr. Miller says: "The anthraxolite which I sent was collected by me 'in situ,' about six miles north of this city. It occurs in a vein which has been worked for barite on the farm of John Woodruff, the north part of lots 16 and 17, in fourth concession of the Township of Kingston. The vein, which is nearly vertical, is about 2 1-2 feet wide, and cuts the limestone of the Black River formation of the Silurian system. This limestone is very fine grained, and lithographic in character, and forms a comparatively thin layer over the Laurentian gneiss, which is exposed at places in the valleys. The most abundant mineral in the vein is barite, but calcite and fluorite are also found, as well as anthraxolite This vein can be traced across country for over one and a half miles in the limestone; it is, however, not found in the valleys where gneiss is exposed.

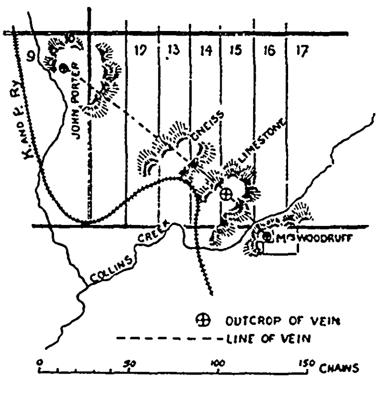
The anthraxolite has been deposited after the barite and other minerals, as it coats them and fills crevices in them. It is probable it has been derived from the

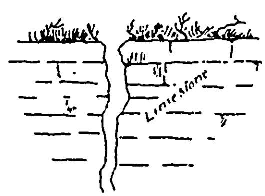


OUTCROP OF COAL
LOT 10 CON. 1. BALFOUR



SKETCH OF OUTCROP AND SECTION OF VEIN





SECTION OF BARITE VEIN AT WOODRUFFS

bituminous matter in the limestone. Crystals of fluorite in the Niagara limestone have been found which enclosed small amounts of petroleum."

This anthraxolite of Mr. Miller's has a duller lustre than the Sudbury mineral, has conchoidal fracture, and resembles bituminous coal more in appearance. It is considerably softer than the Sudbury mineral; its specific gravity is 1.365, and, chemically, it is entirely different. The anthraxolite described by Chapman is "black, lustrous, resembling anthracite in general characters, but very brittle. H. 2.25—2.5; specific gravity, 1.35—1.55; generally decrepitates when heated B.B., a small fragment loses its lustre, but exhibits no further change. Composition essentially carbon, with from 3 to 5 per cent. volatile matter, including a small amount of moisture. The ash, as at present observed, varies from 0 to 10 per cent. When present it exhibits under the microscope no trace of organic structure. This substance, in all probability a product of alteration from petroleum or asphalt, occurs in narrow veins in rocks of various kinds, and in small masses and thin layers or coatings in strata of the Utica and other formations. * * * As it differs essentially by these conditions of occurrence from anthracite proper, the name anthraxolite has been given to it, but simply as a convenient term for present use." (Chapman, Min. and Geol., Ont. and Que., 3rd ed., p.143.) The Kingston mineral is evidently the anthraxolite of Chapman. An analogous occurrence of coal in a vein and not in a bed, and which shows no trace of vegetable origin, is the well-known Albertite of New Brunswick, in appearance, specific gravity and chemical composition widely different from the Sudbury coal. Messrs. Bailey and Ells say in their report: "There can, we think, no longer exist a doubt that the deposit here so extensively worked is a true vein, occupying irregular fissures among highly disturbed strata, and in no way presenting any analogy to an ordinary coal bed." They regarded Albertite as an altered petroleum. This Albertite was discovered in 1849, had its maximum production in 1863-5, when 17,000 tons were produced annually, and in 1876-7 was producing 6,000 tons; the depth was then 1,260 feet, and a trial hole put down 100 feet further showed its continuance. In extent the vein was 2,800 feet long, and was very irregular in size, thickening from a few inches to ten or fifteen feet in a few yards, and much fractured and broken by faults. (Geol. Sur. Rep., 1876-7, pp. 368-388.)

With regard to the origin of the Sudbury anthracite, which occurs in quantities which compel attention, its presence in rocks which are supposed to belong to the Cambrian period, and in which no fossils or traces of vegetable remains have ever been discovered, is very surprising, and cannot be accounted for by the usual theory of the formation of coal from vegetable matter. There are two absolute facts which should be kept in mind, and our theories should be moulded to suit them. In the first place, this mineral occurs certainly in quantities of some hundreds, probably thousands, and possibly an indefinite number of tons; and secondly, the chemical analysis and physical characteristics agree with some anthracites closely; it has, in fact, become more anthracitic than most anthracites. The conclusion which is inevitably forced upon one is that coal can be formed in some other way than by decomposition of vegetable matter. Possibly the development of these veins or deposits will throw some light on this subject.

NOTE.—The sketch of the Sudbury deposit or vein was made by Mr. J. W. Evans, and the sketch of the Kingston vein by Mr. W. G. Miller.

Chemical Notes on the So-called Sudbury Coal. By W. Hodgson Ellis, M.A., M.B., and Wm. Lawson, B.A.Sc.

(Read February 27, 1897.)

Prof. E. J. Chapman has described (Canadian Journal, Vol. X., p. 410) a vein of anthracite from the lower copper-bearing rocks of Lake Superior, an analysis of which gave :

Moisture	2.08
Volatile matter	3.56
Fixed carbon	94.36
Ash	0.00
	100.00

In his "Minerals and Geology of Central Canada" Chapman applied the name "Anthraxolite" to this and similar substances occurring "in veins, with quartz, in the altered strata of Lotbiniere, in the Eastern Townships, and also in regularly banded veins with quartz and iron pyrites on Thunder Bay, Lake Superior" and elsewhere. He regarded it, probably justly, as a "product of alteration from petroleum or asphalt."

In Bulletin No. 2 of the Ontario Bureau of Mines on "Anthracitic Carbon, or Anthraxolite," Dr. A. P. Coleman describes a coaly deposit occurring in a vein in slate in Balfour Township, near Sudbury, to which he applies Chapman's name of Anthraxolite.

We have received specimens of this substance from Mr. Blue, Director of the Bureau of Mines, from Mr. J. M. Clark, from Dr. Coleman, and from Mr. G. R. Mickle, which we have submitted to chemical examination. The samples differ greatly with regard to the amount of minerals, chiefly quartz, with a little iron pyrites, associated with the coaly substance, on which account the ash varies greatly. We found 36.5 per cent., 30 per cent. and 20 per cent. of ash in different samples given us, otherwise the composition of the substance is quite uniform.

The following is the proximate analysis of an average and of a selected sample :

	Average.	Selected.
Moisture	4.00	4.00
Volatile matter	1.30	1.80
Fixed carbon	74.20	90.10
Ash	20.50	4.10
	100.00	100.00

We have also made an ultimate analysis of a carefully-picked specimen, freed as much as possible from associated quartz, etc. The following are our results :

	I.	II.	Mean.
Carbon	94.90	94.94	94.92
Hydrogen	0.55	0.48	0.52
Nitrogen	1.04	1.04	1.04
Sulphur	0.30	0.33	0.31
Ash	1.54	1.50	1.52
Oxygen, by difference	1.67	1.71	1.69
	100.00	100.00	100.00

The specimen contained 2.48 per cent. hygroscopic moisture. Its specific gravity was 1.865.

The combustion was made in a current of oxygen, the nitrogen was determined by Dumas' method, and the sulphur by Nakamura's method.

The striking characteristic of the mineral, as shown by this analysis, is the very small percentage of hydrogen it contains, a quantity much less than that contained in ordinary anthracite.

With a view to comparison we made an analysis of a specimen of anthraxolite from Woodruff's farm, near Kingston, kindly given us by Mr. W. G. Miller, of the Kingston School of Mining. The specific gravity of this mineral was 1.365; it contained 0.96 per cent. of moisture. The analysis of the dry substance gave:

	I.	II.	Mean.
Carbon	90.27	90.23	90.25
Hydrogen	4.18	4.14	4.16
Nitrogen	0.52	0.52	0.52
Sulphur	0.66	0.66	0.66
Ash	0.63	0.80	0.72
Oxygen, by difference	3.74	3.65	3.69
	100.00	100.00	100.00

In this sample the percentage of hydrogen is higher than in most anthracites, and very much higher than in the Sudbury mineral, which, indeed, differs from it as much as the average anthracite differs from bituminous coal.

We have determined the calorific value of the Sudbury "coal" by means of Fischer's calorimeter. We found that one gramme of a sample containing 3.99 per cent. of ash gave on burning 7,490 calories. This will gave a calorific value of 7,800 for the ashless fuel.

On the large scale, so far as the deposit has yet been examined, the ash runs from 20 to 30 per cent. The calorific value will, therefore, be correspondingly lower.

THE CONSTRUCTIONS WITH REFERT AND INTEREST. BY PROF. A. J. BELL, PH.D.

(Read February 28th, 1897.)

The constructions in question are thus described in "Allen and Greenough's Latin Grammar":

"The impersonals *interest* and *refert* take the genitive of the person, rarely of the thing, affected,—the subject of the verb, being a neuter pronoun or a substantive clause, as *Clodii intererat Milonem perire* (Cic. in Mil., 21).

(*a*) Instead of the genitive of a personal pronoun the corresponding possessive is used in the *ablative singular feminine* after *interest* and *refert*: as *quid tua id refert?—magni* (Ter. Ph.); *vehementer intererat vestra qui patres estis* (Plin.).

(*b*) The accusative with *ad* is used to express the thing with reference to which one is interested: as *magni ad honorem nostrum interest*" (Fam. XVI. 1).

The question is: How is it that, while the person interested is expressed by the genitive of the substantive in *Clodii interest* or *eius refert*, it is expressed by the ablative singular feminine of the possessive adjective in *mea interest* or *tua refert*, while the thing concerned is expressed by the accusative with *ad* in *ad honorem nostrum interest?* Indeed, the question is really somewhat more involved; for in the last construction, instead of the accusative with *ad* we find the dative: as in *non referre dedecori* (Tac. Ann. 15.65.), and the dative is also used instead of the genitive to express the person interested: as in *quid refert intra naturæ fines viventi* (Hor. Sat. I. 1. 49.). Indeed the distinction given regarding persons and things, while the rule, is not universal: cf. *multum interesse rei familiaris tuæ* (Cic. ad Fam. 4. 10. 2.) with *quid id ad me aut ad meam rem refert* (Pl. Persa. 513), and in this inquiry we may disregard this distinction. There is, as yet, no agreement among grammarians about the solution of this question, though what seem to me to be correct solutions of the main difficulties involved have been stated or suggested by some of them.

Of the constructions mentioned above, those represented by *mea refert* or *mea interest* and *illorum refert* or *illorum interest* have always been felt to be the cardinal ones, those on the solution of which a correct understanding of the nature of the remaining constructions depends. And first let us notice some of the solutions that have been proposed. Donatus, whose grammar was the text-book of the Middle Ages, in a note on *Quid tua, malum, id refert?* (Ter. Ph. 753) suggests that *tua* is for *ad tua;* and his explanation is evidently based on the idea naturally occurring to anyone who examines these constructions, that, whatever constructions are in fact found with *refert* and *interest*, the dative is the case we should expect to find dependent on them. But in Donatus' day, in the first half of the fourth century of our era, in ordinary thought and conversation the dative had in all likelihood been supplanted by the accusative with *ad*, the construction that takes its place in the Romance Languages. A like view seems to have been in the mind of Scaliger, when he explained *tua nil refert* as equivalent to *tuas res non repraesentat*, i.e., *affert*. Sanctius, the famous Jesuit grammarian, and Ruddiman agree in thinking *tua* here an accusative; but Sanctius prefers to make *mea interest*, the more usual form of expression in Golden Latinity, his starting point, and explains it as equivalent to *est inter mea*. Vossius and Bentley showed that *mea* here could not be the accusative as the *a* is long, and the view was abandoned. It was revived, however, in our day by Emanuel Hoffmann, who, in a paper in the Jahrbuch für Philologie for 1878, suggests that *mea interest* is equivalent to *est inter mea*, and explains *interest omnium* as equivalent to est inter omnium, proceeding from a consideration of such phrases as *in Dianæ*, *ad*

Carmentis,—phrases in which he would not supply an accusative. But the quantity of the *a* in *mea* seems fatal to his view.

Priscian thinks of *mea* in *mea refert* as ablative, and would supply *in re*, making the full construction *mea in re refert* equivalent in meaning to *in mea utilitate refert*. In this he is followed by Valla, but Sanctius denies that *mea in re* can have this meaning; and Vossius, who thinks with Priscian that *mea* is ablative, prefers to supply *causa* or *gratia*. Later supporters of the view that *mea* is ablative—such as Reisig, Krueger and Schmalz—recognize that in the first syllable of *refert* the *e* is long, and that it is properly written as two words, *re fert;* and from the analogy of the Plautine phrase, *e re mea* "to my advantage," they explain *mea refert* as for *e mea re fert*, "it bears to my advantage." This explanation, which is the one now usually adopted, while it is a possible one, has no support from the ancients, and affords no explanation for the constructions in *refert viventi* or *ad me refert* quoted above.

A third explanation given by the Romans, and the oldest of all, is that found in Festus' Compendium of Verrius Flaccus' work, "*De Significatu Verborum*," where we read (p. 282 M.) "*Refert* cum dicimus, errare nos ait Verrius; esse enim rectum *reifert*,—dativo scilicet, non ablativo casu; sed esse jam usu possessum." That is to say, in the phrase *mea re fert*, Verrius thinks *mea re* primarily a dative and equivalent to *meæ rei*, but acknowledges that the words in question are—*jam usu possessum*—generally acknowledged to be ablatives, on account of their form, the identity of which with the ablative is obvious, while into their real and primary nature few pause to inquire. But Verrius was one of the few men who make it their business to inquire into the real nature of such phrases, and of all Romans who engaged in such investigations, his authority best deserves our attention. He lived in the reign of Augustus, who appointed him tutor to his grandsons, Gaius and Lucius Cæsar; and from the epitomes of his work, "*De Significatu Verborum*," made by Festus and Paulus Diaconus, we can see that it was an exhaustive dictionary of Archaic Latin, made at a time when materials were best available for such a work. Gerard Vossius feels the weight of his authority, and is willing to acknowledge that *refert* may be for *rei fert*, being probably influenced by Cæsar's statement that the proper and usual endings of the dative singular in the fourth and fifth declensions is not *ui* and *ei*, as given in the compendia of later grammarians, and as written by later scribes, but *u* and *e*. But *mea*, Vossius thinks, cannot be the dative, and for this reason he rejects Verrius' explanation. But, in the light of the testimony afforded by older Latin inscriptions, Vossius' reason for rejecting this explanation becomes, it seems to me, our strongest reason for accepting it. In the first volume of the Corpus Inscriptionum Latinarum we find eleven instances of undoubted datives of the first declension ending, not in *ae*, but in *a*, as for example in *Fortuna dedi* or *matre matuta dono dedro*. W. M. Lindsay, in a paper in the Classical Review of December last, recognizes in old Latin two forms of the dative singular for *a* stems, represented by *Fortunai* and *Fortuna*, both derived from the primary *Fortuna + ai*, but for the differentiation of which he cannot account. So we find for *o* stems two forms of the dative in old Latin, *populoi* and *populo*, both derived from the primary *populo + ai ;* but here it is the shortened form that has held the field. *Mea re* is, then, if we accept the testimony of Cæsar, and of the oldest inscriptions, as good a dative as *meæ rei ;* and *mea re fert* is, according to our oldest authority, equivalent to *meæ rei fert*, "it bears to the advantage of my affair"; which is precisely the explanation of the meaning of the phrase now generally accepted, but attained without resorting to the Jesuit's trick of the ellipsis, and presenting us with a noteworthy confirmation of the latest view with regard to the form of the dative in Archaic Latin. This explanation seems to me, moreover, to be confirmed by some of the parallel constructions that are in use for *mea*, the ablative so-called. Horace, as we have seen, wrote *re fert viventi*, using an undoubted dative. As far back as Plautus we find, used as a substitute for the dative, the preposition *ad* with the accusative, which takes its place in the Romance languages. And it is used as a substitute for *mea* in *mea refert*, for we read in Plautus, *quid id ad me aut ad meam refert* (Persa. 513). Two of the constructions, then, that can take the place of *mea*, in *mea refert*, are the dative itself and the ordinary substitute for the dative, a fact strongly confirming Verrius' view that *mea* here is itself a dative.

But what of the genitive with *refert*. It appears much later than the genitive with *interest*, belonging properly to Silver Latinity, while the genitive with *interest* is very common in the Golden Latinity of Cicero. No instance of a genitive, other than the genitive of value, is found in Archaic Latin in connection with *interest* or *refert*, if we except the following example in the Lex Acilia Repetundarum (C. I. L. 198. 32), *quod eius rei quaerundai censeant refere*, where the genitive *eius rei quaerundai* is certainly not parallel to that in *eius interest* or *illorum refert*, but seems rather a predicative use of the genitive of characteristic, parallel to *imperium regium quod initio conservandæ libertatis fuerat* (Sall. Cat. 6, 7). If this is correct, the use of the genitive with *refert* is the older construction of the two. Hoffmann's view as to its origin we have already noticed, and he is certainly correct in thinking that it cannot be connected in origin with the older construction of the dative with *interesse* in its personal use, as in *interfui praelio*. An example in Cicero (ad Fam. 4. 10. 2), *suspicarer multum interesse rei familiaris tuae*, leads Schmalz to explain it as primarily a partitive genitive, and he evidently understands the passage as meaning, "I should suspect that much of your estate was involved." But this is not a typical example of the construction, being a genitive of the thing, not of the person. Most probable seems a solution suggested to me by Mommsen's version of the Lex Acilia, and which I find hinted at in Allen & Greenough's Grammar (P. 222 Remark), that the genitive with *interest* is formed after the analogy of the predicative genitive with *est*. The analogy, is, perhaps, best stated in the following way: The idea of possession is originally distinct, in the mind of the Romans, from that of ownership, but later by *usucapio*, i.e., by possession for a number of years, two at most in Gaius' day, ownership is acquired. *Res est alicuius (jure Quiritium)* is the Roman formula for ownership; *res est alicui (in bonis)*, that denoting possession. But what of the thing that, being in the possession of anyone, is passing into his ownership? Can we say, *Res fit alicuius?* We read in the Lex Acilia (66), *res populi fiet*. Did the Roman, then, come to feel that, in the thing then in his possession and passing into his ownership, he had any proprietary right? Gaius speaks of a thing as being subject to a *duplex dominium*, that of the person in whose *potestas* it is,—its owner in the proper sense,—and that of the person in whose *possessio* it is, and into whose *potestas* it is consequently passing. It seems to be this latter *dominium* which finds its expression in the phrase *interest alicuius*. Or, to put it more briefly, *est Marci* means "it is the property of Marcus"; *fit Marci*, "it is becoming the property of Marcus"; *interest Marci*, "it partly belongs to Marcus," or "Marcus has a proprietary interest in it,"—a meaning closely related to the usual meaning of *interest eius*. That *refert*, as early as Plautus' day, was not regarded as two separate words, but as one, is clear from such a construction as *quae ad rem referunt* (Persa, 591), or *quoi rei te adsimulare refert* (Truc., 394). In Cicero's day its meaning differs but little, if at all, from that of *interest*. In such an assimilation of meaning the influence of analogy usually leads to a confusion of constructions originally distinct. The way in which this influence would work may be stated as follows: *refert=interest*, therefore *mea refert=mea interest*; and so for *mea refert*, the only form occurring in Archaic Latin, *mea interest* comes into use in Cicero's time. In like manner *interest=refert*, therefore *omnium interest=omnium refert*; and so beside *interest* with the genitive, the usual construction in the Golden Latinity, there appears in Silver Latinity the genitive with *refert*. And as *interest* has thus acquired a regimen that is primarily and really a dative, it is not strange to find it joined with a construction commonly used as a substitute for the dative, viz. the accusative with *ad*, as in *ad honorem nostrum interest*. That it is never joined with the dative itself, is probably due to a fear of confusion with the ordinary personal use of *interest* in *interfuit epulis*.

THE OCCURRENCE OF RABIES IN ONTARIO. BY J. J. MACKENZIE, B.A., BACTERIOLOGIST TO THE PROVINCIAL BOARD OF HEALTH.

(Read December 12, 1896.)

There is good evidence that there have been at least five outbreaks of this disease in Ontario since 1890. We have knowledge of eight individuals having been bitten by rabid dogs and having been subsequently treated at the Pasteur Institute, New York. A study of the Registrar General's returns for the Province of Ontario since Confederation does not show that rabies has ever been set down as a cause of death.

The evidence that rabies occurs in Ontario rests chiefly upon the results of inoculations made upon rabbits in the Laboratory of the Provincial Board of Health, in the case of an outbreak in the County of Middlesex, in 1895, and another in the town of Paris in 1896.

It has not been possible to trace any connection between these various outbreaks, although it seems probable that the one which occurred in Paris, in 1896, was preceded by one in 1895, in the district surrounding that town. This outbreak, however, was not investigated.

The question as to the origin of the disease in Ontario is a difficult one to decide. It does not seem probable that it is due to wild animals, as all the outbreaks occurred in the southern and older parts of the Province. It is more likely due to the introduction of the virus in imported dogs, chiefly from the United States.

In regard to the prevention of the disease, it seems as if the destruction of masterless dogs and the enforcement of a muzzling law for some months after an outbreak in any district in which it occurs would be sufficient.

A general muzzling law cannot be regarded as necessary.