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PROCEEDINGS

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PUBLIC LIBRARIES IN CANADA. BY JAMES BAIN, JR., ESQ.

(Read December 11, 1897.)

There was a time, shortly after the discovery of printing, when it was possible for a man like Casaubon to say that he knew the contents, more or less thoroughly, of every printed book. But the limits of human endurance were speedily passed, and to-day the enormous mass of literature taxes the ingenuity of the librarian to mould it into organized form. Each successive generation adds its own stratum, and the whole forms the storehouse from which the new generation draws its inspiration and facts. This is especially true of the scientific worker, dependent on the accumulation of minute facts, recorded by long series of patient observers. It is for this reason, therefore, that I bring before you an institution devoted to science, a paper on the "Libraries of the Dominion."

The art of printing was introduced into the infant colonies at a very early period. In Halifax the *Gazette* was published in 1756, the first-born of a numerous progeny, and was followed by the Quebec *Gazette* in 1764. In 1779 a number of the officers stationed at Quebec and of the leading merchants undertook the formation of a subscription library. The Governor, General Haldimand, took an active part in the work, and ordered, on behalf of the subscribers, £500 worth of books from London. The selection was entrusted to Richard Cumberland, dramatist, and an interesting letter from the Governor, addressed to him, describing the literary wants of the town and the class of books to be sent, is now in the public archives, Ottawa. The books arrived in due course, and, while no catalogue survives, I think it would not be difficult to name a large proportion of them. The book world in which Dr. Johnson moved was yet a small one. A room for their reception was granted in the bishop's palace, and as late as 1806 we learn from "Lambert's Travels" that it was the only library in Canada. Removed several times, it slowly increased, until in 1822 it numbered 4,000 volumes. The list of subscribers having become very much reduced, it was leased to the Quebec Literary Association in 1843. In 1854 a portion of it was burned with the Parliament Building, where it was then quartered; and finally, in 1866, the entire library, consisting of 6,999 volumes, was sold, subject to conditions, to the Literary and Historical Society for the nominal sum of \$500.

Naturally, on the organization of each of the provinces, libraries were established in connection with the Legislatures. In Upper Canada the small library in the Parliament Building was destroyed by the Americans, and the one by which it was replaced by the fire of 1824, so that, when the two libraries of Upper and Lower Canada were united in 1841, there appears to have been little left of the early fugitive literature of the province. At the end of the past year the legislative libraries of the Dominion numbered nine, and contained 48,834 pamphlets and 309,395 volumes. By far the most important of these is the library of the House at Ottawa. Originally established on the union of the provinces of Upper and Lower Canada in 1841, it was successively removed with the seat of government from Kingston to Montreal, to Quebec, to Toronto, again to Quebec, and finally to Ottawa—a wandering life, which effectually prevented its attaining large proportions.

The unfortunate fires in Montreal and Quebec still further injured it, robbing it of much that was very valuable, and which could not be replaced. On the federation of the different provinces, in 1867, the library of the two provinces only passed into the hands of the Federal Government. The beautiful building in which it is placed behind the House of Parliament presents a prominent feature in the magnificent pile of buildings which crown the heights overlooking the Ottawa River, and from the windows the spectator gazes across the rocky gorge and the

Chaudiere Falls toward the Laurentide hills, forming one of the most picturesque scenes on the continent. In the eyes of the librarian the library has only one serious defect—it is complete—no arrangement has been made for extension.

On the confederation, in 1867, of the provinces which now form the Dominion, the union which existed between the provinces of Upper and Lower Canada was dissolved, and, as we have seen, the library passed into the hands of the Federal Government. Each of these provinces, now known as Ontario and Quebec, established new libraries in Toronto and Quebec city.

The sixty-two colleges and universities of the Dominion are provided with libraries containing 627,626 volumes and 24,894 pamphlets, an average of 10,123 volumes and 402 pamphlets. It is scarcely fair, however, to depend on an average of the whole number, as some half dozen universities possess at least half of the total number.

The senior of these, Laval University, Quebec, is famous as being, after Harvard, the oldest on the continent, being founded by Bishop Laval in 1663. During the dark days which witnessed the long struggle, first with the Iroquois and afterwards with the English and Americans, little progress was made in the collection of books, and it was not until it was converted into a university, in 1852, that its library commenced to increase rapidly. On the suppression of the Jesuit Order and seminary these books were transferred to it. It numbers considerably over 100,000 volumes, and is unrivalled for the extent and character of its French collection and its many scarce books in early French-Canadian literature and history. Their collection of the relations of the early Jesuit missionaries is only surpassed by the Lenox library, New York.

Our own Province of Ontario was for long the only one which attempted to grapple with the question of public libraries.

Miss Carnochan, of Niagara, has given an interesting account in the Transactions of this Institute for 1895, of the formation and history of the first circulating library in Upper Canada (1800-1820), established by some enterprising citizens of the Town of Niagara, for the supply of their own immediate wants and of those who could pay the small annual fee. It was successful until the destruction of the town by the American troops in 1813 wasted its volumes and impoverished its subscribers, so that it shortly after quietly passed out of existence.

In 1848 the late Dr. Ryerson drafted a School Bill which contained provisions for school and township libraries, and succeeded in awakening a deep interest in the subject. Ever anxious to impress on his hearers the importance of libraries as the keystone to a free educational system, he urged it on every opportunity. Lord Elgin, at that time Governor-General, was so strongly impressed with the importance of the movement that he styled it the "Crown and glory of the institutions of the province." In 1854 Parliament passed the requisite Act, and granted him the necessary funds to carry out his views in the matter. The regulations of the Department authorized each county council to establish four classes of libraries :

An ordinary common school library in each schoolhouse for the use of the children and ratepayers.

A general public lending library, available to all the ratepayers in the municipality.

A professional library of books on teaching, school organization, language and kindred subjects, available for teachers only.

A library in any public institution under the control of the municipality for the use of the inmates, or in any county gaol, for the use of the prisoners.

To aid this work a book depository was established in the Education Office to enable the smaller libraries to obtain readily good literature. The books were supplied at cost, and a grant of 100 per cent. on the amount remitted was added in books by the Department. During the thirty years of its existence 1,407,140 volumes were so supplied.

The proposal to establish the second class was, however, premature, and accordingly, finding that Mechanics' Institutes, supported by members' fees, were being developed throughout the many towns and villages, the Educational Department wisely aided the movement by giving a small grant, proportionate to the amount contributed by the members, for the purchase of books, and reaching a maximum of \$200, afterwards increased under altered conditions to \$400 annually. In 1869 these had grown to number 26, in 1880, 74, and in 1896 to 292. The number of books possessed by these 292 libraries was 404,605, or an average of 1,385 each, with a total membership of 32,603. The issue of books for home reading was 700,958, or an average of 24.6 for each member, which is a very creditable return, considering that only thirty per cent. of the books were fiction.

In 1895 the Minister of Education brought in a bill, which came into force in May, changing the name, "Mechanics' Institutes" into "Public Library." By this Act the directors of any Mechanics' Institute were empowered to transfer the property of the Institute to the municipal corporation on condition that the library be free. This can be done without passing a by-law or requiring a vote from the people. A large number have already availed themselves of it.

In the cities and larger towns, however, the Mechanics' Institute, with its limited number of subscribers, was found unequal to the task assigned it, and accordingly, in 1882, the Free Libraries Act was passed, based upon similar enactments in Britain and the United States.

The first Free Library established under the Act was in 1883, and in the period between that date and 1896 fifty-four have successfully come into operation. They contain 254,091 volumes and circulated during 1895, 1,216,407. Two of them, Toronto, and Hamilton, take rank, both in number and character of their books, among the best libraries of the Dominion.

Unitedly the 346 Public and Free Libraries of the Province of Ontario have on their shelves 658,696 volumes, and supplied in 1895, 1,917,365 books to their readers. Their revenue was \$183,688, of which \$42,741 was contributed by the Province, and they spent of this in books \$49,417.

The Province of Quebec has not yet introduced a Free Library Act, but the generosity of the late Mr. Fraser and of a number of gentlemen in Montreal has provided a fund for the establishment of a Free Library in that city, which was opened in October, 1885, under the title of the Fraser Institute. The Mercantile Library Association transferred to it 5,500 English books and L'Institut Canadien 7,000 French.

In St. John, N.B., a Free Library was founded in June, 1883, to commemorate the landing of the Loyalists a century previous, and in Halifax a Free Library owes its origin to the generosity of the late Chief Justice Young, both of which have been very successful. A sister society, the Library and Historical Society of Manitoba, has been the means of introducing a Public Library, and, with the assistance of the municipal authorities of Winnipeg, has laid the foundation of an extensive and valuable library.

In the lack of trustworthy information, I have not attempted to give any particulars of the Law, Medical, Scientific, Collegiate Institute and Young Men's Christian Association Libraries, further than they are summed up in the following condensed tables, showing the character, and the Province in which they are placed, of the 480 libraries of a more or less public character in Canada.

KIND.	No.	PAMPHLETS.	BOOKS.
Law	21	1,029	105,788
Legislation.....	9	48,934	309,395
Public	325	17,535	663,125
Collegiate, etc.....	62	24,894	627,216
Others.....	29	15,224	96,918
Special	2	14,330	18,500
Y. M. C. Associations	32	23,660
Totals.....	480	122,746	1,874,632

By provinces the 480 libraries are distributed :

PROVINCE.	No.	PAMPHLETS.	BOOKS.
Ontario	374	32,922	942,187
Quebec.....	39	31,811	531,356
Nova Scotia	20	17,756	97,521
New Brunswick	15	2,689	54,787
Prince Edward Island	3	500	8,528
Manitoba.....	8	5,014	34,730
British Columbia.....	10	1,554	11,303
North-West Territories	1	140	2,150
	476	93,416	1,682,572
Dominion	4	29,330	192,060
Totals.....	480	122,746	1,874,632

We may conclude, therefore, from these figures, that so far as the ordinary reader and University student are concerned, Ontario, at least in the cities and towns, is not badly served. The percentage of books per head is not unworthy of a Province which has only been redeemed from the wilderness during the past fifty years. In two directions, however, do we find shortcomings, if not actual want. Outside of the larger cities, towns and villages lies a large proportion of the population of this Province as well as in the others, which are entirely without access to books. There are whole townships and numbers of villages where the weekly newspaper is the only connecting link with modern science and literature.

If we wish to create an attachment by the farmer for his farm, to give an interest in life to his children in their surroundings instead of in the city, and, in other words, to lay the basis for a successful and pleasant country life, we must try to make his intellectual surroundings more attractive and profitable.

And this is not a new problem. Men who have had their country's good at heart have tried for years to meet the difficulty. The late Dr. Ryerson, as we have seen, attempted to make every school-house in the country a centre of "light and sweetness" by the school library, but failed because the effort was premature and because no effort was made to add to or exchange the books.

Since 1892 an effort has been made in New York State to meet it in a different manner. The State law of that year authorized the Regents of the State Library to lend for a limited time selections of books from the duplicate department of the State Library, or from books specially given or bought for this purpose, to Public Libraries under State supervision or to communities meeting required conditions. Out of \$25,000 appropriated for Free Libraries, a portion was at once set apart to buy and prepare books to be loaned under these rules.

The rules then adopted provide that a selection of one hundred books may be lent for six months to the trustees of any Public Library in the State on payment of a fee of five dollars to cover the expense of cases, catalogues, stationery and transportation both ways. Where no such library exists, the books will be lent on petition of any twenty-five resident taxpayers. Special collections of books may also be lent to the officers of a University extension centre, reading course or study club, if properly registered. A later rule offers selections of fifty volumes for a fee of three dollars. In 1893 the Librarian at Albany began to send out a number of small libraries, of 100 volumes each, to such of the small towns and villages as were not provided with Free Libraries. One of these small libraries remained in the community but six months, and was then exchanged for another—hence the name "travelling libraries," which has been applied to them.

The leading purpose seems to have been to incite communities to found permanent local libraries, but the scope of the work has been widened, and the system now provides smaller collections of books for rural communities. So successful has it proved that in 1895 the State of Michigan appropriated \$2,500 to buy books for a similar system and in 1896 the State of Iowa set aside \$5,000 for a like purpose.

In the same year Mr. Hutchins reports to the State Library Commission that in two counties of Wisconsin similar work had been commenced by private individuals. He says that each small library was put up in a substantial case, with double doors,

a lock and key, and so carefully packed that it could be safely shipped by freight. It was provided with a complete but simple system of blank records, so that it could be placed upon a table or counter, unlocked, and be ready for as effective and methodical work as any larger circulating library. In order to insure good care for the volumes and a continuous local interest, the libraries were only sent to communities which organized a local library association of twenty members who agreed to care for the books and to place them where they would circulate freely under the simple library rules prescribed. Each local association elected a secretary, who acted as its executive officer, and each paid a fee of one dollar for each library as a partial payment of the transportation charges.

Twenty-six libraries in one county were sent out in this way. They were visited about two months after by Mr. Hutchins, and he found them even more popular than had been expected. The most interesting accounts are given of the avidity with which the young especially seized the books. The movement is yet too young to allow of accurate statistics, yet they have proved that in Wisconsin, as in New York and Michigan, they supply an urgent need that has not been supplied by any other agency.

They have carried into hundreds of homes new thoughts and information, higher aspirations and ideals, new forces that are making for a better individual, family and social life. Their books are warmly welcomed by families whose doors are closed to the reformer or the missionary. Hundreds of small communities in Wisconsin have attempted to do such work for themselves, but have nearly always failed. They have raised money by entertainments or private subscriptions, and have started libraries with high hopes. In most cases their selection of books has been unfortunate, and when the few entertaining books have been read by most of the patrons and no new volumes are added the popular interest dies, and the library is either put in an obscure place or its volumes are scattered.

By the new system only wholesome and entertaining books are bought, and they are constantly appealing to new readers until worn out by use, and not merely shelf worn. Every six months a library is new to some public, and its arrival is a matter of comment and draws new interest to the library station. The books are bought at the lowest, and substantial editions are selected. They can be occasionally examined and repaired, an important economy, for with books as with clothing, a "stitch in time saves nine." In the making of rules and regulations a wide body of experience can be drawn upon, and in the printing much economy exercised.

Finally, it practically takes the selection of the reading of great numbers of untrained readers from the hands of blind chance, and puts it in the custody of trained experts, who can draw for assistance upon the library experience of the world. Our great and costly system of public schools works unceasingly to teach children how to read and then leaves too many of them to go through their adult lives without using that power to the best advantage, because of lack of opportunity.

The travelling libraries offer an unexpectedly cheap, efficient and practicable method of broadening our educational system to include in its beneficent purposes every one who goes out from the brief course of our common schools, and to enable them to pursue a life-long system of education.

Such a system as has been described seems feasible in Ontario. No part of the Province is beyond reach by rail or steamer, and in no part need there be lack of readers. Our school system, by providing school sections of moderate area, each with its school-house and teacher, seems to have placed the machinery ready to hand. In Wisconsin about one-third of the libraries are kept in the postoffice, one-half in farm houses and the remainder in small stores. But with the school master as librarian and the school-house as the distributing post, the most widely-scattered farm population could be easily reached, while the results of the daily tasks would be more satisfactory. By supplying also in this way the smaller existing Public Libraries, which are barely able to add to their collections, boxes of 100 new books

every six months, fresh life would be thrown into them and their readers brought into contact with the literature of the day.

The Minister of Education might justly consider the proposal to curtail the grants for libraries, amounting to over \$42,700, and devote the saving to the establishment of travelling libraries.

The second want is found at the other end of the scale. Our best libraries have not reached the stage of meeting the wants of our best scholars, and with the limited means at their disposal the time seems far distant when they will be able to do so. Rivalry is out of question with such great libraries as those of Harvard, the Astor-Lenox, Smithsonian, and others in the United States, not to speak of Great Britain, France and Germany, or even Russia; but if our students are to remain at home, some provision must be made to meet their wants. As a nation we cannot afford to be entirely dependent upon others for our highest culture, so that it is incumbent on us to consider carefully our position, and if possible, by combination and economy of energy, endeavour to supply our want.

We have in the City of Toronto some fifteen, more or less, public libraries; all of which, except four, are devoted to special subjects. These four are: the Legislative Library, the University of Toronto, the Public Reference Library, and the Canadian Institute. The first three mentioned are somewhat on the same lines, special departments being added to each to meet special requirements. In the past efforts have been made by the librarians to prevent the duplication of expensive books and sets; but necessarily a large proportion of the books are alike, and much waste of money, time and energy has ensued. The Legislative Library, established to supply the demands of our legislators, has been forced to add to its shelves quantities of general literature. It has now outgrown the chamber provided for it, and it will be necessary for the Government at an early date to provide further accommodation. The City Public Reference Library has in like manner grown to about 45,000 volumes, which are housed in a building unsuitable for the purpose—exposed to danger from fire and in need of additional space for expansion. The Canadian Institute, with its valuable collection of Transactions, is in much the same condition, with the additional disadvantage that the student finds here only a portion of his work, though an important one, and a lack of proper catalogues and literary assistance.

We have here three libraries which partially overlap and which fail to make full use of their opportunities by reason of special circumstances, and yet which if worked in harmony would do much to remove the present reproach.

It has seemed to me, after careful consideration, that the best interests of the Province and city would be served by adopting a proposal such as the following:

The Province of Ontario and the City of Toronto to unite in the maintenance of a common Provincial Reference Library, the books in which would be free to every person in the Province.

The Province, in consideration of the value of the books in the Public Library, to erect suitable buildings in a suitable locality.

The Legislative Library to be confined to such books as are actually required for legislative purposes, and the balance of the books transferred to the joint library.

The Canadian Institute to hand over their collection to the joint library, receiving in consideration a suitable meeting room.

Regulations made by which students in all parts of the Province could share in the use of the books, due regard being had for their safety.

In this way a library could be instituted—free to the citizens of Toronto, as their own is to-day—furnishing the highest literature to every student in the Province, properly housed with little more expense than the three libraries are at present costing, in which would be found room for, extensive geological, mineralogical, botanical and other departments, so much wanted, forming a National Library worthy of the Province and of the City in which it is placed.

NIAGARA AS A TIMEPIECE. BY DR. J. W. SPENCER.

(Read January 22, 1898.)

Although probably a thousand papers have been written upon Niagara, commencing with the discoveries of La Salle and Hennepin, it is still less than twenty years since the physical history of the river began to be understood. La Salle and Hennepin visited Niagara, accompanied by an Indian chief, in 1678. Although they were the first white men who saw Niagara, its existence was made known by Indians to Jacques Cartier when he visited Montreal in 1535. Hennepin's rough sketch of Niagara appears to have been the only one made for a long time. The oldest drawing approaching accuracy, known to the writer, was one made by Lieut. Pierie in 1768.

In spite of the prejudices then existing against the antiquity of the earth, Andrew Ellicott, the surveyor and engineer, more than a hundred years ago, recognized that the gorge had been excavated by the river, and concluded that its age was about 55,000 years. Subsequent estimates were made, but that of Sir Charles Lyell became the most popular. Upon his conjecture that the Falls receded a foot a year, he estimated their age at about 35,000 years. Prof. James Hall made the first instrumental survey of the cataract in 1842, from which comparisons of the amount of recession can now be made. In 1890 the fourth survey was made, and the mean annual recession was found to be about four feet. This factor would reduce the age of the Falls to between 9,000 and 10,000 years, had it been a case of simple, uninterrupted recession. But as the volume of water and the descent of the river have varied so as to increase the time required, the estimate made by Lyell was nearer the true one. Subsequent to the classic writings of Lyell and Hall, of more than fifty years ago, one of the first papers which reopened the study of the physics of the river was written by the writer, in 1881, showing that the Erie basin was not drained by the Niagara river in pre-glacial times. This was confirmed by Dr. Julius Pohlmaes, who, two years later, discovered certain fragments of ancient streams, the valleys of which were taken possession of by the modern Niagara. Again, Prof. G. K. Gilbert found, in 1886, that the river had a greater descent at one time than now; but the earlier, long-continued and interior height of the Falls was first pointed out by the writer. Upon the backing of the water after the maximum descent of the river, the surface of Lake Ontario rose above the present level, so as to again considerably reduce the height of the Falls. This second reduction of their height is, perhaps, the last discovery in the physics of the river, and has hitherto not been announced.

Perhaps the most important change discovered in the physics of the river was (in 1887-1888) that the three upper lakes—Huron, Michigan, and Superior—did not drain into Lake Erie until recently, but emptied, through Georgian Bay, towards the north-east. Thus for a long period Niagara river drained only the waters of the Erie basin. These discoveries show that the determination of the mean rate of recession of the modern Falls had to be greatly qualified in order to arrive at an approximate determination of the age of the cataract; but the difficulty remained of ascertaining the amount of work done during the different episodes. However, at Foster's Flats the bed of the old river and fragments of lateral terraces were found in 1893. From these and other features the key to the situation was partly obtained. Some of these results have since been confirmed by the estimate of the depths in the different basins of the modern channel made by Prof. Gilbert.

The modern Niagara took possession of the old Tonawanda channel, which had drained a portion of the Niagara tableland in pre-glacial times. Its valley was about one and a half miles wide and ninety feet deep, and crossed the course of the modern river. The rapids above the Falls represent the site of the modern waters, now descending over its side into the ancient Tonawanda channel, which had been filled with drift. This ancient valley is now buried, and continues westward of the whirlpool to form the St. David's Valley, about which so much has been written. The whirlpool gorge is only a modern enlargement of a small valley starting, in pre-glacial times, from near where the railway bridges are now located, and forming a little tributary of the Tonawanda channel, just mentioned.

The older geological features and the character of the strata have been known for fifty or sixty years, but the features here mentioned are those directly bearing upon the physics of the river, which were not formerly understood.

The episodes of the river may be briefly outlined. The first was of long duration, when the descent of the river was about 200 feet, and the volume of water one-fourth of that of the present amount (only the drainage of the Erie basin). Then we have all the waters of the upper lakes flowing over Niagara, and shortly afterwards the surface of Lake Ontario was lowered to 420 feet below the upper level of the river. Thus, in a general way, we have arrived at the time when the Falls had reached the foot of the whirlpool rapids, by which time the waters of the Ontario basin rose sixty feet or more above their present level. In the meanwhile there were three principal cataracts, the lower gaining upon the upper. But by the time the Falls had retreated to just above where the railway bridges cross the gorge the Ontario waters were again lowered, so that the modern descent of Niagara river is 326 feet. The physics of the short section along the whirlpool rapids is not yet understood; but even in spite of this, with the consequent errors in the theoretical determination, the age of the Falls so far has not been found to greatly differ from the computations made in 1893, which assigned the period between the time when the Niagara was a strait and the present day to be 32,000 years.

These changing episodes, which appear complex, are after all largely assignable to one cause, namely, the unequal elevation of the earth's crust in the lake region, the amount being greater towards the north-east than in the opposite direction. With the rise of the land, the Huron, Michigan and Superior, collectively named the Algonquin basin, was eventually drained by way of the Nipissing and the Ottawa valleys; and the waters of the Lundy basin, the name for the united Erie and Ontario basins, were lowered so as to leave only an insignificant Lake Erie, and the Iroquois gulf, extending in the Ontario basin to the foot of the escarpment at the mouth of the Niagara river, into which the Falls descended directly at their birth. With the continued rise of the land the waters of the Ontario basin sank, in so far as they affected Niagara, to eighty feet below their present level. The land, now rising more rapidly towards the north-east than the south-west, tilted the river of the Algonquin basin so as to raise a barrier across the Nipissing outlet (worked out by Mr. F. B. Taylor), which diverted the waters of the upper lakes into the Niagara drainage only some 7,000 or 8,000 years ago. The same kind of movement raised the barriers at the outlets of both Lake Erie and Lake Ontario so as to back their waters towards the heads of the basins; and, in the case of Lake Ontario, its surface rose some sixty feet or more in the lower part of the Niagara gorge. But a portion of the barrier at the outlet of Lake Ontario, being composed of drift, has recently been washed away by the St. Lawrence river so as to reduce the surface of Lake Ontario to its present level.

The movement is slow. The rise of the land in the Niagara district is about one and a quarter to one and a half feet a century; about the region of Lake Nipissing, nearly two and a half feet, and about the outlet of Ontario, between four and five feet a century. These upward movements were determined from geological observations made at Niagara, and their effect upon the tilted beaches, which had

been traced over the lake region; but until 1893 all attempts made at determining the rate of terrestrial changes defied investigation. The north-eastward movement is still continuing, as recently determined by Prof. Gilbert. Under these conditions further changes in the drainage of the upper lakes become imminent: thus the rocky barrier at Niagara Falls should be lifted so high in 600 or 700 years as to flood the country about the head of Lake Erie, and raise its surface to the same level as that of Lake Huron and Lake Michigan. In 1,000 or 1,200 years they should be high enough to overflow the low divide near Chicago into the Mississippi drainage. In about 2,400 years all the waters of the upper lakes promise to be diverted from Niagara to the Mississippi. The Chicago canal is not considered in this calculation, but will shorten the time of the last-named events. These calculations, based upon geological data, are very close to those of Prof. Gilbert, based upon other measurements. In the meanwhile the waters about Buffalo will rise somewhat higher than now, but in 5,000 years the whole of the Niagara river and the eastern end of Lake Erie will be turned into dry land, traversed only by insignificant streams. From the time when the whole discharge will be turned into the Mississippi, there will be but little further excavation of the Niagara gorge. Before this change is accomplished, the Falls will have receded scarcely two miles farther southward; and thus for only a small proportion of their life history will they have been of use to man, or their grandeur remain as one of the wonders of the world.

The birth of the Falls was subsequent to the commencement of the lake history, which was posterior to the ice age proper. Upon the computation of the age of the Falls (32,000 years) it has been found that the end of the ice age was more than 50,000 or 60,000 years ago.

THE CREE LANGUAGE. BY REV. E. B. GLASS, B.A. (VICTORIA).

(Read January 29, 1898.)

I.

Of the Algonquin stock, the Plain and Wood Crees use, perhaps, the purest and most euphonious branch amongst the Cree dialects :

EUPHONY.

On the Saskatchewan 'duck' is 'sesep'; 'duckling,' 'sesepis.' At Moose Factory these words are 'sheshep' and 'sheshepish.' The former two words please the eye and ear, and are readily enunciated. There is a natural tendency to place a vowel between consonants in order to secure agreeable sounds. 'Iron' or 'metal,' is 'pewäpisk,' 'road' is 'mäskunow' and 'rail' or 'iron-road' is 'pewäpisko mäskunow.' 'Kiyäs,' 'old,' 'käkwiya,' 'things'; 'old things' is 'kiyäse käkwiya.'

These Indians do not stammer—they are noted for ready utterance and eloquence. Rapid delivery is necessary on account of the syllabic character of the language, as distinct from the alphabetic of the English and most European languages; therefore euphony must be studied to aid pronunciation. I shall give an illustration :

"The new Government wishes to know how the Crees are prospering," has sixteen syllables. This in Cree is, "Kä öske pumini'kik weyusowäwin wekiskäye'tumwuk mä'te kespin Näheyäwä peyechehenäkoo'chekäyekwänik," and contains thirty-seven syllables. Hence it can be seen that to convey the same idea in the same time as the Englishman, the Cree must speak more quickly.

PRECISION.

There is a definiteness about this tongue that is very striking, and in contrast to the ambiguity of many other tongues. If an elder brother is referred to it is 'nistäs,' 'my brother,' if a younger brother, the word is 'nisēm.' My (elder) sister is 'nimis'; 'my (younger) sister,' 'nisēm.' It is observed that 'nisēm' is either 'my (younger) brother' or 'my (younger) sister'; but it is usual to add, in this case, by way of explanation, 'näpāō,' 'man,' and 'iskwāō,' 'woman,' as 'nisēm iskwāō.'

All verbs are precise in first and second plural, and third singular and plural. In English, French, Latin, Greek, "we advise," for instance, is indefinite; but in Cree these forms of the verb leave no doubt in the mind of the reader or hearer addressed. "Ne se'ke'kämünän," "we advise," excludes second person or persons, including only first and third; "ke se'ke'kämünow," "we advise," takes in first and second only.

In addressing the Deity it is unpardonable to say "kemoostowinänow," "we desire it," which form embraces the first and second persons; "ne moostowinänan" must be used.

If I ask a friend whether Mr. Jackson's son is home, the answer is "äp'yewa," not "ap'eu"; the latter word is, in substance, "he is home," and refers to Mr. Jackson himself; but "äp'yewa" has the relative ending "yewa," relating to the second party mentioned, that is, the son.

My friend may then say, referring to Jackson and son, "nätawäye'tum kita päetu'tit ootä" "he desires to come here," that is, Jackson. If it is said, "nätawäye'tum kita päetu'tiyit ootä," the relation extends to the son, and the meaning is that Jackson wishes his (son) to come here."

No one can dispute the ambiguity of the following: "The chief spoke to the thief in his house." Such indefiniteness has no place in Cree. If the chief's house is meant the sentence is, "Okemow ke weche pekiskwamāo okimotiwa weki'k"; if the thief's house is meant, the last word has the relative (relating to another) ending "yi'k" added, making "wekeyi'k."

Suppose that a man wishes to take a horse home. The form of verb he employs indicates whose horse. If his own horse he says, "Ne kī kewā'tahow," "I will take him home." If another's, "Ne kī kewā tāhimowā," "I will take his (horse) home."

SYNTHESIS.

A few examples will give some idea of the constructive peculiarity of this language.

The root "wā" signifies "light" or "white colour." By a system, the Cree has added to this root endings that are significant and unique: "Wapeo," "he sees"; "wāpewin," "sight"; "wāpamun," "mirror"; "wāpa'tum," "he sees it"; wāpamāo," "he sees him"; "wāpehāo," "he causes him to see."

Again, upon the root "pim," "coursing" or "going," is built another set of words: "Pimo'tāo," "he walks"; "pimo'tāwin," "walking," *i.e.*, the noun; "pimo'tahāo," "he causes him to walk," or go; "pimō'yow," "he flies"; "pimiskow," "he paddles"; "pimāsiw," "he sails or goes with the wind"; "pimipā'tow," "he runs"; "pimipā'towin," "running"; "pimipayiw," "he passes running"; "pimipayiwīn," the noun "running" in passing by.

II.—THE NOUN.

There is a disposition on the part of some to underestimate the importance of the noun in Cree. It is difficult to see the reason of this when it is considered that the language abounds in names of all kinds conceivable, and possesses the genius or ability of naming everything that civilization presents as new. It is true that many nouns are formed from verbs by prefixes and modified endings, but this fact is no argument (as will be seen) that the noun is not a prominent part of speech or that it does not naturally occur in the language.

1. Names are given "directly" to objects—kēsik, sky; atim, dog; asinee, stone; nipē, water; nāpāo, man; kōna, snow; pimē, oil, grease; mūstus, a cattle beast; mūsua, moose; muskwā, bear; minahik, pine; askē, earth, a country; pēkō, ashes; mēkō, blood. In the last two words the "rough breathing" of the Greek is used, to secure the *h* sound in English, after *ē* in each word. The force of the breathing is exactly the same as that in the name Lochaber, a district of Inverness.

2. Names are given "indirectly"—that is, they are suggested or derived:

(a) Of these the verb originates many nouns by the prefix *ō*, as kistekāo, he farms; ōkistekāo, farmer; āyamehow, he prays; ōtāyamehow, one who prays, a Christian. The *t* is here inserted between two vowels for easy utterance, or euphony. Mēyosoo, she (mas. or fem.) beautiful; ōmēyosoo, the beauty. Kēyāskēw, he lies; ōkēyāskēw, a liar.

(b) The verb originates other nouns by an affix, or by both prefix and affix, to the third person, singular, present tense. Nikumoo, he sings; nikumoowin, singing. Chēkičkāo, he chops; chēkičkāwin, chopping. Tīpahumākāo, he pays; tīpahumākāwin, payment. Nipā'tākāo, he commits murder (mas. or fem.); ōnipā'tākāsk, a murderer. Äyūmēhākāsoo, he pretends to pray; ōtāyūmēhākāsusuk, a hypocrite. The last three examples show that nouns may be formed by a prefix and the affix *sk* to a modified ending.

(c) By dropping the ending of the third person, singular, and adding *kän*, nouns are derived from verbs: *Keskëpoochëkäo*, he saws (crosswise); *këskëpoochëkäin*, cross-cut saw. *Täskëpoochëkäo*, he saws (lengthwise); *täskëpoochëkäin*, rip-saw. *Pëkopichëkäo*, he plays; *pëkopichëkäin*, plow.

(d) In a number of cases the noun formation consists in omitting the pronominal prefix of a verb, third, singular, and adding *kun* or *chëkun* to the ending, from which the consonant is elided. *Ne minikwän*, I drink; *minikwäkun*, or *minikwüchëkun*, a cup, or drinking vessel. *Ne käsekwän*, I wash my face; *käsekwäkun*, wash basin.

(e) A class of nouns is formed from other nouns by adding *kän*, a vowel being inserted between the consonants, the new formation denoting something simulative or artificial. *Awäsis*, child; *awäsisëkän*, doll. *Pësim*, the sun; *pësimökän*, a clock. *Manitoo*, God; *manitökän*, an idol. *Päkwäsekun*, flour; *pükwäsekunëkän*, wheat; in this derivative one would expect the word for flour to be derived from that which signifies wheat, according to rule, but this is the exception.

(f) If *wän* is added to the name of an animal, a name is obtained for that animal's skin. *Wäpoos*, rabbit; *wäpooswän* rabbitskin. *Mooswä*, moose; *mooswän*, mooseskin.

By affixing *wägin* to the same names of animals, a name for a part of the skin is supplied. *Moostoos*, a cattle beast; *moostooswägin*, a piece of oxhide, or leather. *Mooswägin*, a piece of mooseskin. These derived cognate nouns are much in use. The word for book is *musinëkun*; if *ägin* is added, as in *musinëkunägin*, the name for paper is obtained. *Papakwän*, shirt; *papakwänägin*, shirting.

(g) Diminutives are formed by means of an affix "is," "oos," or an ending of like sound. *Sësep*, duck; *sësepis*, duckling. *Näpao*, man; *näpäsisis*, boy. *Iskwäo*, woman; *iskwäsisis*, girl. *Mükkä'k*, barrel; *mükkä'koos*, keg. *Musinëkun*, book; *musinëkunis*, letter. *Musinëkunägin*, paper; *musinëkunäginooos*, a bit of paper. *Sëpë*, river; *sëpësis*, creek. *Misëhäo*, hen; *misëhäsis*, chicken.

(h) By affixing *äpwë* to a noun or an adjective, the name of a liquid is obtained. *Iskootao*, fire; *iskootäwäpwë*, fire-liquid or whiskey. *Musinëkun*, book; *musinëkunäpwë*, ink. *Sëwow*, it is sour; *sëwöpwë*, vinegar. In this last word, by eliding a vowel and a consonant, a euphonious word is formed.

(i) If *ä'tik* is added to a noun, an appurtenance or part is designated. *Musinëkun*, book; *musinëkunä'tik*, pen. *Chëkëkun*, axe; *chëkëkunä'tik*, axe-handle. *Mëtisowin*, eating or food; *mëtisowinä'tik*, table.

(j) *Kumik* denotes abode, dwelling, or building, when affixed to a noun. *Mistätim*, horse; *mistätimokumik*, horse-stable. *Moostoos*, cattle-beast; *moostoosokumik*, cattle-stable. *Sooneow*, money, *sooneowokumik*, bank. *Asükäo*, he gives rations; *asükäokumik*, ration-house.

(k) By prefixing an adjective or a verb to a noun, a composite noun is formed. *Pë'tukäo*, he enters; *äyamehowin*, prayer; *pë'tukäwëäyamehowin*, class-meeting. When *äyamehäo*, he prays, is prefixed to *eyënew*, person, there results the long word *äyamehäwëyënew*, preacher. *Ki'che* is great; *ökemow* is chief, ruler or king; *iskwäo* is woman. Now, by joining these three in order, and remembering euphony, a significant noun is the result, which means queen. This word is *ki'cheökemäskwäo*.

“RECENT VIEWS ON COLOUR.” BY ALBERT H. ABBOTT, B.A.

(Read January 29, 1898.)

The colour problem has three aspects :

I. The physical problem, which investigates that energy in nature which is especially connected with our sensation of light and colour.

II. The physiological problem, which investigates the processes in the eye and its accessories as the organ of vision.

III. The psychological problem, which investigates our sensations of colour, or colour as it is experienced. The question here is: What are the mental facts of light and colour, and on what conditions do they depend ?

The first “recent” view on colour discussed was the emphasis which has been laid upon this psychological colour problem with the rise of scientific or experimental psychology. Both of the other aspects, the physical and physiological, must recur continually to the facts of colour which scientific psychology discovers or establishes, as the final test of the adequacy of their theories. The facts of all sciences are *primarily* facts for psychology (*i.e.*, psychic or mental facts), and *secondarily*, facts for these sciences, and hence, the conclusions and theories of all sciences must be judged by their faithfulness to the facts of experience.

The second view on colour discussed was a modification to the ordinarily accepted physical theory of colour, suggested by Dr. Kirschmann. The ordinary theory contends that colour is an explicit function of the wave length. There is a difficulty, however, in this view which is raised from the fact that *no one has ever seen light or a colour of only one wave length*, and, therefore, that, could we get light of one wave length, there is no guarantee at all that we should see it coloured. *Colour of one wave length is a purely hypothetical conception*: at every point on a spectrum there is always a superposition or interaction of wave lengths. A slit *infinitely* small would, so far as mathematics are concerned, give the *pure* spectral colours which advocates of this theory demand: but, on the other hand, a plate bearing a slit which is *infinitely narrow* would be for us an *opaque* object. Colour as seen in the spectrum must actually be projected by use of a slit of finite width, and, therefore, it must always be produced by the superposition or interaction of wave lengths.

This contention is based directly on psychical considerations, *viz.*, whether we see colour or not. To contend that that alone would be a *pure* colour which is to be produced under circumstances which would prevent us seeing either light or colour seems to overlook the fact that it is our sensations of colour which make any science of optics possible, and surely they must be the deciding factor in such a matter to the last.

A second line of objection to the theory that colour is an explicit function of the wave length arises in connection with the discussion regarding purple, *i.e.*, the colour which would form the transition from violet to red. This colour is not present in the ordinary spectrum, and from this it has been concluded that purple is not a *pure* but a *mixed* colour, and as such it is not a constituent of white light at all.

An experiment was shown which seems to have some bearing on the question. By very simple means two spectra were thrown upon a screen together, parallel and in close juxtaposition to each other. The one was the ordinary spectrum, consisting of red, orange, yellow, green, blue, violet, and the second was an “inverted” spectrum, consisting of blue, violet, purple, red, orange, yellow. (Note.—Purple is absent from the first, *green is absent from the second*.)* This “inverted” spectrum

* The “inverted” spectrum was first shown in this connection in a lecture given by Dr. Kirschmann before the Mathematical and Physical Society of the University of Toronto. The objection may be raised that the colours in the inverted spectrum are not as “pure” as those in the ordinary spectrum, but this is met by the fact that, as sensations, the colours are quite as pure and brilliant as the ordinary spectral colours. The right of these colours to rank physically the same as the latter colours was further demonstrated in the above-mentioned lecture by the fact that both spectra show interference bands equally well.

is produced by the superposition of two spectra, so that the red and violet rays act together, and so give purple. *The presence of purple, therefore, proves nothing* which could reflect on the ordinary theory, but *the absence of green* is of more significance. If green is a constituent of white light, why is it absent? Where is the green? If we answer, Just where the purple is in the ordinary spectrum, we must undertake a thorough discussion as to the basis of the contention that green is a constituent of white light while purple is not. The fact is, if we prevent the rays of the ends of the spectrum interacting we lose purple, and if we prevent the rays of the middle of the spectrum interacting we lose green. The absence of both of these colours from the spectra seems to be rather a property of the means used in each case than of white light. In white light every wave acts at the same point, while in the longitudinal arrangement of the colours, as in a spectrum, we prevent this; but while allowing the neighbouring waves to act together we deprive the waves of ends of the spectrum altogether of this possibility. Hence, Dr. Kirschmann contends, the absence of these colours in each case. He suggests, therefore, that the theory be modified and stated as follows: "*Colour-quality is a function of the superposition of wave lengths, so that to every qualitative difference in spectral colours corresponds a difference in the mode of superposition.*"*

This position goes back to the psychology of the question. If purple were found to play an exceptional role in our colour sensations there might be grounds for rejecting these conclusions. But if, as is the case, purple be found to obey the same laws which all other colour sensations follow, there is no reason whatever for regarding it in any peculiar light. It is a colour quite as much as any other. There is, therefore, no *a priori* reason for rejecting it from the list of *pure* colours. If, however, it must be rejected in the case of the ordinary spectrum, surely green must be rejected in the case of the inverted spectrum from the list of the constituents of white light, and both for the same reason.

The third question discussed was along the line of the general psychology of colour.

Experiments were made, showing that colour sensation could occur when physically there was no light of the specific colour present, *e.g.*, as in contrast phenomena.

The manifoldness of our colour sensations was also illustrated by a geometrical construction known as "the colour cone," and by means of rotating discs, showing transitions in shades, tints and saturations of colour.

The fact that, from the psychological standpoint, there is no reason to speak of fundamental colours was discussed, and the significance of the colour theory of Prof. Wundt was pointed out. Owing to modifications made in connection with this theory recently by Dr. Kirschmann, and in consideration of the modifications suggested to the physical colour theory by the same scientist, it seems proper to give the theory the name of the Wundt-Kirschmann Colour Theory.

*"Colour saturation and its quantitative relations."—*American Journal of Psychology*, Vol. VII, No. 3.

SEISMOLOGICAL OBSERVATIONS AT TORONTO. BY R. F. STUPART, ESQ.,
DIRECTOR METEOROLOGICAL SERVICE OF CANADA.

(Read February 5, 1898.)

At the Ipswich meeting of the British Association it was resolved that the two committees which were studying vibrations of the earth's crust, viz., "The Committee for Investigating the Earthquake and Volcanic Phenomena of Japan" and "The Committee on Earth Tremors" should not be reappointed individually, but that the whole subject should be referred to a new committee, consisting largely of the members of the old committees, which should be called, "The Committee on Seismological Observations." The new committee at Liverpool reported as follows: "This Committee, however, think that it would be well in this, its first report, to state definitely what it hopes to accomplish, and how far it thinks that the British Association should go. It has long been an unwritten rule that the Association should initiate work, but should not charge itself with its maintenance. This is precisely what your Committee desires. Now that it has been proved that any important earthquake is felt all over the globe, the Committee considers that arrangements should be made for the record and study of these movements. Your Committee considers that such records may prove as important as those of *e.g.*, terrestrial magnetism, and, just as we have magnetic observatories in various parts of the world, so, in its opinion, should there be seismological ones. But, before advocating their erection, it is essential that a decision be arrived at as to the form and degree of sensitiveness of the instrument to be recommended.

This, and correspondence connected with the organization of the system, is the work which the Committee desires to complete. Previous reports and the appendices to the present one, show how much has been done in this direction, but the Committee desires to do much more. It wished to place side by side four good patterns of instruments, and to compare and study their records. When this is done it hopes to receive the support of the Association in approaching the Government with the view to the establishment of a limited number of instruments, identical in sensitiveness, in this country, in India, and in the colonies, and of a small central office at Kew or elsewhere for co-ordinating and publishing the results. As far as the Committee can at present judge, the equipment of each station, with complete apparatus for continuous photographic record, would not exceed £100. For the experimental work of the coming year the Committee have one instrument, and can have the use of another (constructed under a grant to Professor Milne by the Royal Society); it wishes to purchase two others, and will have to build piers, etc., and pay for photographic necessaries and an assistant to run the instruments, which, altogether, would probably cost over £200. Your Committee thinks it desirable that to meet unforeseen items it should have £250, but without £200 the work cannot go on."

Early in 1897 a letter was received from the chairman of this Committee inviting the co-operation of the Canadian Meteorological Service in a seismological survey of the world. The Honourable the Minister having been pleased to authorize the expenditure of the necessary funds, a seismograph was ordered, and the instrument arrived in Toronto on the morning of the day that Professor Milne gave his most interesting lecture on "Earthquakes" at Massey Hall, and he was able to have it on the table for the inspection of those of his audience who wished to examine its construction. The instrument consists of a horizontal pendulum with a boom two feet six inches long: at the end of this boom is a plate in which is a narrow slit,

parallel to the length of the boom. The position of this, beneath a slit at right angles to it, is shown by a speck of light from a small lamp, reflected down, which photographs continuously on a bromide film two inches wide, which passes at the rate of five feet each day. Every hour the light is eclipsed by a screen attached to the long hand of a watch, and thus a time scale is supplied.

After the departure of the members of the British Association we lost no time in getting the instrument in position, but unfortunately were unable to begin operations immediately, as the maker had failed to send us the necessary paper, and it was not until the 20th September that the clock was set in motion. I say unfortunately, because there was great disturbance on at the very instant the record began, and we have a clear record of the maximum and last vibrations caused by an earthquake which Professor Milne informs us occurred in Borneo.

There are difficulties to contend with in the management of the seismograph, and the greatest of all is vibration of the pendulum, caused, we believe, by some movement of the air. Professor Milne has been unable to altogether get rid of the movement in his instrument in the Isle of Wight: he is inclined to think it is caused by air currents. He has studied the vibrations under various atmospheric conditions, and apparently finds, as we do, that the disturbance is most pronounced on clear, calm nights when radiation is great. It is a subject for investigation, whether we are not registering on our seismograph the very atmospheric tremors or waves which cause telegraph wires to hum on clear, calm nights, and that, Mr. Percival Lowell asserts, are the cause of bad seeing on certain nights which, to all appearance, ought to be good for astronomical observations.

Since the starting of the instrument we have recorded eleven very decided quakes and nine small earth tremors: many others have perhaps been lost in the air current disturbances. The most marked of the eleven was the first one, the origin of which Professor Milne places in Borneo, the next in order of importance occurred on December 10th, when earthquakes were reported both from Bermuda and Italy: this was not recorded in Great Britain. Next came one on December 28th, and was followed by a larger one on the 29th; and both were also recorded by Milne in the Isle of Wight.

The preliminary tremors on the 28th (Fig. 1) began at Toronto at 8h. 24m. 37s., Greenwich mean time, and in the Isle of Wight at 8h. 54m. 51s., or over half an hour later. At present we have no knowledge of the origin of this disturbance. The disturbance of the 29th at Toronto (Fig. 2) was marked by the absence of preliminary tremors, and vibrations of large amplitude began at 11h. 32m. 29s. In the Isle of Wight preliminary tremors began at 11h. 40m. 48s., and the larger waves at 12h. 0m. 37s., or 28m. 8s. later than Toronto. The origin of this disturbance was obviously near the north coast of San Domingo. Two cables were broken by it, and, according to newspaper reports, the town of Santiago was greatly damaged at about 11h. 29m.: which time, however, Professor Milne thinks is an error, and is inclined to place six minutes earlier. The distance from San Domingo to Toronto is 1,510 nautical miles, and to the Isle of Wight 3,823 miles. We are endeavouring to obtain further particulars from San Domingo regarding the time of the shake, and if successful the comparison will be particularly interesting. The last important shock was on January 24th, the preliminary tremors beginning in Toronto (Fig. 3) at 12h. 18m. 28s., or 32m. 39s. later than in England: this would seem to indicate a very different origin from those of December, perhaps in Asia Minor. At the Toronto meeting of the British Association last year Professor Milne obtained a grant for the construction of a few seismographs, and I promised to place one of them in charge of the meteorological observer at Victoria, B.C. The instrument is nearly ready for shipment, and will probably be placed in position about the 1st of June. This will be another link in the chain of seismological stations, and it is pleasant to know that Canada is taking a very active part in this most interesting and important seismic survey.

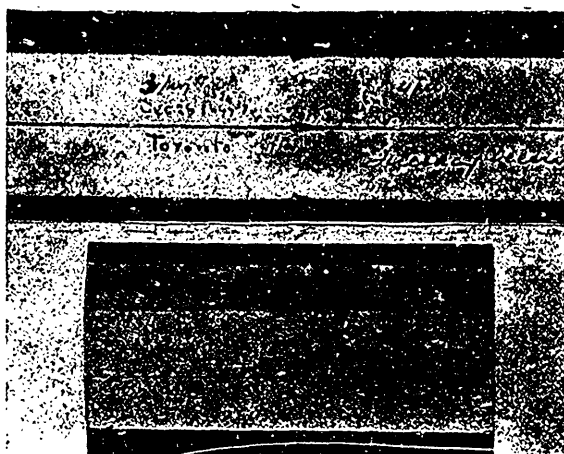


FIGURE 1.

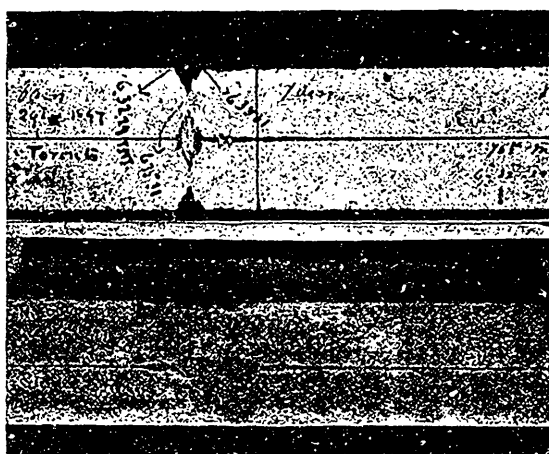


FIGURE 2.

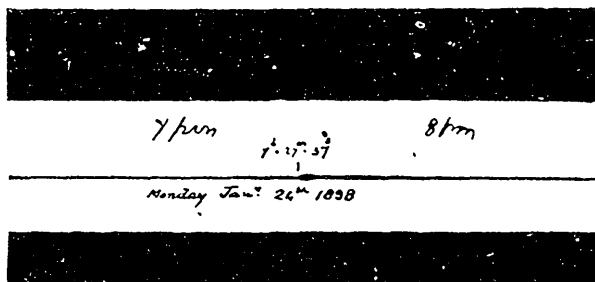


FIGURE 3.

THE GENERAL HISTORY OF THE CELTS. BY REV. NEIL MACNISH, LL.D.

(Read February 19, 1898.)

In the topographical names of the British Isles, in the names of streams and rivers and hills and mountains and lochs and headlands, an argument plausible and strong can be found in favour of the theory, that the Gaelic portion of the Celtic race preceded the Cymri, or Welsh, in the occupation of Britain; and that the Scottish Gaels of to-day speak the same language which our remote ancestors spoke, who, of the Celtic race at least, were the first to enter and inhabit the British Isles. Those whose hearts are warmed with Celtic blood have at least the satisfaction of knowing that they are the descendants of perhaps the oldest race in Europe; and that, although the early appearance of the *Keltoi* in that Continent is enveloped in hopeless obscurity, it is true beyond contradiction that their Celtic forefathers were both numerous and powerful long before the English, or German, or French, or Italian peoples had any distinctive existence. The Celtic dialects were strong and well developed and cultivated before any of the important languages of modern Europe were born. Pride of extraction and veneration for genealogies that reach back into the distant past, seem to have an irresistible attraction for the human heart. In the social life of modern days, there is a tacit admission that he is entitled to more than ordinary respect who can establish his contention, that the blood of many respectable generations is coursing in his veins. In addition to the acknowledged antiquity of their presence in Europe, the Celts have the additional satisfaction, that the stream of their particular blood has flowed down with comparative purity during many centuries; and that in the Celts of our day, there is a large absence of that admixture of blood and nationality which is so marked in the Anglo-Saxon race. Mommsen asserts "that the Greek and Italian are brothers, and that the Celts, the German and Slavonian are their cousins." Max Müller thus writes: "The fourth branch of our family is the Celtic. The Celts seem to have been the first of the Aryans to arrive in Europe, but the pressure of subsequent migrations, particularly of Teutonic tribes, had driven them towards the westernmost parts, and latterly from Ireland across the Atlantic. At present the only remaining dialects are the Kymric and the Gadhelic. In former times the Celts not only enjoyed political autonomy, but asserted it successfully against the Germans and Romans. Gaul, Belgium and Britain were Celtic dominions, and the north of Italy was chiefly inhabited by them. In the time of Herodotus we find Celts in Spain and Switzerland. The Tyrol and the country south of the Danube have once been the seats of Celtic tribes; but after repeated incursions into the regions of civilization, familiarizing Latin and Greek writers with the names of their kings, they disappear from the east of Europe." This is the opinion of Latham regarding the *Keltoi*: "This stock was indigenous to the water systems of the Loire, the Seine, the Rhone; in other words, to the whole of France north of the Garonne, to the south of which river lay the Iberians. From Gaul it spread to Great Britain. Its present representatives are the Bretons of Brittany, the Welsh, the Gaels of Ireland and Scotland, and the Manxmen of the Isle of Man."

The early annals of Rome record a victory which the Gauls, under their leader, *Brennus*, obtained over the Romans. At Allia, in the neighbourhood of Rome, the Romans sustained so severe a defeat in 391 B.C. that the Gauls were allowed to occupy the city without much or any molestation. Though the inventive genius of Roman historians has thrown a halo of romance over the departure of Brennus and his Gauls from the city, the stubborn fact remains that the Gauls were at that time brave and numerous and powerful. Further, we learn from classic story that

Gauls under the leadership of another Brennus invaded Greece in 279 B.C., and were prevented by some miraculous interposition from gaining possession of the treasures at Delphi. The Gauls were defeated and their leader was killed. After their departure from Greece they crossed into Asia Minor, and finally settled in the province which was known as Galatia—a name which doubtless owed its origin to the Gauls who planted their homes in that portion of Asia Minor. Max Müller and others are of opinion that *Brennus* is akin to the Welsh *Brewnin*; and that the meaning of the word in question is *king*. The conjecture may be advanced that, as the two leaders of the Gauls bore the same name, *Brennus* may be regarded as a distinction of office, or as an appellation which every Gaul who occupied the highest position bore in virtue of his office. I am disposed to believe that *Brennus* is a Gaelic word; and that in it we have a faithful if not an unmistakable reproduction of *Breitheanas*, or *Judgment*, or better still, *Breith a nuas*, *Judgment from above*. The presence in Gaelic annals of *l'ergobretus*, or *Fear gu breith*, or *Man of Judgment*, or judicial officer, strengthens the conjecture that Brennus is a reproduction of our Gaelic word *Breitheanas*.

Various opinions have been advanced as to what the true meaning of the term *Celt* is. In his introduction to the "Beauties of Gaelic Poetry" Mackenzie writes: "The appropriate name which this remarkable people gave themselves was *Celtae*, but the terms *Calatae*, *Galatae* or *Gallatians*, and *Galli* or *Gaul*, were adopted by the Greeks and Romans, and were the appellations by which in later ages they were usually distinguished. A more probable derivation is from the fair complexion by which the ancients characterized this race. This is the *Etymon* given by Greek scholars, as if the body were *Galactoi*, milky-coloured. And as G and C are commutable letters, it must be confessed that the Gaelic *Gaelta* or *Celta* has the closest possible resemblance to *Celta*." Zeuss, the erudite author of the *Grammatica Celtica*, suggests that *Gael* has its origin in a word meaning *wind*; and that it, therefore, signifies a violent, stormy people. Latham contends that *Kelt* means *Mountaineer*. In the description which Virgil has given of the various scenes that were represented on the shield of Aeneas, reference is made to the Gauls who captured Rome, "*Aurea Caesaris ollis et aurea vestis*." Two allusions are found in Herodotus to the Celts. His words, literally rendered, are these: "For the River Danube, beginning from the Kelts, and the City of Pyrene, flows, dividing the middle of Europe. But the Celts, or *Keltoi*, are outside the pillars of Hercules, and border on the Cynesii, who are the last that dwell toward the west of those who reside in Europe. The *Ister*, or Danube, beginning from the Celts, *i.e.* having its source at the country of the Celts, flows through the whole of Europe. The Celts are the last of the Europeans after the Cynesii, who live in the direction of the setting of the sun." Pausanias thus writes in reference to the Celts of his own time: "The custom of calling them *Galatae* or *Gauls* has only prevailed of late. They were formerly named *Celtae*, both by themselves and others." We may conclude with at least a large measure of reason, that the words *Keltoi*, *Galatai*, *Gaul* and *Gael* have very much in common, and that their signification is to a large extent the same. *Kelt* is a more ancient, and doubtless a more comprehensive term than *Gaidheal*. So strong and palpable is the relation which *Gael* bears to *geal* (white) that there is valid ground for believing, in consideration of the argument which Mackenzie adduces, as well as of the reference which is found in Virgil to the yellow or golden hair of the Gaul, that the origin of the appellation, *Celt* or *Gael*, is to be traced to the fair complexion of the ancient members of the Celtic race.

The earliest settlers of a country are wont to leave behind them indelible reminiscences in the names of mountains, streams and lochs. There can be no doubt whatever that the word *Alp* is Celtic; and that we have in the very name of one of the largest mountain ranges of Europe, an enduring proof that the *Keltoi*, at some time in the remote past, inhabited that portion of Europe which is embraced by the region of the Alps. There is an old Gaelic word *Alp*, which signifies a height or

mountain, and hence we perceive that *Alp* is a very expressive designation. In the word *Apennines* the root *ben* or *beann*, a hill or mountain, occurs; nor can there be any difficulty in detecting a strong likeness, if not an identity, between the name of the mountain range in Italy and *Apuinn*, the name of a hilly district in the north of *Argyllshire*. *Pyrenees* (*bryn*, a hill), the name of the range of mountains whereby Spain is separated from France, is a compound of *bior*, sharp, and *beinn*, *Biorbheinn*, sharp-pointed hills. When it is remembered that the letters *b* and *p* are convertible in Gaelic, the similarity of the Gaelic word, *Bior-bheinn*, *piorbheinn*, and *Pyrenees* will become apparent. The Gaelic word *Tabh* (water) is to be found in *Loch Tay* and the *River Tay* in *Perthshire*, *Scotland*. There can be no doubt that the same root, *Tabh* (*Irish Tab*), is traceable in the word *Tiber*, *Tagus*, *Thames*. It is said that when the Roman soldiers beheld the *Tay* in *Perthshire* they exclaimed, *Ecce Tiberim*. I find that *Tacitus* in his "*Agricola*" renders *Tay* by *Taus*; and, such being the case, it is evident that *Taus* and *Tagus* are largely identical, and that in the name of the latter river we have a Gaelic word which signifies water or ocean. In the word *Italy* the presence of a Gaelic word is traceable. *Eudailt*, the Gaelic name of that country, involving, as it does, *Eudail*, cattle, does not bear a very far-fetched resemblance to *Italy*, and indicates that the fertility of that country has always been very great. Very few suspect that *Portugal* is a genuine Gaelic word—*Port nan Gaidheal*, the port or harbour of the Gaels. In *Oporto*, the presence of the same word *port* is to be found. The very fact that the harbour which *Columba* entered when he first visited *Iona* bears to this day the designation of *Port na Cuirich*, is sufficient to show that *port* is a genuine Gaelic word; and that its presence in *Portugal* justifies us in sending our thoughts back to a time when Gaelic was spoken in that country.

The names of some of the rivers of France are Gaelic. *Rhine* is compounded of *reidh*, smooth, and *amhainn*, river. *Rhone* is compounded of *ruadh* and *amhainn*, the Red river. *Garonne* is compounded of *garbh*, rough, and *amhainn*, river, the rough river. *Seine* is compounded of *seinh*, smooth, and *amhainn*, river, the smooth river. In *Calais* we have almost an exact reproduction of *Caolas*, a Gaelic word, which signifies *Firth* or *Strait*. The narrowest part of the English Channel is at *Calais*. In *Baile Chaolais*, a little village at the mouth of the famous *Pass of Glencoe*, in the north of *Argyllshire*, a word which in its English form, *Balachulish*, baffles the skill of the English tourist so far as pronouncing it correctly is concerned, we have the word *Caolas*, the *farm* or *village of the strait*. Thousands who are in the habit of admiring the sublime scenery of the *Kyles of Bute* in the *Frith of Clyde*, are not aware that *Kyles* is exactly the Gaelic word *Caol* in its plural form, and, therefore, signifying *straits* or *narrows*. In *Colintraive*, or *Caol un t-suainh*, the *strait of swimming*, we have another word into which the root of *Calais* enters as a component part. *Dover*, which stands opposite *Calais* on the other side of the English Channel, is the Gaelic *Dobhar*, a word which means the border of a country. The examples which have now been given of names of mountains and countries and rivers wherein Gaelic roots are manifestly present, may suffice to indicate that the Celts inhabited the south and south-west of Europe in the far-off past, and that they left monuments behind them in the names of mountains, streams and rivers—monuments which no power of victorious armies can ever demolish—monuments which will continue to endure and to tell in their own mute language that the Celts once owned and occupied that portion of the world.

Many questions may be asked in connection with the Gaelic words, *Calais* and *Dover*. Is it not clear that the Celts in those far-off days were well aware that the narrowest channel is between *Calais* and *Dover*? Is not the surmise reasonable, that they availed themselves of that particular part of the channel for going to Britain and for returning from it? Is there not ground for the conjecture that the largest stream of population must have entered Britain through the straits between *Calais* and *Dover*? The names *Calais* and *Dover* will always indicate that if the Celts

were not the earliest settlers in the neighbourhood of those places, they were at least powerful and important enough to leave behind them a memorial which time cannot obliterate. Aristotle is the first writer who mentions the British Isles by name. His words are : " Beyond the pillars of Hercules the ocean flows round the earth, and in it are two very large islands called British *Βρετανίκα λεγόμενα* Albion and Ierne lying beyond the Keltai." While the term British is employed by Aristotle, he applies the name Albion to what is now known as England and Scotland. It is evident, therefore, that so far as the knowledge of the famous Greek extended, the portions of British Isles which are now embraced by the kingdoms of England and Scotland were regarded, it may be, as one kingdom, and bore one designation. Pliny's language is very similar to that of Aristotle : " Albion ipsi nomen fuit, cum Britanniae vocarentur omnes insulae." Stephanus of Byzantium thus writes : " Albion insula est hodie Britannia dicta ab albis rupibus quas mare abluit." Julius Caesar came much in contact with the ancient inhabitants of Britain. His description of their habits and their country is, therefore, full of interest. In his " De Bello Gallico " he informs us that " the interior of Britain is inhabited by a race said to be aboriginal—the coast by invaders from Belgium, who, having come over for the sake of spoil, have settled in the country. For money they use either copper or pieces of iron of a certain weight. Tin is found in the interior of the country, iron on the coasts, but the quantity is small. Copper is imported; the timber is of the same kind as in Gaul, except the beech and the fir. The climate is more temperate than in Gaul, the cold being less severe. By far the most civilized are the inhabitants of Cantium (or Kent). They do not differ much in their customs from the Gauls. The inhabitants of the interior do not, for the most part, sow corn, but live on milk and flesh, and clothe themselves with skins. All the Britons stain themselves with woad, which produces a blue colour, and gives them a more formidable appearance in battle. They wear their hair long, and shave every part of the body except the head and the upper lips. The Druids are engaged in matters of religion, and have the care of public and private sacrifices. They are the arbiters in almost all disputes, public and private, and assign rewards and punishments. Whoever refuses to abide by their decision is excluded from the sacrifices, and thereby put outside the pale of the law. The Druids are exempt from military service and from the payment of taxes. Their chief doctrine is that souls do not perish with their bodies, but are transferred after death to other bodies."

In his life of Agricola, Tacitus details the fortunes of the Romans in Britain. He particularly describes the exploits of his father-in-law in Caledonia and against the Gaels whom Galgacus led. The speech which, following the example of classic historians, he puts into the mouth of Galgacus, is remarkable for the patriotic spirit that pervades it, as well as for the ingenious argument which the brave Gael adduces to stir up the hearts and stimulate the heroism of his soldiers. It was at the Grampians that the battle was fought between Agricola and Galgacus. The army of the Gaelic warrior was defeated, and found instant refuge in the rocky portions of Caledonia. May we not discern something akin to the division into clans which subsequently prevailed in the Highlands of Scotland in these expressive words of the Roman historian : " Nec aliud adversus validissimas gentes pro nobis utilius quam quod in Commune non consulunt." The name Galgacus is evidently Gaelic. It is virtually Gaidheal gagach, a stammering Gael—a Gael with an impediment in his speech. Enthusiastic descendants of the heroes who fought under Galgacus are wont to reflect with pride that, while the Roman arms were powerful in every corner of the world, and while the bravest races were compelled at last to succumb to the forces of the city on the seven hills, the Caledonians were never fully vanquished. It defied the forces of Rome and her ablest generals to bring under her yoke the intrepid inhabitants of Caledonia. I am disposed to think that into the term Grampians there enters the adjective *gorm* or *garbh*, and beinn, *gorm bheinn*, or *garbh bheinn*, green mountains or rugged mountains.

Many ethnological questions suggest themselves—questions as to how Great Britain and Ireland were first settled; as to what course the stream or streams of population took; as to whether there had been two streams that entered Britain from the continent of Europe, or whether it is possible to maintain that the differences which have existed for many centuries between what Zeuss chooses to term the Irish and British branches of the Kelts in Great Britain and Ireland—arose after the Celts had fairly taken possession of the British Isles. Scholars who have examined the question very carefully are disposed to believe that the differences which now exist between the representatives of the ancient Celts began and were developed in the British Isles, and are necessarily to be regarded as the result of two independent streams of population from the continent of Europe. Latham avers that, "no matter how unlike the Scotch and the Welsh may be, they are more like than the English that lie between them." It is altogether probable, according to a reasonable conjecture, that the route of which the earliest Celts availed themselves was the straits between Calais and Dover. The earliest settlers would extend northwards and westwards, reaching Scotland, and advancing to that portion of it which was subsequently known as Caledonia. As to the manner in which Ireland was peopled, for poetical legends are fanciful, it is natural to suppose that when the western portion of Wales was reached adventurous Celts would cross to Ireland; and that, when the stream of population had fairly reached and taken possession of Scotland, so great and marked are the facilities which the south and west of that country offer for crossing to Ireland, that Celts could in a very simple manner plant homes in that island. Owing to the rude interference of the Romans, and to the prowess of their arms, as well as on account of continuous invasions in later centuries from the north and west of Europe, the Britons or the early occupants of Great Britain found shelter in the mountainous regions of the country. In this manner we can understand how Wales and the Highlands of Scotland came to be inhabited strictly by Celts, and to furnish a home even to our own time for the descendants of the early occupants of the British Isles.

It has already appeared, on the authority of Aristotle and others, that Albion was at one time the name of what is now known as Great Britain, or as England and Scotland. The term *Albion* is now entirely confined to Scotland. We are wont to say: I am a Scotchman, *Is Albannach mise*. I am a Highland Scotchman, *Is Gaidheal Albannach mise*. I was born in Scotland, *Rugadh mi ann an Albainn*. He is an Englishman, *Is e Sasunnach a tha ann*. He was born in England, *Rugadh e ann an Sasunn*. There is no Gaelic word to represent England or Englishmen directly. We are wont to speak of England as *Sasunn*, or the land of the Saxons, and of Englishmen as *Saxons*, *Sasunnaich*. It seems to me that as the word *Albion*, which at one time was an appellation for Great Britain, has for many centuries been restricted to Scotland, we may find an argument in favour of the supposition that the Highlanders or the Gaels of Scotland are the descendants of the earliest Celts who occupied Britain: that they, therefore, continue to speak of themselves as *Albannaich*, a designation which must at one time have been general enough to include all the Celts of the British Isles, and that the Britons are a later stream of population than the Scottish Gaels.

Albion signifies the land or country of hills or mountains. *Alb* or *Alp* is the same root which is to be found in *Alps*. *Albion* is compounded of *Alb* or *Alp*, for *b* and *p* are convertible letters, and *fonn*, or with the aspirate *fhonn*, *Alb-fhonn*. The root *fonn* or *fhonn* occurs in *Eilean, eil fhonn*, another land. *Eilean* is the Gaelic name for island. The same word, *fonn* or *fhonn*, occurs in *Oban*, a term which strictly means the land of bays or creeks, an apt designation, as anyone will admit who has seen Oban in Argyllshire, and who has taken notice of the physical features of that bay and its neighbourhood. The same root, *fonn* or *fhonn*, is to be found in *Sasunn*, England, the land of the Saxons, and in *Firinn*, Ireland. The derivation of *Albion* (*ab albis rupibus*) from the white rocks of Britain is not to be regarded with

any serious attention. The common derivation which is assigned to *Eirinn* (Ireland) is *I iar-fhonn*, the land of the western isle; or, the land of the island of the west. The letter I (island) occurs in Iona, Islay and many other topographical names. Max Müller gives in a footnote in his first series of lectures on the Science of Language, a very learned and elaborate disquisition by an eminent Irish scholar on the etymology of the word *Eirinn*. The most enthusiastic admirer of the Celtic race can scarcely maintain that the Celts of those far-off times had even an approximation to the philosophical ingenuity that is involved in the disquisition on the word *Eirinn*, to which allusion has just been made. I hold the opinion that the common explanation of *Eirinn* is correct, and that the disquisition to which Max Muller has given a place in his lectures is too learned to be of any practical value.

Various derivations of the word *Breatum* have been advanced. *Is Breatunnach mise*, I am a Briton. *Rugadh mise ann an Breatum*. I was born in Britain. *Breatum* and *Breatunnach* are, therefore, Gaelic words, and are very commonly employed. Some one has contended that *Breatum* is a compound of *brath*, extensive, and *in*, an island; and that, therefore, the signification accordingly is an extensive island. The presence of a fertile imagination is so unmistakably manifest in that interpretation of *Breatum* that no importance can be attached to it. An ingenious explanation of *Breatum* has been given by Mr. Clark in his "Caledonian Bardis," where he contends that the components of the word in question are *Braigh*, top, and *tomn*, waves. The argument whereby it is sought to defend that interpretation is very ingenious: "That Britain was at first peopled from the opposite coast of Gaul is a rational hypothesis, and accordingly it has been adopted by the most eminent historians. As Britain was within sight of Gaul, the inhabitants would bestow on it some name before they crossed the channel, is a supposition not altogether improbable. Ingenuity could certainly suggest no term more significant of the appearance of Britain from France, viewing it over the convexity which the globe forms in the breadth of some part of the channel, than the *land on the top of the waves*." To overthrow the fanciful interpretation that Britain means the *land on the top of the waves*, it is sufficient to consider that there is no syllable to correspond with *land* in *Breatum*; and that in the last syllable *um* there is evidently present the same root which forms the termination of *Albion*, *Eirinn*, *Sasum*. The word *Breatum* has also been resolved into *Breac Innis*, the variegated island. I find that Prydain is the name of the first legendary King of Britain, and that from him the British Isles have taken the appellation, *Ynis Prydain*. To contend that *Breatum* had its origin in Breton, the name of that portion of Gaul from which the Celts emigrated to Great Britain, is merely to thrust the difficulty aside, and not to explain it at all. Professor Rhys, of Oxford, has in recent years advanced another interpretation of *Breatum*. He asserts that when the Romans came to Britain they learned the name *Britannia* or *Brettann*, which the Brythones gave themselves. He is of opinion that *Britanni* and *Brettani* are regarded as of the same origin as the Welsh *brith*, spotted, parti-coloured—feminine *braith*: and that there can be found in them a reference to the painting or tattooing the body, already alluded to more than once. "It would appear," he writes, "that the word *Brythan* and its congeners mean a clothed or cloth-clad people. There is no reason why the name should not be treated as exclusively belonging in Britain to the non-Goidelic branch of the Celts of the second invasion. But some time later, there arrived another Celtic people with another Celtic language, which was probably, to all intents and purposes, the same as that of the Gaul. These later invaders called themselves Brittones, and seized on the best portions of Britain, driving the Goidelic Celts before them to the west and north of the island." It seems, however, to be impossible to explain the term *Breatum* in a manner that can be regarded as altogether satisfactory.

The Picts and Scots are by common consent admitted to have played a prominent and restless part in the early annals of Great Britain. In a paper which I prepared for the Canadian Institute last session, I entered somewhat fully into the

discussion of the question as to who the Picts and Scots were. In his dissertation on the poems of Ossian, MacPherson remarks that the Caledonians, who possessed the east coast of Scotland, applied themselves to the raising of corn or to agriculture. It was from that employment that the Gaelic name of Picts proceeded, for they are called *Cruithnich*, i.e., the wheat or corn-eaters. I may add that the etymology of *Cruithnich* is identical with that of *Cruithneachd*, the Gaelic word for wheat; *cruth*, form, and *snachd*, snow, the reference doubtless being to the white colour of the flour which is extracted from wheat.

With regard to the term *Caledonia*, it has to be observed that it was never applied by the Gaels of Scotland to their own country; and that it comprised that portion of country which lies to the north of the Forth. Dunkeld, in Perthshire, has been regarded as the capital of the Caledonian Gaels when the Romans first invaded that portion of Scotland. Dunkeld, or Duncalden, forms the substratum of Caledonia. Among the various explanations which have been given of Caledonia, the most plausible seems to be *Dun a' Chaluim*, the hillock of the hazel, and not *Dun Caeldhaoine*, the stronghold of the Gaelic people. St. Columba is said to have resided at Dunkeld for some time about 570 A.D. There rose then at Dunkeld a royal monastery, which subsequently attained to great eminence.

Zeuss prefers to divide the Celtic tribes and languages of Great Britain and Ireland into the Irish and British branches—the former including the Celts of Ireland, and of the Highlands of Scotland and of the Isle of Man, the latter including the Welsh and the Armoricans in Brittany. It is abundantly evident that those in whose veins the blood of Galgacus and his heroes, of Taliessin and Ossian, of Fingal and Arthur is now flowing, are honouring themselves by taking a warm interest in the language which, venerable with years and use, continues to be still spoken, and to have in many cases the vigour and persuasiveness of olden times. Max Müller affirms "that the language of England may be said to have been in succession Celtic, Saxon, Norman and English. The history of the Celtic language runs to the present day. It matters not whether it be spoken by all the inhabitants of the British Isles or by only a small minority in Wales, Ireland and Scotland. A language, so long as it is spoken by anybody, lives and has its substantive existence. The last old woman, Dorothy Pentreath, that spoke Cornish, and to whose memory it is now intended to raise a monument, represented by herself alone the ancient language of Cornwall."