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# PROCEEDINGS

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OF

# THE CANADIAN INSTITUTE,

TORONTO

BEING A CONTINUATION OF THE "CANADIAN JOURNAL"  
SCIENCE, LITERATURE AND HISTORY.

OCTOBER, 1888.

Whole No. Vol. XXIV.]

[No. 50.

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PROCEEDINGS  
OF  
THE CANADIAN INSTITUTE,  
SESSION 1887-88.

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FIRST MEETING.

First Meeting, 5th November, 1887, the President in the chair.

Donations since last meeting, 76; Exchanges, 1112; of which 25 were new exchanges.

The following were elected members:—D. W. Clendenan, Canniff Haight, John Charles Dent, Allan McLean Howard.

The following resolution was moved by James H. Pearce, seconded by J. D. Tyrrell, M.D., and carried:

That the Canadian Institute having been formally advised during the vacation of the death of Spencer Fullerton Baird, LL.D., Director of the U. S. National Museum, and Secretary of the Smithsonian Institution, Washington, take the opportunity of the first meeting of the session, to place on record their high appreciation of his executive powers and ability as a naturalist, displayed during a period of so many years when in charge of the most important scientific institutions of the United States, and instruct their Secretary to convey this motion of condolence to the Directors of the Institution over which he so long and ably presided.

Mr. Pearce, on behalf of the Industrial Exhibition Board, presented the gold medal awarded to the Institute for their exhibit of Archaeological Specimens at the Exhibition of 1887.

Mr. Alderman Piper on behalf of Mr. Cordier, presented a piece of the Obelisk, Central Park, New York.

Dr. J. H. Garnier read a paper on Snake Poisons, an abstract of which appears on page 255 of the previous volume.

## SECOND MEETING.

Second Meeting, 12th November, 1887, the President in the chair.

Exchanges since last meeting, 27.

A report from the Council was read that they "regret exceedingly that the President, Mr. W. H. VanderSmissen, has found it necessary, in consequence of the increased duties devolving upon him at University College, to withdraw from the office of President. They can only express inadequately in a short notice their appreciation of his services in filling the chair with efficiency and dignity, and more especially in the administrative talent he has displayed in organizing the several sections. In view of the importance of the office, they do not desire to avail themselves of their right to elect a successor, but leave the election to the Institute; at the same time, they recommend the name of Mr. Charles Carpmael."

The report was received and adopted, and on motion by Dr. Ellis, seconded by Mr. Marling, Mr. Carpmael was elected President for the remainder of the term.

The following were elected members :—Capt. Stupart, R.N. John Townsend, Andrew Rutherford, George Macdonald, John I. Davidson, H. R. Fairclough, B.A., W. O'Connor, M.A., George W. R. White.

Mr. Alan Macdougall read a paper by Mr. G. R. Gilbert, of the U. S. Geological Society, on "Old Shore Lines in the Ontario Basin," as follows :

In 1837, a paper on this subject, prepared by Mr. Thomas Roy, of Toronto, a civil engineer, was presented to the Geological Society of London. It described a series of terraces and ridges observed by him between Lake Ontario and Lake Simcoe, and believed to mark

old water levels ; and it also advanced certain speculations in regard to the extent and history of the water body producing them. The printed minutes of the society are concerned chiefly with his speculations and do not give his particulars of observation ; but these have been partially preserved in other ways, although his paper was probably never published in full. Sir Charles Lyell, who visited Toronto in 1842, and went over the ground with Mr. Roy, devoted several pages of his "Travels" to a description of the phenomena. Prof. James Hall published in 1843 a list of eight altitudes of shore lines measured by Roy, and these with five others appear in the report of the Canadian Geological Survey for 1863. The thirteen altitudes are as follows, all being referred to the water surface of Lake Ontario :—762, 732, 680, 624, 556, 500, 420, 400, 344, 308, 280, 208, and 108 feet. In 1861 Mr. Sandford Fleming described in the pages of the *Canadian Journal* an ancient shore line passing north of Toronto and having an altitude above Lake Ontario of about 170 feet. A comparison of his text, which is full and eminently satisfactory, with that of Lyell leads to the belief that the shore line he describes is identical with the second of Roy's series, although the recorded measurements, 170 feet and 208 feet, do not closely correspond. Roy's determinations have been cited by nearly all writers who have discussed the ancient hydrography of the Laurentian basin, but I am not aware that anyone since Lyell has verified his observations. Mr. G. J. Hinde speaks in one place of "the well-defined terraces between Toronto and Lake Simcoe," and says in another, "From an imperfect examination, however, it appears to me doubtful if the higher terraces (of Roy) furnish unequivocal evidence of having been formed by the working back of the lake." Professor J. W. Spencer perhaps implies acquaintance with the ground, for, after quoting Roy's measurements, he says :—"Additional gravel beaches occur along the Northern railway at 600 feet, and on descending towards Georgian Bay, at 520, 388, 354 feet above lake Ontario. A still finer series of beaches may be seen from Toronto westward along the Toronto, Grey and Bruce railway." Being called by other errands to the city of Toronto, I undertook last September to verify the observations of Roy and Lyell, and especially to repeat Roy's measurements, whose accuracy appeared to be impeached by Fleming's observation. With this intent I traversed the slope from Aurora

to Toronto, following Yonge street in the main, but diverging where that line seemed ill-suited for the preservation and exhibition of old shore lines. To my surprise my observation was almost entirely negative, the only shore line recognized being the one described by Fleming. Below that level I cannot say that I saw the slope at a point favorable for such observation, but above 170 feet, and thence to the height of land between Lakes Ontario and Simcoe, the facilities for observation were exceptionally good. The ground traversed is cleared of forest, and I saw it after the crops had been harvested. The superficial formation is drift, which has an undulating topography, graduating near the height of land into the hummock-and-kettle type. It is eminently fitted to receive and preserve a record of wave action, and the facilities for observation were exceptionally good, certainly far better than when Roy and Lyell made their excursions through the forest. In a court of law the evidence of several witnesses who saw an occurrence far outweighs that of a single witness who did not see it, and I therefore do not dispute the classic observations of Roy and Lyell. But I publish my unsuccessful attempt in the hope that others may repeat it, or else may find the phenomena I failed to discover, and give me references to the precise localities.

Mr. Ives stated that his attention having been drawn to the curious conflict of testimony on the subject, he had referred to the brief notice of Mr. Roy's communication to the Geological Society, which occupied only one page of its proceedings. He drew attention to the fact that Lyell in his *Travels in North America* speaks of Mr. Roy's "endeavor to explain the phenomena by supposing the existence of a vast inland sea," and seems to imply that his communication had not carried conviction. Mr. Ives also pointed out that when Lyell accompanied Roy on horseback, several hours' ride through almost impenetrable bush, he had no opportunity of verifying the measurements of the latter. He states that he took Mr. Roy's work to be reliable, but differed from him as to the mode in which the lodges were formed, attributing to them a marine origin as opposed to Roy's theory of a vast lake.

In connection with the reference to the paper of Mr. Sand-

ford Fleming, read before the Canadian Institute March 2nd, 1861, it was remarked that Mr. Gilbert appeared to have overlooked a communication made to the Institute two weeks later by Professor Chapman on "The Ancient Extension of the Lake Area of Western Canada."

Referring to the allusion to Mr. G. J. Hinde's paper, in which he speaks of "well-defined terraces between Toronto and Lake Simcoe," Mr. Ives wished to point out that that author only intended to state what Lyell was "attracted to Toronto to examine," whilst later on he says: "these terraces are *said* to exist," etc., and in the same paragraph, "from an imperfect examination, however, it appears to me," etc.

Mr. Ives stated that he had gone over the ground as far as Lansing without being able to recognize any other beach than that recognized by the author, and by Mr. Sandford Fleming, with the exception of a slight rise following roughly the line of College and Carlton streets, corresponding to the first terrace of Sir Charles Lyell, "situate one mile north of the lake shore," which, however, he thought hardly entitled to be called a terrace.

Mr. Boyle thought that Mr. Ives was mistaken in supposing that Mr. Hinde had not gone over the ground himself. He believed that Professor Chapman's explanations had been made not so much with the view of exploring the terraces as of ascertaining the marine mollusca.

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NOTE.—Subsequently to the reading of the paper, through the kindness of Mr. Alan Macdougall, Mr. Ives was permitted to inspect in the office of the City Engineer, certain plans and sections recently compiled with reference to the water supply for Toronto, and he wishes to state that he regards those sections as strongly confirmatory of the conclusions of Roy, based probably upon a similar series of measurements, as Lyell states that the levels had been "accurately ascertained by Mr. Roy when employed professionally in making measurements for several projected canals and railroads."

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### THIRD MEETING.

Third Meeting, 19th November, 1887, the President in the chair.



Donations and exchanges since last meeting, 73.

D. A. O'Sullivan, D.C.L., read a paper on "Experiments in Governing Canada."

He would refer to changes in the mode of governing Canada since the fall of Quebec until 1867 with some references to proposed amendments in the Act of Union of that year. The period prior to the cession and after the capitulations of the two cities was a period of military occupation in which the country was in an unsettled state without its future destiny being quite apparent. It was the government of the drum-head, unsatisfactory to all parties. Government under the Treaty of 1763, is, of course, to be imputed to the British authorities, who were then under no manner of doubt as to the ownership of the country. It lasted for eleven years with a very well founded complaint on the part of the people that by the Proclamation of the Act of 1763 no share in the government was accorded to them. The Quebec Act of 1774 was the first attempt in that direction, and failing to introduce or continue the laws of England in civil matters it was highly objectionable to the English settlers. A sketch of the extended Province of old Quebec was given, showing the boundaries reaching on the south and west to the Ohio and Mississippi rivers. The Constitutional Act of 1791 was the next change brought about by the increase of the English-speaking settlers in the western part of Quebec, now Ontario. This lasted for fifty years, and if any sufficient measure of self-government was embodied in it, it would doubtless have survived until a more general union was possible than that foreshadowed by Lord Durham. The Union of 1841 was the last one until the present union. The provinces had then become about equal in point of race and religion, and the Act recognized the two sections of the country. In all these changes the British Ministry had an eye to relative numbers of race and religion. The charter of 1867, the latest of these experiments, is a new departure of Colonial government. It is a system of divided powers—one set for provincial matters and one general government for matters pertaining to all parts of the Dominion. The power of disallowance was the only great inroad on former methods, but the legislation and its prohibition were all in the hands of the one people. The veto power looks offensive, but it has not worked much more injustice than any

other means of disallowance might give rise to. It is unpleasant to have matured statutes disallowed, but the Canadian people might find it more objectionable if the disallowance came from a quarter beyond the reach of their votes. If lodged in the Supreme Court or the Judicial Committee of the Privy Council in England it would be as objectionable to those against whom it might be used as it is now, and it would be absolutely beyond correction.

Mr. Marling thought that the whole question of the constitution of the country did not receive that attention it ought in the instruction of the young. He referred to the example of the United States, where the youth were well instructed in the nature of their constitution and government.

Mr. G. M. Rae agreed with Mr. Marling as to the importance of our young people being well informed in regard to the nature of the government under which they live, and in the principles of political science. There would be a difficulty, however, in accomplishing this, arising from the differences between the two great political parties.

Mr. W. Dale was of opinion that the youth should be taught the history of their country without any reference to party questions. He knew from his own experience that the amount of ignorance in the matter was very great. He thought that the instruction required could be imparted without touching party politics. He inquired whether the relationship to the Crown in regard to the ownership of land in Canada was the same as under the French monarchs.

Dr. O'Sullivan said it was a difficult question. In England the tenure of land was a system of tenancy, not allodial. The English monarch succeeded to the rights of the French monarch. He did not think that any allodial rights extended back to 1763.

Mr. T. B. Browning said that prior to 1790 the old regulations of France were in force, since that time the land was held in free and common soccage.

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## FOURTH MEETING.

Fourth Meeting, 26th November, 1887. W. H. Ellis, M.A., M.B., in the chair.

Donations and exchanges since last meeting, 40.

On a communication from the Biological Section in reference to the appointment of an Ornithologist on the Geological and Natural History Survey of Canada, it was moved by Mr. J. B. Williams, seconded by Mr. G. G. Pursey, and carried, That the matter of petitioning Government as to the appointment of an Ornithologist be referred to the Council.

A. B. Macallum, M. A., and John Linden, were elected members.

Mr. A. F. Chamberlain read a paper on "The Eskimo Race and Language."

After describing the habitat of the Eskimo, a territory which, although seldom exceeding 150 miles in width, extends from north-west to south-east, about 3,000 miles, or along the coast (by which road the Eskimo, who are essentially a littoral people, migrate) a distance of fully 5,000 miles, he said the Eskimo is the only aboriginal race which inhabits both the Old and the New Worlds, branches of this stock being found in North-east Siberia as well as throughout Arctic America. He discussed the various theories with regard to the origin of the Eskimo and their migrations in the prehistoric past. The generally accepted view up to within a few years since was that the Eskimo were a comparatively recent modification or offshoot of the Mongol tribes of North-east Asia. This was the opinion of Cranz, the historian of Greenland, and at the present day is advocated by Rae, Peschel, Flower, and many others. Dr. Rink and Dr. Robert Brown, however, some years ago set forth the theory that the Eskimo are the remnants of an original race, forced by stress of circumstances and the pressure of more powerful enemies into the position they now occupy. This view is shared by W. H. Dall, Dr. J. C. Abbott, Dr. Aurel Krause, Dr. F. Boas and others. Dr. Rink thinks that the home of the primitive Eskimo was in Alaska; Dr. Boas would place it in the "west of the Hudson's Bay region." The author inclined

to favor a modification of Dr. Boas' theory, which would bring the Eskimo into close relationship with the great Huron-Cherokee family, whose primitive seat is placed by Horatio Hale "in Eastern Canada on the banks of the St. Lawrence," and with the mound-builders of the Ohio Valley, whilst behind the latter would be primitive Aztecs, of the Colorado-California region. He pointed out that the root of the word for copper is the same in Eskimo (*kannu-yak*), Iroquois (*kana-dzia*), Mohawk (*quenn ies*) and Japanese (*kae-e*), and suggested that the Japanese, who are but comparatively late intruders into Nippon, may have been an offshoot of and the present representatives of the mysterious mound builders. He referred to the question of the former southward extension of the Eskimo, thinking that there was much to favor the theory of Dr. C. C. Abbott, Prof. E. W. Claypole, etc., that the palæolithic man of the river-drift of New Jersey, is now represented by the Eskimo. He also discussed the important theory first advanced by Professor Boyd Dawkins in 1866, and since advocated by Mortillet, the distinguished French anthropologist, that the Eskimo is the modern representative of the man of the palæolithic river-drift of France, and thought that the Eskimo probably came from Europe, although much might be said in favor of deriving palæolithic man from America. Indeed, Baron Nordenskjold has advanced the view that the Eskimo are the remnants of an ancient Polar or Hyperborean race, once much more extensive and important. The author stated his reasons for believing that relatives of the Eskimo are to be found in the fossil men of Brazil, as well as among the Botocudos, Fuegians, and other South American tribes. He thought there was a substratum of dolichocephalic Eskimo-like races, followed by immigrants from Europe or North Africa, of Basque or Iberian ancestry. He gave comparative vocabularies to illustrate the connection between the Eskimo dialects and the languages of British Columbia; those of the Huron-Algonkin, Cherokee-Choctaw, and other Indian stocks. He pointed out, however, that while the American Indian languages are strongly agglutinative and incorporating, the Eskimo language is agglutinating only. In illustration of the language he presented vocabularies, drawn from various sources, of some twenty five Eskimo dialects, including those of Davis and Frobisher, which seem to have been overlooked by Mr. Pilling in his recently published biography of the Eskimo language. A most

important part of the paper was the comparative Eskimo-Turanian vocabulary of over 250 words, showing the relation between the Turanian languages of N. E. Asia and the Eskimo, in support of his view that these languages have had a common origin, and that the Eskimo is the representative of the parent stock. The author also produced archaeological, craniological, historical and topographical arguments in favor of this theory. In the comparative vocabulary there are given 100 Japanese words alone whose representatives are found in the Eskimo dialects, thus confirming by linguistic evidence the close relation of the Eskimo and Japanese advocated by Professor Flower, on physical and anatomical grounds.

Mr. F. F. Payne described some of the customs and habits of the Eskimo that he had observed when at Stupart Bay. His experience had been confined to that particular locality. He had been more interested in the natural history of the country, though he had watched their habits a good deal. They were very much scattered, and shifted about according to their need of food. Their villages were small, not containing over a dozen huts. They made offering to their dead. He had found two old guns and a quantity of bullets and shot which had been offered to the sun. He had put up a beacon and they made offerings to that. If they kill a seal or a walrus they will not go out for three days. They never seemed to have any meetings. They believed in a great spirit, and in a future state. They believed that it was in the south, where they would have plenty to eat and have nothing to do.

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#### FIFTH MEETING.

Fifth Meeting, 3rd December, 1887, W. Brodie, Esq., in the chair.

Exchanges since last meeting, 22.

Rev. D. W. Watson, D.D., was elected a member.

Prof. R. Ramsay Wright read a paper on Recent French Investigations on Hypnotism.

He remarked that the attention of European scientific men had been within the last ten years attracted to the phenomena of hypnotism by the remarkable results obtained by two professional exhibitors, Hansen, a Dane, and Donato, a Belgian. Physiologists, psychologists and physicians have been engaged in investigating these phenomena from their respective standpoints with the result that many facts had been established which a few years ago would have elicited a smile of incredulity. French neurologists have especially made progress in the study, because hysteria, and hysterio-epilepsy (which render subjects very susceptible to hypnotic influences) are extremely common in France. Hypnotism has been found of great service in the treatment of these diseases, and in the hands of men like Charcot escapes the stigma of being "unprofessional," which arrested the first serious English investigations some 40 years ago. The phenomena of hypnotism or somnambulism may either occur without any obvious inducing cause (auto-somnambulists who fall at once into the sleep-walking or sleep-waking condition without passing through the ordinary initial lower phases), or they may be induced by the subject (as in the case of the Indian fakirs, who can render themselves insensitive to pain), or finally they require to be elicited by an operator who uses physical means such as "passes," or the fixation of the eyes on a bright spot, or else physical means such as the imperative "suggestion" to sleep. Such cases of induced hypnotism may, if they have been frequently hypnotised, fall like the somnambulists at once into the higher sleep-waking phases, but most subjects exhibit initial phases of somnolence with succeeding deeper sleep in which either catalepsy with plasticity of the muscles (retaining any position in which they are placed), or lethargy in which the muscles are easily excited to contraction, are prominent symptoms. The use of a series of magnets so arranged as to slip over the finger has been recommended to detect susceptibility to hypnotism, but Professor Delbœuf believes that these "hypnoscopes" are only useful as such because they disclose a lively power of imagination in suitable subjects. Various cases were cited, however, to show that the magnet appears to produce remarkable results on subjects already hypnotized, causing transfer of anæsthesia, *e. g.* from one side of the body to the other, and reversing suggested ideas or sensations by calling into prominence their correlative opposites. Prof. Wright called the attention of the philo-

logical section of the institute to the works of Dr. Ábel, of Berlin, which show how the relativity of consciousness has expressed itself in the roots of primitive languages such as the Egyptian, where the same root may involve diametrically opposite meanings. The well-known phenomena of the hyperæsthesia, both of smell and sight, in certain hypnotic stages were next referred to. The suggestion, *e. g.*, is made to a subject that, one out of numerous blank cards bears a photograph, and although the cards are shuffled the particular one can always be picked out owing to some insignificant mark or irregularity of surface which ordinarily would not attract attention, and which the subject does not appear to be conscious of. An excellent illustration of this was cited in a case described by Dr. Janet, where there was double consciousness and double personality. The subject when hypnotized was in virtue of her double personality able to converse with those present about the suggested photograph, while simultaneously in response to a suggestion in a different tone by the operator she could explain by automatic writing (entirely unconscious as far as the other half of her personality was concerned) the real peculiarity by which the card was recognized. The kind of hyperæsthesia in virtue of which subjects have been said to be able on suggestion to experience the effects of drugs in closed bottles (the subject being ignorant of the nature of the drug and its physiological effects) was discredited, and the phenomena attributed to unconscious suggestion of the proper effects by the operator or his assistants. On the other hand, instances of blisters having been excited by suggestion were alluded to, as well as the possible explanation thus afforded for cases of stigmata such as those of Louise Lateau. The carrying out of suggestions at a set time after waking was shown by Delbœuf's experiments to be accompanied by an unconscious waiting for the hour or day in question, and by a feeling of awaking after performing the act, which shows that the arrival of the hour acts as a suggestion to fall into the hypnotic state. After some references to the difficulties afforded by apparently well-established instances of suggestion at a distance, and to the recent collapse of some of the evidence for thought-transference relied on by the English Society for Psychical Research, Professor Wright concluded by stating that his address was to be regarded as a review of articles contributed by various scientists to the *Revue Philosophique* during the last year,

and that he himself had had no opportunity of investigating the phenomena personally.

Dr. Workman in connection with the paper, called attention to the kindred subjects of dual personality, catalepsy, and the influence of the imagination in creating visions and apparitions. Those alternative states of consciousness, in which the person seemed to pass through two different modes of existence, were too well confirmed by numerous well attested cases to admit of doubt.

In catalepsy there seemed to be no intervening state of consciousness during the attack. The person, after the fit, took up, as it were, the thread of existence where it had suddenly stopped, as in the case of a lady who when playing upon the piano, was seized by catalepsy, and when she recovered, continued at the same note where she had left off. The powerful influence of the imagination was well known. He referred to a recent instance in the case of a girl about 13 years who when taking care of sheep saw the Madonna and child. Her experience was confirmed by all the people of the district, who also saw the Madonna and Bambino. This could be accounted for by the state of expectancy influenced by a strong effort of the imagination.

Dr. Canniff said it was a question whether hypnotism should be considered a science. Every science had a counterfeit : was not this a counterfeit science? He had yet to learn whether hypnotism had been of any benefit to mankind. As to the alleged cases of cure, he thought that they could be referred to the influence of the imagination.

Mr. Brodie thought that no one could be brought under the influence of hypnotism unless he was in a diseased state.

Prof. Wright considered that the claims of hypnotism to the rank of a science were now well established. They were recognized by some of the most eminent men of the day. Many important cures had been undoubtedly effected by it. It



was constantly used by celebrated French physicians. One had stated that in 744 cases in which he had employed it, he had been unsuccessful in only 72 instances. These could not be referred to the influence of the imagination.

Dr. Workman thought that Hypnotism had a very bad effect on the nervous system.

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### SIXTH MEETING.

Sixth Meeting, 10th December, 1887, the President in the chair.

Donations and exchanges since last meeting, 40.

J. J. MacKenzie, B.A., was elected a member.

Dr. A. M. Rosebrugh read a paper on "Electro-Therapeutic Apparatus," and some new instruments were exhibited and described. The paper was introduced by a brief sketch of the history of medical electricity, showing that electro-therapeutics has been very much retarded in its development by the slow progress of electro-physics. One of the earliest treatises on this subject was written about the middle of the last century, and strangely enough by a clergyman, namely, the Rev. John Wesley. In this treatise Wesley anticipates much that has since been accomplished. He also suggests the probable electrical origin of the "northern lights," and, independently of Franklin, recommends the use of lightning rods. This was forty years before the discovery of galvanism, and seventy years before the discovery of the faradic or induced current. Static electricity from frictional machines was the only form of electricity then known. Galvanism was discovered in 1786 and the voltaic pile in 1800; but very little progress was made in the use of the galvanic current until after the discovery of the faradic current and not until after the discovery of better battery cells by Daniel, Grove and Bunsen, about 30 years ago. Electro-therapeutics has made great progress during the last 10 or 15 years, and this is largely due to greatly improved apparatus. As important improvements have been made quite lately

in this direction, still greater progress in medical electricity may be expected in the near future.

Modern electro-therapeutic apparatus may be described as follows :—1. A faradic battery. 2. A galvanic battery, with not less than 30 cells. 3. A good galvanometer. 4. A rheostat. 5. A commutator or its equivalent. 6. Rheophores or insulated wires for conveying the current, and 7, a complete set of electrodes. As a complete set of apparatus is present for inspection a detailed description is unnecessary.

In the matter of galvanic batteries the portable form is the most convenient for general practice, while large cells in a stationary form are used in hospitals and also by specialists in office practice. Portable batteries have been greatly improved of late and seem to leave very little to be desired. For general purposes the portable chloride of silver battery is the most convenient, while for electrolysis and especially for operations in gynecology a modification of the McIntosh zinc-carbon or chromic acid battery is to be preferred. He wished, however, more-particularly to call attention to some new apparatus quite recently devised for regulating, controlling and registering the galvanic current when used in medicine or surgery. These are, first, a new form of galvanometer, called a milliampère meter ; second, a new form of rheostat.

The milliampère meter is a modification of the galvanometer, and indicates, firstly, the presence of the galvanic current ; secondly, its direction ; and thirdly, the strength of said current in milliampères. By the use of this instrument the dose of electricity may now be both prescribed and administered as definitely as a dose of medicine can be weighed or measured. The new rheostat, known as the Bailey rheostat, is an apparatus for interposing a column of water into the galvanic circuit so as to break the force of said current before it is allowed to pass through vital parts of the body.

It prevents any shock to the nervous system, and furthermore, when combined with the use of the milliampère meter, the strength of the current can be very accurately gauged by increasing or diminishing the quantity of water interposed in the circuit. The maximum number of cells are placed in direct circuit, and no commutator for increasing or diminishing the number of said cells is required, the

strength of the current being regulated wholly by the rheostat. This is much safer, more economical and more convenient than the old method, and these two additions to electro-therapeutic apparatus mark a new departure—a new era, in fact—in electro-therapy.

The vagueness of empiricism gives place to mathematical precision, and this branch of medical science is at once lifted to a higher plane of dignity and importance.

In answer to a question by the President as to what proportion of the current of electricity passed through the train, Dr. Rosebrugh said that the current recorded itself. By placing needles in the brain of a cadaver the galvanometer showed the amount of the current that had passed through the brain.

Prof. Wright said that it was a matter of congratulation that electro-therapeutics had passed out of the hands of charlatans and had become a part of the regular practice.

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### SEVENTH MEETING.

Seventh Meeting, 17th December, 1887, the President in the chair.

Donations and exchanges since last meeting, 46.

The Institute having been notified of the election of Professor Samuel Pierpont Langley, LL.D., as Secretary of the Smithsonian Institution, to succeed the late Professor Spencer F. Baird, it was resolved on motion of James Bain, Jr., Esq., seconded by Alexander Marling, LL.B., "That the Secretary be instructed to convey to the Board of Regents of the Smithsonian Institution their congratulations on having secured the services of Professor Samuel Pierpont Langley, LL.D., in the office of Secretary, he being so well qualified to fill the position by his attainments in mathematics and his eminence in physical research."

Alexander Black and John Bertram were elected members.

C. Gordon Richardson, Esq., read a paper on "Maize and its derivatives."

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### EIGHTH MEETING.

Eighth Meeting, 7th January, 1888, the President in the chair.

Donations and exchanges since last meeting, 133.

The Council reported the election of Mr. P. Neilson Carmichael, as an associate.

A communication from the Audubon Monument Committee of the New York Academy of Sciences, requesting the co-operation of the Institute in the erection of a monument over the grave of Audubon in Trinity Church Cemetery, New York, was on motion of Mr. Browning, seconded by Dr. Ryerson, referred to the Biological section, recommending the appointment of a committee to take up subscriptions.

The President, Secretary, Curator, and the Chairmen and Secretaries of Sections were named a committee to make arrangements for the annual conversazione.

Mr. Macdougall exhibited a section sawn from a fender pile that was recently broken off from the Canadian Pacific railway dock at Vancouver, B.C., by a slight strain from a hawser, it having been weakened and rendered useless by the ravages of that destructive mollusk the *Teredo Navalis*. He also exhibited specimens of the *Teredo* preserved in alcohol; one whole one with the exception of the tail, which had become detached, and the head and tail of another one. The former was about nine inches long. They were sent by Mr. J. F. Garden, late of Toronto, now of Vancouver, B.C., of the firm of Garden & Herman, Civil Engineers. Accompanying the specimens were some remarks on the *Teredo*, by Mr. Garden. He says:—This sea worm is certainly of great interest to Engineers on this coast, as their power of boring into and destroying wooden structures submerged in sea water renders it a difficult problem how to construct wharves and docks, even of a temporary character, that

will resist their attacks. The pile from which the section exhibited was cut was driven about fourteen months ago. Externally at first glance the stick seemed to be as sound as when first put in place, but on close examination minute pin holes were seen. Within a thin outer shell the wood is honeycombed in all directions with holes up to half an inch in diameter. Near the outer shell the holes are smaller than towards the center; all of which seems to indicate that the embryo is deposited on the outside and develops in size and rapacity as it works its way inward. The head is covered with a shell open in front with cutting edges like a ship's auger; but instead of the cut wood being outside as with that implement, the particles are drawn into the animal's mouth as it works its way onward, and nearly all of it is assimilated, as but very little dust is found in the passages in the stick. It secretes a thin layer of calcareous matter with which it lines the chambers it eats out. The tail is a most peculiar part of its structure, appearing like the vertebræ of small fishes or two small feathers attached to either side of the extremity, and which is probably used to propel the *Teredo* forward. The rest of the body is a soft white mass. It is said to confine its attacks to wood between high and low water marks, or a distance of about 12 feet in Burrard Inlet. Creosoting has been tried as a preventive, but in many instances with but indifferent success. A stick of "gumwood" brought from Australia was driven some time ago, as it is said to be impervious to them, but I have not learned that it has been examined since. Copper sheathing has been adopted on the piles of a small wharf which has stood for some years here. This is, I believe, about the only complete way of excluding them. Iron piles are largely used in the construction of the C.P.R. wharves.

G. S. Ryerson, M.D., L.R.C.S., Edin., then read a paper on "The Influence of Tobacco and Alcohol on Vision."

He stated that Mr. Jonathan Hutchinson was the first to describe a palsy of the optic nerve with certain general symptoms due to the poisonous influence of tobacco and alcohol. He quoted a number of medical authorities in support of his contention. The conditions which render persons particularly subject to poisonous effect of tobacco are a sedentary occupation, middle life, prolonged use of and rapid consumption of Tobacco. The quantity necessary to produce ill effects was on an

average half an ounce daily. He related a case of a man who smoked all day and when awake at night, and another of a cigarmaker who smoked 40 cigars daily. Some persons were much more affected by a small quantity of the "weed" than others; some consume large quantities with apparent impunity. The local symptoms of tobacco and alcohol poisoning are gradually increasing dimness of sight affecting both eyes alike; blindness for the lighter shades of red and green; the sight is better in the twilight; nervousness; sleeplessness; irregular appetite; palpitation and pain over the heart and loss of memory are the general symptoms. Most smokers are alcohol users—but Dr. Ryerson related cases of total abstainers who suffered from this malady, tobacco blindness. A majority of cases are curable, but a certain proportion remain permanently blind.

Mr. Macdougall asked whether Dr. Ryerson's statements referred altogether to persons leading a sedentary life, or to all classes.

Dr. Ryerson. They referred to all classes.

Mr. Macdougall said that he could smoke more when engaged in active work.

Mr. Elvins. Would alcohol alone produce those effects on the vision?

Dr. Ryerson. It would not.

Mr. Livingston. Would chewing alone produce them?

Dr. Ryerson. No.

Mr. Williams called attention to the many cases of colour blindness among railroad men arising from the use of tobacco, so that a law had to be passed against it.

The President thought that a great deal of colour blindness was not caused by the use of tobacco. More attention had been recently paid to the subject, so that the cases were more noticed. This accounted for the increase in the number of cases.

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## NINTH MEETING.

Ninth Meeting, 14th January, 1888, the President in the chair.

The meeting took the form of a *conversazione*, the whole building being thrown open to visitors, and an exhibition of views being given by the Photographic Section. During the evening an exhibition of lantern slides by the oxy-hydrogen light was given, the views shown being principally from Switzerland.

Mr. Hugh Neilson, Manager of the Bell Telephone Company, read a paper on "Recent Advances in Telegraphy and Telephony."

In telegraphing by the single wire system, he stated, not much change had been made, except in the substitution of sound instruments for the old paper register. Between large cities the duplex and quadruplex extension system had been introduced, by means of which two and four messages could be transmitted simultaneously through a single wire. The cables were now all made duplex. Another advance yet to be made was the application of the Morse system to cable telegraphy. An important innovation alluded to was train telegraphy, a system by means of which messages could be sent and received on board trains going at the rate of forty to fifty miles an hour. This system was now in operation on the Lehigh Valley railway. The lecturer concluded by a reference to the wonderful development of the telephone system, and said that Ontario, so far as its towns and villages were concerned, had the best telephone service in the world.

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## TENTH MEETING.

Tenth Meeting, 21st January, 1888, the President in the chair.

Donations and exchanges since last meeting, 82.

The President announced the recent death of an honorary member of the Institute, Professor Balfour Stewart, of Owen's College, Manchester. In giving a brief sketch of his scientific labours, Mr. Carpmael mentioned that in his early electrical and meteorological investigations, he had taken the observations of the Toronto Observatory as a basis.

Professor Chapman, of University College, was elected an honorary member of the Institute.

J. Lester Nichols, was elected an ordinary member.

A communication was read from the trustees of the Elizabeth Thompson science fund, offering aid for the prosecution of scientific research, and stating the grants which had already been made.

A report of the Geological and Mining section on "The Mining Industries of Canada" was referred to the Council with a view to its being printed.

Mr. T. B. Browning read a paper on "Individualism, from a social and historic point of view."

Of the Aryan race, the Anglo-Saxon has the most developed form of individualism ; and of the Anglo-Saxon that portion of it which inhabits the northern portion of this continent. The form of society which prevails most widely is a more or less complete communism. The question : what is an individual ? is not capable of any but a relative answer. The question is, what is the unit of a society ? which varies from age to age. Human beings may be in one respect individuals, while they are not so considered in others, *e. g.*, under criminal and not under civil law, as infants, etc. The lecturer reviewed the evolution of the individual to his present status, in a legal, religious and economic point of view. Individualism has manifested itself in two forms—



negatively, in times of revolution ; and positively, in periods of construction and reconstruction. In the latter form he brought forth the influence and benefit of trade unions and friendly societies, such as Oddfellows, Knights of Pythias, Labour, etc., which was said by the lecturer to consist mainly in this—a provision against the precarious condition of industry as it affects the artisan, combined with the desire of association. The living industries of to-day are no longer in the isolated or individualistic conditions contemplated by economists of the last century, but are on both sides combinations. George's theories of taxation and landholding were passed under review, but in the opinion of the lecturer the trend of civilization was in an opposite direction ; to make land personalty, to abolish the doctrines of realty, and enlarge rather than diminish the extent of property which may be held in it. The tendency is toward a wider individualism of the constructive or positive form, to which legislation has lent much assistance in regard of social interests of an economic character in late years.

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### ELEVENTH MEETING.

Eleventh Meeting, 28th January, 1888, James Bain, Jr., Esq., in the chair.

Donations and exchanges since last meeting, 36.

The following were elected members: A. C. McKay, B.A., Lieut. Col. George A. Shaw, Alexander Rankin, Alex. Nairn.

Mr. Charles M. Dobson, M.E., read a paper on "The Electro-Mercurial Amalgamation of the Precious Metals from Argentiferous and Auriferous Ores."

He commenced by explaining that miners always experienced considerable difficulty in securing the float and flour gold with present amalgam methods. The present method was to crush the ore, and when reduced to a fine pulp or sand, to allow it to trickle over large copper tables that have been treated to a coating of mercury. The gold sticks to the mercury, and after a quantity has adhered the

tables present the appearance of frozen snow. The amalgam is removed with India rubber "squeegees" every five hours, and when a quantity is obtained it is squeezed through chamois leather, leaving a heavy hard ball. This ball is placed in a retort, which is heated and the mercury expelled, leaving a sponge-like mass of pure gold, when the crushed ore contains titanite iron sand which adheres to the tables and allows the gold to pass over. From a slight knowledge of electricity possessed by Mr. Dobson, he discovered that a current of electricity would heighten the activity of the mercury and keep the titanite sand in agitation and from adhering. Mr. Dobson explained the working of his machine, and said that with its aid he had extracted  $\frac{1}{4}$  dwt. of gold from 250 lbs of black sand taken from the St. Lawrence region.

Mr. Arthur Harvey believed that the next generation would see Canada one of the most important mining countries in the world. That the Dominion would develop into a great gold producing country, he had no doubt whatever. There was a great gold belt running from Nova Scotia to New Brunswick, through Quebec, going across the St. Lawrence, the Ottawa River, and thence by the north shores of Lake Huron and Lake Superior to Rat Portage and the surrounding district. This gold belt is of almost unparalleled richness. Sir William Logan had said that some day or other Canada would be one of the greatest gold producing countries in the world. Mr. Harvey then gave an account of his personal explorations in the Marmora district. The Moira river came down between the Silurian on one side and the Laurentian on the other. The Richardson mine was just on the edge where the Silurian joined the Laurentian formation. Between these formations one of these gold-producing belts happened to run. He said that it was perfectly certain that on the fourteen miles of that belt there was \$500,000,000 worth of gold waiting for exploration. Mr. Squier told him that he had seen \$500,000 worth of gold in one pocket. At the same time that the Richardson mine was taken up by people from Chicago, Mr. Gatshall took up a location seven miles from Madoc, which had also been success-

ful. He had himself washed gold there found on the surface, and he never saw any place so rich in auriferous ore as that region. He estimated its produce at \$100 a ton, whilst Prof. Chapman had estimated it at \$50 or \$60 a ton from his own examination. By the present system 90 per cent of the gold was lost, every little particle of gold being covered with a film of arsenic so that the quicksilver would not touch it. If Mr. Dobson's invention succeeds in cleansing the particles of gold from the arsenic, it would be worth millions of dollars to the country. He was glad that there were several barrels of ore in Toronto ready to be tested by this machine. He next referred to the great extent of the gold sands of Canada, and the wealth of the deposits south of Quebec. There was no river which came down from the Laurentian formation that did not carry gold. Referring to his own experience, he had washed gold in the Parry Sound district, at Port Arthur, Pearl River, and other places. He had seen millions of tons of the black sand that produced gold back in Haliburton. Canada has riches beyond belief, and the country was anxiously looking for some scientific process by which this immense wealth would be made available.

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#### TWELFTH MEETING.

Twelfth Meeting, 4th February, 1888, the President in the chair.

Donations and exchanges since last meeting, 44.

Arthur Harvey and John Lamb were elected members.

Prof. J. Hoyes Panton, read a paper on "The Caves and Pot-holes at Rockwood, Ont."

Mr. Andrew Elvins read a paper on "The Outburst of Sun Spots in 1887."

He quoted from T.R.A.S., in "Knowledge," and stated that his

own observations were in accord with the statements of that writer. Mr. Elvins also stated by the method adopted by him in papers published in 1871 and 1872, a maximum should have occurred in 1887, but he also stated that he was not quite satisfied that the true period had yet been determined. The fact remained, however, that a maximum was predicted for 1887, and an outburst had occurred during the past year.

The President said that the subject had exercised a great many scientific men for a long time: there were many difficulties attending the investigation of it. In the case of the distance of one maximum to another, when it has risen rapidly from a minimum to a maximum or to maxima on different sides of the equator, it would require a long series of observations to come to a satisfactory conclusion, so that at present we would not be justified in predictions for any one year. Although the fact was indisputable, Mr. Elvins' explanation could hardly be accepted in our present knowledge of the subject. We must wait till we have ascertained the physical cause. Prof. Balfour Stewart had made observations connecting meteorological phenomena with shorter periods as one of 27 days. He found a connection between magnetic disturbances and the appearance of sun spots in short periods from observations made at Toronto, Kew and Prague.

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### THIRTEENTH MEETING.

Thirteenth Meeting, 11th February, 1888, T. B. Browning, M.A., in the chair.

Donations and exchanges since last meeting, 40.

Mr Sandford Fleming, C.M.G., F.G.S., was elected an honorary member.

Mr. A. F. Chamberlain, B.A., read a paper on the "Catawba Language."

He said the Catawba Indians dwelt in South Carolina, in the vicinity of the Woccons and Tuscaroras, inhabiting the district to the south of these. The language of the Woccons and that of the Catawbas appear to be nearly allied. Other than this the philological relations of the latter are somewhat uncertain. The object of the paper was to show the connection of the Catawba language with the Siouan family of speech, by comparison of vocabulary. Mr. Horatio Hale has shown from a vocabulary taken down from the lips of the last survivor of the Tutelos (a tribe who formerly dwelt in Carolina), that the language of these belongs to the Siouan stock. Rev. J. Owen Dorsey has shown that the whole of the Siouan tribes (Dakotas, Kansas, Omahas, Ottos, etc.) formerly dwelt east of the Mississippi. It seemed, therefore, considering certain remarkable coincidences in vocabulary, that a Siouan connection of the Catawba was most probable. From Rev. J. Owen Dorsey, the greatest of Siouan authorities, who had some years ago perceived the apparent coincidences in vocabulary, and who has examined with great care the large amount of Catawba linguistic material, obtained by Mr. Gatochet and others, in the library of the Bureau of Ethnology at Washington, the writer has since learned that the connection is still most doubtful. The failure to obtain from the grammatical forms and materials others than vocabulary, all of which have been subjected by Rev. Mr. Dorsey to a searching examination, must be given great weight. But the many coincidences of vocabulary remain as yet unexplained except by the theory of Siouan connection. The writer also noticed coincidences in vocabulary between the Catawba and the Choctaw-Muskogee and related languages. One of the most remarkable is the word for "buffalo," which, with local colouring, is the same in Catawba, Cherokee, Chicasaw, Choctaw and Muskogee.

Mr. F. F. Payne read a paper on "The Eskimo of Hudson's Strait."

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## FOURTEENTH MEETING.

Fourteenth Meeting, 18th February, 1888, T. B. Browning, M.A., in the chair.

Donations and exchanges since last meeting, 34.

A vote of thanks was passed to Dr. John Hall, Senior, for a donation of a shark's jaw, and a bottle of poisonous serpents and centipedes from the West Indies and South America.

Rev. C. J. S. Bethune, D C.L., and Rev. R. T. Nichol, were elected members.

Mr. Alan Macdougall read a paper on "The Water Temperatures of Lake Ontario," from observations made by him on 3rd September last, after a spell of very hot, dry weather.

W. A. Douglass, B.A., then read a paper on the "Study of Economics."

He commenced by asking, is the study of Economics of sufficient importance to demand a place in our educational institutions? We now have popular sovereignty, and on the intelligence of the people must depend the goodness of our government. He then called attention to many of the questions of an economic character that must be submitted to the people, and to aid the citizen in the proper solution of these questions our educational system does almost nothing. To show how disastrous such ignorance must be to a nation, he cited the experience of the United States at the time of the late war. Men could be had in abundance, but how to raise money in the best way was a pressing problem. The tax imposed on distilled spirits was taken as a sample of their method of taxation, and it was shown that it had the following defects:—1st, It increased the price and precluded its use in several industries into which it largely entered, thus destroying or sadly hampering these industries; 2nd, the increased price of that out of bond went into private pockets and not to the treasury, thus enabling one part of the people to collect taxes from another; 3rd, the increased price thus obtained led to conspiracies on the part of the manufacturers to have the tax increased for their own benefit; 4th, the evasion of the tax was easy. Thus, while the people had to

contend against an open enemy in the field, they had to contend against a more subtle enemy at home, a harpy who took advantage of the necessities of the times to impose taxes for his own benefit. That enemy has survived the war and has fastened himself like a barnacle to the ship of state. The disastrous effect of interfering with the currency at the same time was noticed. Attention was then called to the most important question now pressing for solution—the growing obligations on society, not mutual, but one-sided. Every increase of ground-rent and of public debts means an increased burden thrown on one part of society. It was pointed out that in many cases those who had made the greatest sacrifice for society are those who by our present system of finance have increasing obligations imposed on them.

Mr. Houston asked in what way the teaching of the subject could be introduced into our public institutions of learning.

Mr. Douglass said the facts being presented to the students, all the teacher had to do was to show them how to correlate them. He gave an illustration how a class should be taught, showing them how with diminished toil there was an increase of wealth and at the same time a diminution of value, leading them to draw their own conclusions and reach the truth themselves.

Mr. Marling asked in what grade of schools he would have the subject introduced.

Mr. Douglass thought that the subject should be introduced into all the schools. He would have it form part of the instructions of every teacher.

Mr. Marling said the problem they had to encounter was the multiplicity of subjects that presented themselves and the selection of the most suitable for the purposes of public instruction.

Mr. Douglass thought that many useless subjects might be omitted, so as to leave time for the teaching of more profitable ones. A great deal that was useless in history could be dropped. He was in favour of banishing the teaching of spelling.

Mr. Armstrong gave an instance of a young girl aged about eleven struggling with the difficulties of physiology. He imagined that some social subject would be more useful.

Mr. Houston supposed that the difficulty could be got over by leaving it to the discretion of the teacher. He thought that the more obvious phenomena of economics could be easily introduced. He gave instances of such problems. Children of an early age could be made to understand them ; they are now entirely neglected.

Mr. Chamberlain was of opinion that the subject should be introduced only into the high schools. It would be more useful than teaching history and geography to such extremes as is at present the case. If these and others were modified there would be time for the study of Economics. He would like to know which was more important, a knowledge of the effects of the duties on sugar, or the location of some petty town in Siberia. Many of the pupils in our schools had a better knowledge of the geography of Russia than of the Dominion of Canada.

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### FIFTEENTH MEETING.

Fifteenth Meeting, 25th February, 1888, T. B. Browning, M.A., in the chair.

Donations and exchanges since last meeting, 51.

Mr. Charles Levy read a paper on "Capital."

He said capital is of two kinds, vital and separate, vital capital being the expectancy of the life, as it would be estimated by the usage governing the sale of life annuities ; separate capital being everything attaching to the life. The Creator of all things is the first and greatest capitalist. The earth is one of His instruments of distribution. Man drawing through the earth upon the Creator became a capitalist to the extent of his drafts. All men are capitalists,



because all have drawn upon the earth, or upon those having the care of their early life. The capital so stored in men will produce good, bad or no return, according as it is used, or allowed to remain idle. The terms capital and labour are misleading, inasmuch as they do not explain the relationship between the persons to whom they are applied. The distinction is one of tense only, "Separate capital" being the exponent of past labour, "vital capital" the exponent of present labour. Vital capital is lent for a consideration to be paid in separate capital. Interest on vital capital (wages) is of the nature of a life annuity, the purchase price of which corresponds to the total "vital capital," upon which the interest (wages) is paid. Neither class of capital is productive, nor is it safe in the absence of the other. The employer borrows, the workman lends, vital capital. Both are capitalists, one producing present, the other expending past labour.

Mr. Douglass said that one difficulty in discussing the subject of capital arises from the ambiguity of the term. Perry in his Political Economy says, one of the characteristics of capital is its power of growth, thus a hundred of capital at five per cent. becomes two hundred in about fifteen years. But capital does not increase. Food is consumed, clothes wear out, machinery wears out. The one characteristic we can affirm almost universally of capital is that it does not increase, it diminishes. When Perry therefore says capital increases, he refers not to the capital, but to ownership. A similar ambiguity occurs in the writings of Bagehot when he says that capital is readily convertible. But we cannot convert wheat into iron, ships into stove, or railroad iron into overcoats. Capital is not convertible, but ownership is. Thus, before we can make any headway in discussing capital we must very closely distinguish the exact sense in which we use the term.

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## SIXTEENTH MEETING.

Sixteenth Meeting, 3rd March, 1888, the President in the chair.

Donations and exchanges since last meeting, 41, including four volumes presented to the Library by Dr. Scadding, for which a vote of thanks was tendered him.

The Secretary on behalf of Prof. George Lawson, Ph. D. LL.D., of Halifax, read a paper on "The Canadian Species of Picea or Spruce Firs," after which it was moved by Mr. Shaw, seconded by Mr. Browning, and carried, That the thanks of the Institute be tendered to Prof. Lawson for his valuable paper.

Mr. Chamberlain on behalf of Mr. J. B. Tyrrell, B.A., F.G.S., read a paper on "David Thompson, the Pioneer Geographer of the Northwest."

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SEVENTEENTH MEETING.

Seventeenth Meeting, 18th March, 1888, T. B. Browning, M.A., in the chair.

Donations and exchanges since last meeting 37.

The Council reported the election of E. M. Morris and Harry Turner, as associates.

Robert H. Hedley and H. B. Proudfoot, were elected members.

The Secretary for Prof. J. W. Spencer, M.A. Ph. D., of Washington, read a paper on "The Iroquois Beach, a chapter in the Geological History of Lake Ontario."

Mr. G. E. Laidlaw, of Victoria Road, exhibited a number of specimens of Indian relics, consisting of pipes, arrow-heads, axes, gouges, chisels, needles, spear-heads and various other

implements. After some remarks on the country in which the relics were found, viz., the west shore of Balsam Lake, he gave a description of the various articles and their uses.

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### EIGHTEENTH MEETING.

Eighteenth Meeting, 17th March, 1888, the President in the chair.

Donations and exchanges since last meeting, 51.

The Council reported the election of A. C. Barrett and C. H. A. Baird, as associates.

Mr. W. A. Douglass and Prof. Baker were appointed Auditors for the year.

After the sale of last year's periodicals Mr. J. A. Livingston read a paper on "Creation," in which he took the ground that the earth spoken of in Genesis was the dry land as contradistinguished from the seas. The word earth was never used to denote the whole globe until the sixteenth century. He proceeded to demonstrate mathematically several problems in connection with planetary and geological growths. He contended that coal was in a liquid state originally, and its formation the result of mineral rather than vegetable processes.

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### NINETEENTH MEETING.

Nineteenth Meeting, 24th March, 1888, the President in the chair.

Donations and exchanges since last meeting, 131, including 15 volumes presented to the Library by Henry Rowsell, Esq.

Prof. W. H. Ellis was appointed representative of the Institute at the sixth annual meeting of the Royal Society of Canada, to be held on the 22nd May.

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## TWENTIETH MEETING.

Twentieth Meeting, 31st March, 1888, the President in the chair.

Donations and exchanges since last meeting, 32.

John A. Morton and J. Castell Hopkins were elected members.

W. Houston, M. A., read a paper on "The Scientific Aspect of the Henry George Movement," of which the following is a synopsis :

He began by explaining that it was no part of his object to assail Mr. George's main contention, that the "unearned increment in land" should belong to the community and not to the individual owner. In that contention he concurred, so much so that he regarded it as an axiomatic truth. He further explained that it was no part of his purpose to depreciate Mr. George as a thinker or a philanthropist. He defended him against the charge of being a mere mischievous agitator, and appealed to his writings for proof. The mischief is done by intolerant critics who do not take the trouble to understand either the aims or the methods of such men as George, Powderly, or Parnell. Each of these men is a philosophical student of political science, prepared with reasons to convince others, and himself open to conviction. The object of the paper was to show that though Mr. George is right in his main contention the reasoning by which he supports it is unscientific and unsatisfactory. The same contention was put forward long ago by John Stuart Mill,\* and an association was actually organized in 1870, † called the "Land

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\* Richard Cobden stated the doctrine of the "unearned increment" in a public speech delivered on the 17th of December, 1845.

† Henry George's "Progress and Poverty" was written between August 1877 and March 1879, and the pamphlet, of which it is an expansion, appeared in 1871.

Tenure Reform Association," one object of which was 'to claim for the benefit of the State the interception by taxation of the future unearned increase of the rent of land (so far as the same can be ascertained) or a great part of that increase, which is continually taking place without any effort or outlay by the proprietors, merely through the growth of population and wealth; reserving to owners the option of relinquishing their property to the State, at the market value which it may have acquired at the time, when this principle may be adopted by the Legislature." Mr. George's merit is that he has shown how the unearned increment in land can be appropriated by the community by a sound system of taxation, but he has needlessly weakened a strong case (1) by using words vaguely—a fault which he severely condemns in other writers; (2) by allowing himself to be influenced to some extent by considerations that belong not to sociology but to natural theology; and (3) by assailing certain economic doctrines which, properly regarded, not merely support his main thesis, but are absolutely necessary as a foundation on which it must rest. His position resembles that of a man who not merely draws a sound conclusion from wrong premises but actually goes to great trouble to demolish the right ones. This points to the probability of the conclusion having been suggested to him by circumstances, and of his having gone wrong in his search for reasons, and there is good ground to believe that this is the real history of his mental development. Henry George's "main contention" above referred to may be summed up in these propositions:

- (a) There is an unearned increment in land in every progressive community;
- (b) This unearned increment is caused by the growth of the community, and should belong to the community;
- (c) A practical and equitable means of securing it for the community can be found.

This means is what Mr. George calls "taxation of land values," a kind of taxation which would be exemplified if our municipal assessment system were reformed by abolishing the tax (1) on income, (2) on personalty, and (3) on that portion of realty which is in its economic nature akin to personalty. Such a system of taxation is

defensible alike on grounds of natural justice and political expediency, but with these political science has nothing to do. It is defensible also on purely scientific grounds, when we come to examine the origin of what is called the "unearned increment," and it is in this part of his case that Mr. George's reasoning breaks down. His argument tends to weaken his case, not to strengthen it, and he has in this way alienated support of a valuable kind from the movement which goes by his name, and the propaganda which he is actively promoting. That there is something wrong with Mr. George's reasoning is shown by the fact that John Stuart Mill, who maintained the wage fund theory and the Malthusian law, both of which Mr. George thinks it necessary in the interest of his case to refute, was as strong an advocate as Mr. George is of the appropriation by the community of the "unearned increment.\*"

The lecturer before specifically criticizing portions of Mr. George's argument gave his own view of the origin of the unearned increment. The most striking class of phenomena which present themselves for economic investigation are those described by the term "exchange" or "barter." Things that have value exchange for each other in accordance with the law of supply and demand where competition prevails, and George correctly defines the law of competition to be the law of "least exertion." In an ideal competitive state each tries to get as much and give as little as possible, but in the actual state competition is limited by custom, by combination, and by the comparative immobility of capital and labor. In the true sense of the term "economic" non-exchanging parties are not proper subjects of economic investigation at all, and some of Mr. George's errors arise from his habit of going back to the conditions of primitive society for illustrations of the operations of our complex industrial community. As a matter of fact some economic principles of great importance do not emerge at all until industry becomes organized. Exchange of valuable articles for each other is conditioned on (1) transferability, (2) desirability, and (3) scarcity, and the first two being assumed the value will vary with the scarcity, or practically with the efficiency of productive agencies in overcoming difficulties. The productive agencies are (1) natural powers, described by the term "land," (2)

\* Since the above paper was read, Mr. Edward Atkinson, in the August number of the *Forum* has, while repudiating Mr. George's conclusion, concurred in his denunciation of Malthusianism.

capital, (3) enterprise, and (4) labor, the corresponding shares of the product being (1) rent, (2) interest, (3) profit, and (4) wages. These four agencies are differentiated from each other only in highly organized conditions of industry. The order in which the shares of the product are determined is the one just given, but the order in which they historically emerge is precisely the reverse. Mr. George's account of the matter is defective because he leaves out the agency of the *entrepreneur* and his corresponding profit. Other expounders of economic science do the same, but sometimes with less fatal effect on their systems. Mill identifies the *entrepreneur* with the capitalist and makes his "profit" part of the "profits" of capital under the designation of "wages of superintendence." Prof. Laughlin, the American editor of Mill identifies the *entrepreneur* with the labourer and his profit with wages. If the above account of the economic conditions of modern society be correct it is evident that Henry George's account is defective, and that much of his reasoning about rent, wages, and capital must be obscure, as indeed it is. Of his destructive criticism of the "wage-fund" theory it must be said: (1) That no one now holds it, if any one ever did, in the form which he criticizes; (2) that the "unearned increment" principle does not in any way depend on the wage-fund theory either in the form criticised by George or in any other form; (3) that the wage-fund theory, though nonsensical in the form he criticizes, is in a sense—and that a very important one—true; and (4) that the amount of truth in the wage-fund theory and the amount of truth in George's refutation of it depend entirely on the definitions given of "capital" and "labor." Even Mr. George expressly admits that capital may "limit the form of industry and the productiveness of industry, by limiting the use of tools and the division of labor," and this is equivalent to an admission of the existence of a wage-fund in Mill's sense of that term. F. A. Walker expressly defines "capital" as including "materials," "tools," and "subsistence." Capital accumulated and seeking investment often affects the rate of wages apart altogether from the productiveness of the labour it employs. Moreover, as Walker puts it, capital determines *when* wages will be paid, even if the product of the labour determines the amount of the wages.

More important in relation to the "unearned increment" principle is George's destructive criticism of the Malthusian law of population.

That law Mr. George thus summarizes : "The essence of the Malthusian doctrine is that population tends to increase faster than the power of providing food ;" and again : "The vital point is that there is a natural tendency and constant effort in population to increase beyond the means of subsistence ;" and again : "Population, constantly tending to increase, must, when unrestrained, ultimately press against the limits of subsistence, not as against a fixed but as against an elastic barrier, which makes the procurement of subsistence progressively more and more difficult, and thus, wherever reproduction has had time to assert its power, and is unchecked by prudence, there must exist that degree of want which will keep population within the bounds of subsistence." Each of these versions of the doctrine is substantially correct and is axiomatically true, and Mr. George himself admits that the doctrine was ten years ago "an accepted truth which compels the recognition even of those who would fain disbelieve it," he might have added "on grounds of natural theology." In reality the Malthusian principle is neither more nor less than a well-known biological fact which is as much the basis of Darwin's law of the "survival of the fittest" as it is of the doctrine of the "unearned increment." Darwin himself instances the elephant as the slowest breeder of all known animals, and yet, assuming one hundred years as the limit of its life, apart from violence, "after a period of from 740 to 750 years there would be alive nearly 19,000,000 elephants descended from the first pair." Man breeds more rapidly than the elephant, and under favorable circumstances a single pair will have, without twins, as many as thirty children. This is no phenomenal occurrence amongst the French people in Quebec, and families of over 20 children are very common. Mr. George's refutation of the law is no refutation at all, and his citation of the cases of China, India, and Ireland are not at all in point. On the contrary, each of these countries is a remarkable proof of the truth of the Malthusian doctrine. That doctrine, taken in connection with the law of diminishing returns from the application of labor and capital to land, is the basis of the Ricardian theory of rent, and also of Mr. George's doctrine of the unearned increment. The pressure of population on the means of subsistence would never have been felt but for the law of diminishing returns ; the operation of the law of diminishing returns would never have been noticed but for the pressure of population on



the means of subsistence. These two facts are fundamental in sociology. They explain the migrations of mankind, and they explain why progress was made in methods of producing food and in the arts generally. So far from being in conflict with natural theology, they are amongst the most striking proofs of omniscience on the part of the Creator of society, for all sociological progress is conditioned on these two great principles.

Mr. Douglass said that while he concurred in the important conclusions arrived at by the speaker, there were matters of detail that might fairly be challenged. Professor Fawcett makes the statement that because there are three agents of production—land, labour, and capital—therefore we may assume that there should be three recipients of the product—the landowner, the capitalist, and the laborer. This the speaker characterized as being a most slovenly examination of one of the most important questions in the whole range of Economics, and atrociously illogical.

The term "land," as an agent of production, is very objectionable. The sun is an agent of production; so is rain, and to include these under the term "land" is very misleading. Then what an absurdity to assume that the product is to be divided amongst the agents of production, for how can we give a share to the sun or the rain? And then if it were true that each agent of production should receive a share of the product, in what way can we say that the mere appropriator of ground rentals is an agent of production. While Malthus had emphasized one fact in Economics, the speaker thought he sadly overlooked another still more important fact. It may be true that increased population drives population to poorer lands, and thus reduces production in one direction, namely, of agricultural products; still it is not true that increased population diminishes the aggregate production. For, put a man in isolation on the prairie and he will be poor, however great the natural advantages. Give him a companion and the two will together produce more than twice the pro-

duct of one. Thus product increases faster than population. But while product thus increases, ground rent also increases, whether as fast or faster than population the speaker was not prepared to say positively, but in some cases he mentioned the rental had increased much more rapidly than population. This rental at present, instead of being appropriated for community purposes, is taken by individuals and thus impoverishes the toiler. This latter fact, one of the most momentous in its effects on society is certainly not noticed as it should be by the exponents of the doctrines of Malthus.

Mr. Gerald Fitzgerald read a paper on "Miracles."

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### TWENTY-FIRST MEETING.

Twenty-First Meeting, 7th April, 1888, the President in the chair.

Donations and exchanges since last meeting, 42.

S. D. Mills was elected a member.

Alderman Harry Piper read some notes on zoology :

He referred to the collections of animals in ancient times, of which that made by Alexander the Great for his preceptor Aristotle was the first we have any account of. He then referred to modern collections. In addition to the great collections at London and Paris there were twenty-two others, some of which he had frequently visited. Mr. Piper then dwelt at some length on the value of zoological collections from various points of view. He pointed out some of the errors of early writers on natural history, which arose from the want of personal acquaintance with animals. Many of the scholars of our public schools know more of the habits of animals than some of those writers. He gave an account of the present state of the Zoo, which, though small, was in excellent condition, and enforced the importance of making it free to the public.

Mr. Bain read a paper by J. B. Tyrrell, B.A., F.G.S., of the

Geological Survey, entitled "Catalogue of the Mammalia of Canada, exclusive of the Cetacea."

Mr. Chamberlain read a paper by Rev. John McLean, M.A., of Alberta, on "The Blackfoot Sun Dance."

Mr. A. Harvey referred to the similarity between the ceremonies described in the paper and some of the customs of the Greeks and Romans and our own ancestors.

Mr. T. B. Browning had seen one of these Sun dances by the Crees, a very large one. There were no less than ten or twelve chiefs and about 140 tepees. The ceremonies were substantially the same as those described by Mr. McLean. He saw four undergoing the torture. They were smeared with a white chalk clay. When strung up they rested wholly on the heel, and skipping round described about the third of a circle, the chiefs cheering them on. He witnessed another ceremony at the same time, that of adoption. A medicine man brought forward a little girl, crossed his hands over her, took her from her mother and handed her over to the man who adopted her. His informant, a half breed, told him that the medicine man called upon the gods to witness the rite.

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## TWENTY-SECOND MEETING.

Twenty-second Meeting, 14th April, 1888, the President in the chair.

Donations and exchanges since last meeting, 51.

Oliver R. Avison, M.D., was elected a member.

Mr. W. A. Douglass, B.A., read a paper entitled "A Scheme of Political Economy."

Mr. W. Houston, M.A., read a paper on "The Relation between Political Science and Practical Politics."

In order to comprehend this relation it is necessary to have a clear conception of what is meant by political science on the one hand and practical politics on the other. Political science, like the physical sciences, has for its function the investigation of phenomena with a view to ascertaining the general principles underlying and producing them. "Science" is not mere knowledge of facts; it is a knowledge of facts as explained by principles, or of principles as they explain facts. It is the part of chemistry to explain the phenomena of compound bodies, of geology to explain the facts of the earth's crust, of biology to explain the phenomena of life. So it is the part of political science to explain the facts and phenomena of organized political society. Moreover, the method of procedure is similar to that of the physical sciences. The facts of political society have to be analysed, classified, and made the basis of generalizations, just as the facts of the physical world are. The method by which political principles are reached from political facts is the inductive method, and when the connection is established between facts and principles, the work of the scientific investigator is done. It is no part of his function as a scientific enquirer to act as the adviser of the practical statesman, or attempt to show that a particular change either should or should not be made. When he does this he leaves the domain of political science and enters that of practical politics. His investigations may be the means of throwing light on the statesman's path, for sometimes the best way to ascertain in what direction we are drifting is to enquire how we have arrived at the point of observation; but to shed that light is no necessary part of the scientific enquirer's function. What has been done he may endeavor to explain; what ought to be done he is not called upon to decide or even suggest. This distinction between political science and political politics was illustrated by a number of instances selected from various departments of sociology. For example, the scientific enquirer may endeavor to get at a satisfactory explanation of the fact that in this and other countries the right of a person to issue promissory notes has been limited by legislation, so that only chartered banks can put such notes into circulation. It is the part of the practical politician to say whether any or what changes should be made in the laws which control and regulate the currency of the country; it is the part of the political scientist to search for the causes which have brought such a

currency into existence and use. The practical politician may suggest improvements in our municipal institutions if he finds them not in his opinion perfect; the political scientist, as such, confines himself to tracing their growth and development under the operation of certain influences. It is the business of the practical politician to meet the growing needs of political society with new laws adapted to the situation; it is the work of the scientific politician to find out why our laws are such as they are. And so on through a wide range of topics which might be cited. If it be objected to this view of political science that it is too narrow, the obvious reply is that to give the term "science" Comte's meaning makes it impossible to apply it at once to the physical and to the historical sciences. It is possible in the region of physics to foretell with certainty future events; it is not possible in the region of history. It may be replied further, that even on this narrow view of it political science is extremely important for two reasons: (1) because it affords one of the best possible intellectual trainings, and (2) because though political science, as such, does not aim at sociological improvement, the scientific study of politics cannot but suggest to the mind of the student improvements that in the way of practical politics should be made. Moreover, the prosecution of such studies has a humanizing effect on the student. No other discipline approaches this in its value as a means of counteracting the mischievous efforts of political partizanship with its exaggerations, its prejudices, its hypocritical praise and equally hypocritical blame, its condemnation of opponents without regard to what is commendable, and its condonation of the errors and even the crimes of friends.

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## TWENTY-THIRD MEETING.

Twenty-third Meeting, 18th April, 1888, the President in the chair.

Mr. T. B. Browning, M.A., read a paper on "The Chamberlain Treaty, 1888."

## TWENTY-FOURTH MEETING.

Twenty-fourth Meeting, 21st April, 1888, the President in the chair.

Donations and exchanges since last meeting, 45.

Herbert C. Jones was elected a member.

Mr. George Martin Rae read a paper on "Should the Privilege of Making Wills be Restricted?"

Mr. Rae pointed out that the law relating to wills was constantly undergoing modification. That originally a man had only power to bequeath one-third of his personalty, the other two-thirds devolving on his wife and children respectively; that even yet the wife had the right to elect whether to take the provision by will or not in the case of real estate. That marriage revoked a will but imposed no relative duties as to any disposition of the married person's estate, and suggested that the absolute power to bequeath should be to some extent restricted in favor of husband, wife, parents and children, as had been done in 1859, when married women were permitted to make wills. He suggested that the right of sick and aged persons to make wills was of doubtful value; believed that the true intention of the testator often failed to be expressed, and that the precautions required by law only extended to the signature of the document, not to the knowledge of the contents. That at present the sick and feeble were exposed to the risk of persecution. He suggested that it was a proper subject for scientific enquiry whether the disposing mind existed in the majority of such cases, which his experience led him to doubt.

Mr. Horatio Hale, of Clinton, read a paper on "The Development of Language."

In answer to a question from Dr. McCurdy relative to the origin of inflections, Mr. Hale said that he had already in part answered it, mankind have never invented inflections. We have no authority for any inflections having been invented.

If one person had invented a new inflection, it could not be possible that any others would adopt it.

In answer to a question from Mr. Harvey on the connection of a language rich in inflections with a highly advanced state of civilization, Mr. Hale said that he had explained his views in a paper on the subject. The attainment of a highly inflected language does not depend on the degree of civilization. It had a good deal more to do with the character of the people than with their attainments in civilization.

#### TWENTY-FIFTH MEETING.

Twenty-fifth Meeting, 28th April, 1888, the President in the chair.

Donations and exchanges since last meeting, 43.

A letter was read from Dr. Selwyn, Director of the Geological Survey of Canada, relative to a statement reported on page 191 of the last volume of the Proceedings as attributed to him by Mr. W. H. Merritt, which statement he declared to be absolutely and wholly untrue; also a letter from Mr. Merritt, denying the correctness of the report of his remarks.

Nominations for Officers for the ensuing year were then made.

Captain Stupart, R.N., read a paper on "Whence did the Scandinavians obtain their Knowledge of the Compass?"

This question cannot be limited to the marine compass, for the "magnetic car" appears to have been invented about the same time. The first mention of the magnet in China was in A.D. 121. On Chinese vessels the use of the compass was first made in A.D. 419, and the "magnetic car" in the Island of Japan in the seventh cen-

ture. The Arab ships used the needle in India in A.D. 1117; European chronology gives its introduction about A.D. 1200; Odin's supposed migration to Scandinavia, B.C. 50; conquest of Samarcand by the Arabians, A.D. 712; discovery and settlement of Iceland, A.D. 861; Arabs trading with caravans between Pekin, Samarcand, Kazan, Novgorod and Varangia, about A.D. 850. After their first settlement the Governor of the Icelanders was sent each year to form new or improve the old laws, A.D. 861. It is probable that the Arabs brought the compass from China to Novgorod, where it was transferred to the Varangians, who passed it on to Iceland and the Faro Isles.

Mr. David Spence read a paper on "Peculiarities and External Relations of the Gaelic Language."

The writer of the paper noted the curious fact that until lately there has been scarcely an instance of a Saxon whose curiosity had been excited to know something about the language of the Gael, which was one of the most important branches of the old Aryan speech and nearer the old forms than any other European language. Having referred to a few peculiarities of the Gaelic language, traceable to a peculiarity in the mode of thought, Mr. Spence cited examples of beliefs and customs indicative of the bent of mind of the Keltic people; and gave a large number of Aryan forms of words which have been accurately preserved by the Gaelic-speaking people. The importance of Gaelic for philological purposes could not, he said, be over-estimated. The various branches of the old Aryan race, both in Asia and on the Continent of Europe, had been so disturbed and mixed that the languages must necessarily have been greatly changed and broken up, while the people in the Highlands and in Ireland had been so isolated that their branch of the old language had been, as it were, bottled up, sealed and preserved for the use of the philologist. Words changed but little when spoken by the same race, but when pronounced by alien lips they might change so as not to be recognized. The names *Dumbarton* and *Sterling*, in Scotland, concealed their meaning when pronounced by Englishmen, but when pronounced by the Gaul they were still "*Dunbreaton*," the Briton's Fort, and "*Struithlia*," the rock stream. The Gaelic system of orthography



was so different from the English that English scholars had been deterred from studying it, but it was to be hoped they would follow the example of the German and take a share in the honour of working a mine so interesting though long neglected.

Mr. Chamberlain read on behalf of the author, a paper by Mr. John C. McRae, of Port Colborne, on the "Geological Formation at Port Colborne as shown by drilling for Natural Gas."

Commencing at a spot twelve feet above Lake Erie level, the writer gave a minute and valuable description of the strata penetrated by the drill. Permanent water was found at 26 feet, salt water at 452 feet; a fair flow of gas at 454 feet, with a stray odor of sulphuretted hydrogen. At 764½ feet the present supply was found, which is almost odorless. The well was drilled to 1,500 feet, but there was no increase in the quantity of gas. The accurate flow of the well has not been estimated, but on its being closed for seven hours, the hydraulic gauge registered 275 pounds, and was still going up. The gas is used for light and fuel and gives satisfaction.

A paper by A. F. Chamberlain, on the "Mississauga Language," was read by title.

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### THIRTY-NINTH ANNUAL MEETING.

Thirty-Ninth Annual Meeting, 5th May, 1888, the President in the chair.

Donations and exchanges since last meeting, 41, including a box of minerals from Dr. Hall, for which a vote of thanks was tendered him.

The Council reported the election of Murray A. White, as an associate.

A. B. Eadie, M.D., was elected a member.

The following reports of sections were read and adopted :

1. Architectural Section.

TORONTO, April 10th, 1888.

The Architectural Section of the Canadian Institute have the honor to present their Second Annual Report :

Since our first report to the Canadian Institute we have held weekly meetings during the winter months, closing the first session of our existence on May 9th, 1887, and commencing the session of 1887-88 on October 11th.

The following papers and addresses were delivered before this section during the past year:

- April 4th, 1887, Mr. C. F. Wagner read a paper on "Carpentering."  
 April 11th, " Mr. J. W. Gray read a paper on "The Doric Temple in its Constructive Aspect."  
 May 2nd, " Mr. Curry gave an address on "Plumbing," illustrated by drawings, showing correct and defective work.  
 Jan. 17th, 1888, Mr. M. J. Hynes gave an address on the subject of "Terra Cotta."  
 24th, " Mr. Frank Douglas read a paper on "Renaissance Architecture."  
 31st, " Mr. J. B. Vick gave an address on "Stone Cutting and Stone Setting."  
 Feb. 7th, " Mr. A. G. Gregg, read a paper on "Architectural Lessons from the Human Figure."  
 14th, " Mr. Jas. Wright gave an address on "Plastering."  
 28th, " Mr. Wm. Simpson gave an address on "Joinery."  
 Mar. 20th, " Mr. R. J. Hovenden gave an address on "Painting."  
 27th, " Mr. R. J. Hovenden gave an address on "The Manufacture, Adulteration and Application of Colors."

Apr. 10th, 1888, Mr. Wm. Phillips gave an address on "House Drainage."

The Officers for the ensuing year are :--Chairman, A. F. Wickson ; Vice-Chairman, R. Dawson ; Treasurer, C. D. Lennox ; Secretary, J. F. Brown ; Committee of Management. John Howard and G. F. W. Price.

ROBERT DAWSON,  
*Chairman.*

## 2. Biological Section.

TORONTO, 21st April, 1888.

*The Council of the Canadian Institute.*

The Biological Section of the Canadian Institute have held their regular meetings on the 1st and 3rd Mondays in every month during the past session. At each of these meetings one or more original papers have been read on a variety of topics, as may be seen on reference to the programmes issued.

The "Microscope Fund" has through the liberality of a few members and their friends been sufficiently augmented to allow of the purchase of a first-class instrument, now expected to arrive in a few days.

Yours faithfully,

W. E. MIDDLETON.

### SCHEDULE OF PAPERS READ IN BIOLOGICAL SECTION 1887-8.

May	2,	1887,	"The English Rabbit as an Agricultural Pest,"	William Brodie.
	16,	"	"The Fresh Water Hydra,"	W. E. Middleton
		"	"The Coleoptera of the N. W. T.,"	Wm. Brodie:
June	20,	"	"The Acclimatization of the English Goldfinch	Wm. Brodie
Oct.	3,	"	"Canadian Ants,"	Wm. Brodie
	17,	"	"Canadian Gall Insects,"	Wm. Brodie
Nov.	7,	"	"Foreign Ants,"	W. E. Middleton
	21,	"	"Hyphantria Cunea,"	Wm. Brodie
Dec.	5,	"	"The Brownian Movement,"	W. E. Middleton
		"	"Mind in Animals,"	Wm. Brodie
		"	"The Calamorpha Moth,"	Wm. Brodie

	19, 1887,	"Canadian Reptiles,"	.....	J. B. Williams
Jan.	16, 1888,	"Planorbis Corpulentus,"	.....	Wm. Brodie
		"Some Canadian Insects,"	.....	Wm. Brodie
Feb.	6,	"Birds Eggs,"	.....	E. V. Rippon
		"Museum Collections and their Preser- vation,"	.....	C. Armstrong
		"Certain Alleged Digestive Glands of Carnivorous Plants,"	.....	W. E. Middleton
		"The English Sparrow,"	.....	Dr. Garnier
	20,	"Chloroform,"	.....	Wm. Brodie
Mar.	5,	"Coleoptera of the N. W. T., No. 3.	.....	Wm. Brodie
April	2,	"Habits of Canadian Birds,"	.....	E. E. Thompson
	16,	"The Echini,"	.....	Rev. K. F. Junor
				(22 papers.)

The Officers for the ensuing year are :—James H. Pearce, President ; W. E. Middleton, Secretary.

### 3. Geological and Mining.

The President read the following :

TORONTO, April 26, 1888.

#### REPORT OF THE GEOLOGICAL AND MINING SECTION OF THE CANADIAN INSTITUTE FOR THE YEAR 1887-8.

This section of the Institute was organized at a meeting held on the 20th of April, 1887, and its Regulations and By-Laws were approved by the Council on the 30th of the same month. The names of sixteen members of the Institute are enrolled on the minute book as members of the section.

Besides the inaugural meeting, six meetings of the section have been held during the year. The attention of the section was called soon after its formation to the want of statistics and other trustworthy information relating to the mining and metallurgical operations carried on in the Dominion, and the desirableness of the public being put in possession of such information as soon after the close of each year as possible. A memorial setting forth these views was prepared by the section, approved by the Institute, and forwarded to

the Dominion Government in May of last year. In answer to this memorial the Government replied on the 28th September, that an Order-in-Council was passed creating a division of the Geological Survey to attend to these matters. Furthermore, in reply to an interview had with the Deputy-Minister of the Interior by an authorized sub-committee of the section, consisting of the chairman and secretary, the Minister stated : (1) That the officers of the division referred to have been appointed ; (2) That the publication of statistics and information by this division will here after be much more prompt after the close of each year than hitherto ; (3) That the Dominion Government has co-operated and will co-operate with the Provincial Governments in the direction of acquiring mining and metallurgical information ; and (4) That the Government is considering the publication of all reports of the Geological Survey relating to mining and metallurgy in Canada since 1863 in connection with the work of the forthcoming census.

A select committee of the section has also prepared an exhaustive report, with tables of exports and imports, on the minerals and raw metallurgical products of the United Kingdom, the United States, Canada and the other Colonies of the Empire, more especially in regard to the trade of the several countries with each other.

In addition to the foregoing work accomplished by the section, papers were read at the several meetings as follows :

1. "On the Mineral Production of Canada in 1886-7," by Wm. Hamilton Merritt.
  2. "On Iron and other Ores of Ontario," by James T. B. Ives.
  3. "On certain Lacustrine Deposits and their Economic Values," by Arthur Harvey.
  4. "On the Physical Aspects of Iron Smelting," by Samuel D. Mills, of St. Ignace, Michigan.
  5. "Notes on Thunder Bay Silver Ores," by Robert B. Headley, of Port Arthur.
  6. "Notes on New Jersey Iron Ores," by Wm. Hamilton Merritt.
- Two Officers elected at the organization of the Section, viz. :

Alexander McNabb, Vice-Chairman; and J. T. B. Ives, Curator, having resigned in consequence of leaving the country, their places were filled by the appointment thereto of Arthur Harvey and David Boyle, respectively.

The following Officers of the Section have been elected for the Institute year, beginning May 1, 1888:

Chairman, William Hamilton Merritt; Vice-Chairman, Arthur Harvey; Secretary, A. Blue; Executive Committee, John Notman, A. Elvins, R. W. Phipps, Dr. P. H. Bryce and A. F. Chamberlain.

A. BLUE,  
*Secretary.*

RESOLUTION adopted unanimously by the Geological and Mining section of the Canadian Institute, at Toronto, on the 26th April, 1888.

Whereas, the late Hon. Thomas White, Minister of the Interior, for years recognized the importance of the mineral and metallurgical interests of the Dominion of Canada, and previous to taking office in the Government ably advocated through the press the desirability of more attention being paid to their development; and whereas, since taking office he has reorganized the Geological Survey so that a division of it may accomplish a practical utility in keeping a record of mining and metallurgical development in Canada, and has also made important and beneficial changes in our mining laws; Be it resolved, that, while expressing the most profound sorrow at his death, the Geological and Mining Section of the Canadian Institute desire to bear record to the great benefits accomplished by the deceased during his short term of office to the mineral interests of the Dominion of Canada; and that a copy of this resolution be forwarded to his son, Mr. Robert White.

#### 4. Philological.

TORONTO, April 7, 1888.

*The Council of the Canadian Institute:*

GENTLEMEN,—In accordance with the constitution of the Canadian Institute I beg to submit the following report of the work of the Philological Section for the year ending March 31, 1888:

The number of members on the roll is eighteen. Since the 31st March, 1887, the section has held eleven meetings. Since December 13, 1887, the meetings of the section have taken place at twenty o'clock on the second and fourth Tuesdays in each month of the session of the Institute.

At the meeting of November 14, 1887, it was decided that the Section should take up the study of "Phonetics," and the work of the members has to a great extent been the pursuance of such study.

At the meeting of January 10, 1887, Mr. George E. Shaw, B.A., resigned the position of Secretary of the Section, to which office Mr. A. F. Chamberlain, B.A., was appointed.

During the year the following papers have been read before the Section, viz. :

- (1) April 11, 1887, "The Science of Language in Popular Education," by the Rev. J. F. McCurdy, Ph. D.
- (2)       25,   "    " "Umbrian Inscriptions," by the Rev. Dr. McNish.
- (3) May    9,   "    " "An International Alphabet with a System of Shorthand," by M. L. Rouse.
- (4) Dec. 13,   "    " "The Organs of Speech, with Special Reference to the Production of Speech in the Larynx," by Dr. G. R. McDonagh.
- (5) Jan. 10, 1888 "Throat Sounds," by the Rev. J. F. McCurdy, Ph. D.
- (6)       24,   "    " "Portuguese Nasal Sounds," by G. E. Shaw, B.A.
- (7) Mar. 27,   "    " "A Contribution to the Study of the Franco-Canadian Dialect," by Jno. Squair, B.A.

(Signed)

A. F. CHAMBERLAIN,

*Secretary Philol. Sect. C. I.*

TORONTO, April 7, 1888.

ADDENDA.—Since the above report the Section has held two meetings at which the following papers were read :

- (8) Apr. 10, 1888, "A Chart of Elocution," by T. B. Browning, M.A.
- (9) 24, " " "Volapük, the New World-Language," by D. R. Keys, B.A.
- (10) 24, " " "On some Words of Indian Origin, in the Dialect and Literature of Quebec," by A. F. Chamberlain, B.A.

At the meeting of April 24, the following officers were elected :—  
 Chairman, Rev. J. F. McCurdy, Ph D. ; Vice-Chairman, D. R. Keys, B.A. ; Secretary, A. F. Chamberlain, B.A. ; Ex. Committee, H. R. Fairclough, M.A., W. H. VanderSmissen, M.A., John Squair, B.A., W. H. Fraser, B.A., G. E. Shaw, B. A., and W. H. Huston, M.A.

A. F. C.

The Report of the Chairman of the Photographic Section was read and referred to the Council.

The President read the following :—

ANNUAL REPORT OF THE COUNCIL OF THE CANADIAN INSTITUTE  
 SESSION, 1887-88.

The Council of the Canadian Institute have the honour to lay before the Members their Thirty-Ninth Annual Report :

Early in the past Session the President, Mr. W. H. VanderSmissen, to whose exertions so much of the increased activity and prosperity of the Institute was due, was unfortunately obliged, through the pressure of other duties to resign, and the Vice-President being at the time absent in Europe, Mr. Charles Carpmael was elected to fill the vacant position.

Twenty-six meetings including the annual conversazione, have been held during the past session, at which thirty-nine papers have been read in addition to fifty read at Section meetings. The aggregate number of papers read thus exceeds by seventeen that of the preceding year, when there were but seventy-two, and this number was



again largely in excess of that in any previous year in the history of the Institute. The character of these communications has been fully equal to the standard of previous years, and the range of subjects (as shown in the appendix) has been unusually large. The average attendance at the regular weekly meetings has also shown an increase. It is also satisfactory to notice that there has been a considerable increase in the number of members who have made use of the reading room.

On the occasion of the annual conversazione the Museum of Natural History and Archaeology was opened, and there was an excellent exhibition of photographs by the Photographic Section. There was a large attendance of members and their friends. The Archaeological collection is already extensive, and has been admirably arranged by the Curator, to whom the Institute is greatly indebted for his exertions, both in collecting specimens and in carefully classifying them. The Archaeological Report, which has been bound up with the Annual Report of the Institute for the year 1886-87, is already in the hands of the members, and contains an account of what had been done by the Institute down to December last, in this field.

Our exertions to add to our collection continues unabated, and the Council have thankfully to acknowledge the grant of \$1,000 by the Ontario Government, which will enable us to devote a considerable sum, as in the past year, to this purpose.

The number of books and pamphlets received during the year is shown in Appendix III, to have continued to increase, and to have been considerably more than eight times as large as it was five years ago.

A pamphlet has been prepared by Mr. Sandford Fleming on the subject of "Time Reckoning," and issued by the Institute, for the purpose of introducing the subject, in the educational institutions throughout the Dominion. In this pamphlet the principles of time-reckoning are set forth, with special reference to the recommendations of the Washington conference on the subject. A deputation of the Council of the Institute have waited upon the Minister of Education of the Province of Ontario, and acting on the recommendation of this

deputation, the Minister has requested to be furnished with five hundred copies of the pamphlet for distribution to the head masters of the various high schools and collegiate institutes in the Province. The Council have also sent copies of the pamphlet to the Ministers of Education in the other Provinces.

It will be remembered that it was a paper by Mr. Sandford Fleming, read before this Institute, copies of which were forwarded with a memorial from the Institute to the Marquis of Lorne, then Governor-General of the Dominion of Canada, and through him to the British Government, and to various foreign scientific institutions, which first called prominent attention throughout the world to this subject. The views then advanced by Mr. Sandford Fleming, were very generally accepted by scientific men in all civilized nations, the subject was discussed at various congresses, and in October, 1884, a conference was held at Washington on the invitation of the President of the United States, at which twenty-five nations were represented, and the proposed reforms were by it recommended for adoption by all nations. Your Council have every reason to hope that the pamphlet now issued will facilitate the introduction of these reforms in Canada.

A memorial was also forwarded to the Minister of the Interior in connection with Geological and Mining affairs, and in reply a certified copy of a report of a committee of the Honorable the Privy Council, approved by His Excellency the Governor-General in Council on the 28th September, 1887, has been received, in which it is set forth that a Division of the Geological Branch of the Interior has recently been organized by the appointment to the permanent staff of the Survey of a Mining Engineer and a Mining Geologist to examine and report upon the mining industries of the Dominion, to collect mineral statistics, and otherwise to work out the economic geology of our mining districts.

While congratulating the Institute on the increase in membership and activity, the Council feels it necessary to impress upon the members that much has yet to be done in the direction of the further extension of the Museum and Library. Our accommodation in these is still inadequate, and additional shelving and cases are required.

The balance shewn on our balance sheet is already expended. It therefore urges upon the members the necessity of supporting the present efforts of the Committee of Ways and Means by every means in their power, by contributions, by presenting the claims of the Institute to the public in every possible way, and by endeavoring to obtain new members.

During the past year the Institute has lost by death one of its most distinguished honorary members, Prof. Balfour Stewart, of Owen's College, Manchester. Balfour Stewart's name was first prominently brought before the public by his researches on radiant heat, published in 1858. In 1859 he was appointed Director of Kew Observatory, and held this post until 1870, when he was appointed Professor of Physics at the Owen's College, Manchester. He died of apoplexy on December 18, 1887.

CHARLES CARPMAEL,  
*President.*

On motion of Mr. Browning, seconded by Mr. Noble, the report was received and adopted.

The election of officers for the ensuing year resulted as follows :

President, Charles Carpmael, M.A. ; Vice-President, T. B. Browning, M.A. ; Secretary, Alan MacDougall, M. Inst. C.E. ; Treasurer, James Bain, Jr, Esq. ; Editor, George Kennedy M.A., LL.D. ; Librarian, George E. Shaw, B.A. ; Curator, David Boyle, Ph. B. ; Members of Council, Alex. Marling, LL.B., W. H. Ellis, M.A., M.B., W. H. VanderSmisssen, M.A.

On motion by Mr. Browning, seconded by Dr. Kennedy, it was resolved, "That the thanks of this Institute are due to the newspapers of the City of Toronto for the space which they have so freely given to proceedings of the Institute during the year, and especially to the *Mail* newspaper, for the extended notices of the meetings which have so regularly appeared in its columns."

On motion by Mr. Pearce, seconded by Mr. Pursey, it was

resolved, "That a special vote of thanks be tendered to Mr. W. H. VanderSmitten, M.A., the late President, for the interest he has always taken in the affairs of the Institute, and his active exertions in its behalf, which have contributed so largely to its prosperity."

Votes of thanks were also passed to the retiring Officers, the Assistant-Secretary and the Auditors.

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### APPENDIX I.

Number of Members April 1, 1887.....	290
Withdrawals and deaths during the year.....	27
	<hr/>
	263
Elected during the year.....	56
	<hr/>
Total members April 1, 1888.....	319

Composed of :

Honorary Members.....	6
Life Members.....	12
Ordinary Members.....	301
	<hr/>
Total.....	319
Associates.....	54

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## APPENDIX II.

TREASURER IN ACCOUNT WITH THE CANADIAN INSTITUTE FOR THE YEAR  
ENDING MARCH 31ST, 1888.

To Summary:—

“ Balance on hand.....	\$ 56 40
“ Annual Subscriptions.....	909 75
“ Rents.....	206 50
“ Government Grant.....	1000 00
“ Journals sold.....	7 15
“ Periodicals sold.....	38 80
“ Donation.....	2 50
“ Interest.....	1 14
“ Proceeds of Note.....	200 00
	\$2422 24

By Summary:—

“ Salaries.....	\$ 314 00
“ Printing Journal.....	813 27
“ “ Miscellaneous.....	59 00
“ Stationery.....	2 00
“ Postage.....	78 85
“ Freight and Express Charges.....	13 53
“ Repairs.....	36 64
“ Gas.....	40 75
“ Water.....	24 00
“ Periodicals.....	120 76
“ Furniture.....	11 15
“ Housekeeping.....	43 80
“ Fuel.....	20 75
“ Insurance.....	52 00
“ Blinds.....	10 00
“ Gas Lights.....	19 20
“ Taxes.....	9 75
“ Journals purchased.....	2 50
“ City Directory.....	3 00
“ Chemicals for Museum.....	8 53
“ Grant to Photographic Section.....	40 00



APPENDIX II.--*Continued.*

## ASSETS.

Building.....	\$ 11,500 00
Warehouse.....	720 00
Ground.....	3000 00
Library.....	5500 00
Specimens.....	2000 00
Personal Property.....	1000 00
	<u>\$ 23,720 00</u>

## LIABILITIES.

Mortgage No. 1, due 1892.....	\$ 3000 00
“ 2, “ 1892.....	1000 00
Note discounted.....	200 00
Balance in favour of the Institute.....	19,520 00
	<u>\$ 23,720 00</u>

## APPENDIX III.

*Donations and Exchanges.*—Books and Pamphlets received from April 1st, 1887, to April 1st, 1888 :—From Canada, 229 ; United States, 503 ; Great Britain and Ireland, 466 ; India and Australasia, 90 ; all other countries, 1,045. Total, 2,333.

Total number received in 1882-3, 280 ; in 1883-4, 800 ; in 1884-5, 730 ; in 1885-6, 1,502 ; in 1886-7, 2,230 ; in 1887-8, 2,333.

## APPENDIX IV.

The number of Societies and Publications with which the Institute exchanges is 396.

## APPENDIX V.

The Periodicals subscribed for are the same as last year, with the addition of the *Amateur Photographer*.

## APPENDIX VI.

Classification of papers read by subjects :—Anthropology, 3 ; Archæology, 1 ; Biology, 2 ; Botany, 1 ; Chemistry, 1 ; Economics, 4 ; Geology, 4 ; Geography, 2, Jurisprudence, 1 ; Medicine, 1 ; Metallurgy, 1 ; Meteorology, 1 ; Philology, 4 ; Political Science, 3 ; Psychology, 1 ; Sociology, 1 ; Solar Physics, 1 ; Telegraphy and Telephony, 1 ; Zoology, 4 ; Miscellaneous, 2. Total 39.

Read at Section Meetings :—Architectural Section, 12 ; Biological Section, 22 ; Geological and Mining Section, 6 ; Philological Section, 10. Total 50.

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## SOCIOLOGICAL CIRCULAR.

SIR,—The Canadian Institute is desirous of collecting and incorporating in its PROCEEDINGS reliable data respecting the political and social institutions, the customs, ceremonies, beliefs, pursuits, modes of living, habit, exchange, the devolution of property and office which obtain among the Indian peoples of the Dominion, and of enlisting your voluntary coöperation in the work. It feels that this department of research has not been so fully cultivated in Canada as its importance demands, fears that the opportunity of gathering and carefully testing the necessary facts may with the advancing tide of European civilization soon pass away, and is of opinion that much light may be cast upon the genesis and growth of government as well as upon legal, sociological and economic thought by an accurate study of our Indian tribes in their existing conditions and organizations. Contributions to the philology of the Indian tongues and additions to their folk- or myth-lore will be welcomed as heretofore. At the same time the Institute begs leave, without desiring to contract the field of observation, to direct your attention to the following matters :—

(1.) The basis of family or tribal organization, *e.g.*, whether it be purely personal, or partake to any extent of territorial attributes ; the received mode of ranking and tracing relationships, paternal, maternal, or both ; with a table of degrees, if possible, of agnates and cognates :

(2.) Adoption, its kinds, ceremonies and formulæ, the extent of its use, and the particulars in which it modifies, the family, gens, tribe, etc. :

(3.) The rules and practice which govern the contracting, maintaining and dissolving of marriage ; the degrees of prohibition ; exogamy and endogamy ; the effect of marriage on the status of woman, her position upon divorce, etc. :

(4.) Grades of persons of both sexes apart from office, free and slave ; to what extent mature children of either sex are the subjects of rights ; the age of enfranchisement, if any :

(5.) The character of parental power, paternal and maternal ; its

extent over persons and property in matters civil and criminal ; exceptions to it :

(6.) Offices, their kinds, the powers annexed to them, the terms for which and on which they are held ; the mode of succession, *e.g.*, general election, election by a few, election within a group, inheritance, etc. :

(7.) Assembles or councils and the questions treated at them ; how and by whom they are summoned ; in whom resides the right of debate and franchise in the several assemblies of the family, gens, band, tribe, or nation :

(8.) Property, its admitted classes inside the family and tribe ; joint proprietorship how acquired, held, managed, aliened ; whether common ownership is acknowledged, and in what respects it is distinguished from joint ownership ; whether private property is allowed ; if so, how acquired, enjoyed, transferred, or lost ; whether succession to it is permitted ; if so, within what degrees ; if not, how it is disposed of, *e.g.*, buried with body on death of owner, burnt, or otherwise destroyed :

(9.) Division of labor and duty, civil and military, and how apportioned, *e.g.*, to chiefs, sub-chiefs, ordinary male members, ordinary female members, immature children ; methods and extent of production, modes and measures of distribution, the means of support of family or tribe, the interior economy of family and gens or band ; the modes of bargain and sale in use ; by whom conducted ; the use of gifts :

(10.) The settlement of disputes or conflicting claims as between (a) members of same sub-family, (b) family, (c) different families or sub-families, (d) bands, groups or gentes, (e) tribes, (f) nations ; in whom resides the civil and in whom the criminal power, by tradition or custom ; how and by whom dooms are pronounced and inflicted ; whether punishments as between the tribes are corporate or individual ; the compounding of crimes and offences, *e.g.*, murder, theft ; to what extent the bond of blood-feud binds ; ostracism, surrender of offender, death penalty ; in what cases practiced ; the effect of vows upon the performance of contract :

(11.) The making of inter-family and inter-tribal arrangements, *e.g.*, treaties as to boundaries, peace and war, sale and purchase ; the solemnities observed among larger and smaller groups :

(12.) The cultus and sacrifices which obtain in sub-families, families, *totem*, etc. ; moral or religious code which accompanies them ; the form and purpose of the different tribal or inter-tribal ceremonies in use, *e.g.*, dog-, sun-, thirst-dance, etc. :

(13.) Death and birth rates ; effects of miscegenation :

(14.) Practice in cases of burial, its rites :

(15.) Border civilization, its effect upon the beliefs and moral conduct of Indian peoples :

(16.) The influence of territorial reserves, outside jurisdiction, education and support upon the Canadian Indians :

The Institute will be happy to receive and give its best attention to papers upon any and all the above, or such other subjects allied to them as may seem to you important.

It would appear from reports published in the newspapers that in the Province of Ontario, in the other Provinces and the Territories of the Dominion, a considerable quantity of valuable information concerning our Indian peoples is reduced to writing, but is not given to the world because no proper channel has been established for its dissemination. This Institute desires to draw these scattered rays to a focus for the benefit of students at home and abroad ; and believes that investigators will find in its PROCEEDINGS (now circulating among members in Canada, 300, foreign societies and institutes, 400,) that avenue of communication of which they have been so long in need. Proprietary rights in the papers may be reserved.

For some years the Institute has given special attention to collecting and classifying specimens of natural history, geology, and Indian archaeology which, according to the custom of the Institute, are duly inscribed with the names of the donors. Its museum includes many very rare and valuable specimens which are open for inspection and study every lawful day from 1 p.m. to 6 p.m. It is the desire of the Institute to increase its collection in all departments, enhance its public usefulness and render it worthy of the Dominion as a national institution. Through the liberality of the Canadian Pacific Railway

Company, the Institute is enabled to make announcement to donors and intending donors that specimens for the museum will be carried over the Company's line free of charge in packages suitably packed for freight.

It is particularly requested that packages of specimens for transmission by rail, papers, abstracts, communications in or pertaining to the matters of this circular be directed to

*The Chairman of*

THE SOCIOLOGICAL COMMITTEE.

*Canadian Institute,*

*46 Richmond Street East,*

*Toronto, Ont.*

CHARLES CARPMAEL, M.A., F.R.A.S., F.R.S.C., *President.*

GEORGE KENNEDY, LL.D., *Editor.*

ALEX. MARLING, LL.B.

T. B. BROWNING, M.A., *Vice-President. Chairman of*

Sociological  
Committee.

Toronto, June, 1888.

## CATALOGUE OF THE MAMMALIA OF CANADA EXCLUSIVE OF THE CETACEA.

BY J. B. TYRRELL, B.A., F.G.S.

The preparation of the present catalogue has been undertaken with the view of putting before the naturalists of Canada a short synopsis of the results of what has been done in recording the occurrence of the Mammalia in the Dominion up to the present time, and of stirring them up to renewed endeavours to fill in the many gaps which there evidently are in the list as it now stands, especially among the smaller Rodents and Insectivores.

Its synoptical character precludes the necessity of inserting a complete list of synonyms under each species, and those only have been mentioned which can be most readily referred to, or if unknown would be most likely to lead to confusion. The Cree and Saulteaux (Ojibway) names of the different animals have, whenever known, been given, as they will very often facilitate the obtaining of much valuable information from those tribes of Indians. These names have in all cases been obtained by the writer from the Indians themselves, or from half-breeds living with them, and in writing them the vowels have been given the continental sounds.

The catalogue has necessarily been to a large extent compiled, but during the past five years, while travelling in Manitoba and the North-West Territories, I have had the opportunity of making many observations on the distribution of the Mammalia, and the results of these observations have been incorporated throughout. Free use has also been made of the specimens collected for the Geological and Natural History Museum at Ottawa, and several of the officers of the Geological and Natural History Survey have furnished me

with valuable notes; while for the notes on the Seals I am largely indebted to Mr. J. W. Tyrrell, who spent the winter of 1885-86 on Hudson's Straits, in charge of one of the Government Meteorological Stations.

The following are the principal books and papers relating to the Mammals of Canada, but there are many others that contain brief notices of one or more species:

Richardson, John. Fauna Boreali-Americana. London, 1829.

Audubon and Bachman. Quadrupeds of North America, 3 vols. New York, 1856.

Baird, Spencer F. Mammals. Washington, 1857.

Ross, Bernard H. List of the Mammals, etc., observed in the Mackenzie River District. Nat. Hist. Review, 1862, pp. 271-276.

Allen, H. Monograph of the Bats of North America, Smithsonian Institute, Washington, 1864.

Lord, John Keast. The Naturalist in British Columbia. London, 1866.

Gilpin, J. Bernard. On the Mammalia of Nova Scotia. Trans. Nov. Sc. Inst. Nat. Sci., vol. 3, 1871.

Coues and Allen. Monographs of North American Rodentia. Washington, 1877.

Coues, Dr. Elliott. Precursory Notes on American Insectivorous Mammals. Bull. U. S. Geol. Survey, 1877.

Coues, Dr. Elliott. Fur-bearing Animals. Washington, 1877.

Allen, Joel Asaph. North American Pinnipeds. Washington, 1880.

Chamberlain, M. List of Mammals of New Brunswick. Bull. Nat. Hist. Soc. N. B., 1884.

Thompson, E. T. A List of the Mammals of Manitoba. Trans. Man. Sci. & Hist. Soc. 188(6)7.

Saint-Cyr, D. N. The Pinniped Mammalia of the River and Gulf of St. Lawrence. Quebec, 1887.

Various articles by officers of the survey in the Reports of the Geological and Natural History Survey of Canada.

## UNGULATA.

ALCE AMERICANUS, *Jardine*.

Moose.

*Cervus Alces*, Rich.*Mooswa*. Western Cree.*Mooz*. Sauteaux.

Common in the forest regions from Nova Scotia and New Brunswick westward to the Rocky Mountains, and north-westward to the mouth of the Mackenzie river and Alaska. Rare on the west side of the Rocky Mountains in Southern British Columbia, but reported as far west as the Gold Range.

RANGIFER CARIBOU, *Linn*.

Woodland Caribou.

*Cervus tarandus sylvestris*, Rich.*Muskcek-a-tik*. Western Cree.*A-tikh*. Northern Manitoba Cree.*A-tikh*. Sauteaux.

Formerly abundant in Nova Scotia, but now almost extinct. Common in the more thickly wooded parts of northern New Brunswick, Quebec and Ontario, the North-West Territories and British Columbia, but very rare in north-western Manitoba.

RANGIFER GROENLANDICUS, *Linn*.

Barren Ground Caribou.

*Cervus tarandus*, var. *arctica*, Rich.

All the northern parts of the continent with the adjacent islands in the Arctic Ocean.

CERVUS CANADENSIS, *Erwl*.

American Elk. "Red Deer." Wáskasew.

*Cervus strongyloceras*, Rich.*Wa-was-ka-si-o*. Cree.*Mus-koos*. Sauteaux.

Up to a hundred years ago an inhabitant of Eastern Canada,

but now only occasionally met with from Manitoba westward to the Pacific coast, as far north as Lat. 57°, and also on Vancouver and some of the adjacent islands. Being easily approached it is becoming rapidly exterminated.

The name "Wapiti" was applied to this species by Richardson, who was apparently under the erroneous impression that the Indians knew it by this name. The Indian name "Wapatik" belongs, however, to the Mountain Goat and not to the Waskasew. The former means "white deer" (both the mountain sheep and mountain goat being considered as deer) and it would therefore only apply to the white Mountain Goat.

*CARIACUS VIRGINIANUS*, Bodd.

Virginia Deer.

*Wap-ai-oos*. Western Cree.

*Wép-ai-oos*. N. Man. Cree.

South-western New Brunswick, central Quebec and Ontario; and as var. *leucurus* Dougl. from the Plains of the Saskatchewan westward to the Pacific coast and Vancouver Island.

*CARIACUS MACROTIS*, Say.

Mule Deer. Black-tailed Deer.

*Kas-ki-ché-wai-oos* (the Black-tail). N. Man. Cree.

*Kwas-kwé-pai-hoos* (the Jumper). N. Man. Cree.

*Mu-ke-ché-wai-oos*, (the Black-tail). Saulteaux.

*A-pi-si mo-soos*, (the little Moose) Cree. Applied both to this and to the preceding species.

Plains of the Saskatchewan and westward as far as the Cascade range in British Columbia.

*CARIACUS COLUMBIANUS*, Rich.

Black-tailed Deer.

*Cervus macrotis*, var. *Columbianus*, Rich.

Westward from the Rocky Mountains to the islands off the coast of British Columbia.



ANTILOCAPRA AMERICANA, *Ord.*

Antelope. Cabree.

*Antilope furcifer*, (Smith) Rich.*A-pis-ché-chi-koo*. Cree and Saulteaux.

Plains south of the North Saskatchewan eastward to the Missouri Coteau, and occasionally to the banks of the Assiniboine in the vicinity of Fort Ellice. Among the Cavi-cornia this animal is peculiar and resembles the deer in annually shedding the outer corneous portion of its horns.

APLOOERUS MONTANUS, *Ord.*

Rocky Mountain Goat.

*Capra Americana*, Rich.*Wap-a-tik* (white deer). Cree.

From the Rocky Mountains westward to the Cascade Range and as far northward as the Arctic Circle.

OVIS MONTANA, *Cuv.*

Mountain Sheep. Big-horn.

*Mai-a-tik*. Cree.

Rocky Mountains to the Coast Range in British Columbia and as far north as the Arctic Circle.

OVIBOS MOSCHIATUS, *Zimm.*

Musk Ox.

Barren grounds west of Hudson's Bay, to near the eastern boundary of Alaska. Not found further south than Lat. 59°.

BOS AMERICANUS, *Gmel.*

Buffalo. Bison.

*Moos-toos*. Cree.

Formerly living on the plains from the Red River to the foot or occasionally in the Passes to the west of the summit of the Rocky Mountains, chiefly found south of the forest line but some used to stray as far north along the Mackenzie River as Lat. 64°.

Now practically extinct in Canada though a small herd was

seen by the writer near the Red Deer River in 1884. A few are still in existence in the basin of the Mackenzie River, and these which never migrate to the south, have come to be known as Wood Buffalo. With regard to these, Mr. King, the Hudson's Bay officer who is now in charge of Fort Pelly, but who till very lately has lived in the Peace and Mackenzie Rivers District, kindly furnished me with the following notes, stating at the same time that he had seen many of them. The animals will average two hundred pounds heavier than their prairie cousins and their hair is darker and thicker. When the Wood Buffalo were abundant in the Peace River country, the Prairie Buffalo were also very abundant. They lived in the open poplar woods outside the limits of the true forest, a style of country that is especially common throughout the North-West Territory. At present there are two bands known to be in existence. One band of about five hundred lives on what is locally known as the "Salt Plain" which is a prairie from five to twenty miles wide, stretching for five hundred miles south-westward from the vicinity of Fort Smith on the Slave River to the foot of the Rocky Mountains. Another band of about a hundred is roaming on a smaller prairie lying to the south-east of Fort McMurray between the Athabasca and Clearwater Rivers. Mr. King states that the two forms are very easily distinguished. Mr. Campbell, however, the Hudson's Bay officer who first established forts on the Yukon River, informed me that it was often impossible to distinguish what was known as the Wood Buffalo from the Prairie Buffalo.

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### CARNIVORA.

FELIS CONCOLOR, *Linn.*

Cougar. Panther. Puma. Mountain Lion.

*Mista-pi-sioo* (big cat). Cree.

Found in rough wooded regions in southern Quebec, the Rocky Mountains, British Columbia, and Vancouver Island.

LYNX RUFUS, *Gmel.*

Wild Cat.

Common in Nova Scotia, New Brunswick, southern Quebec and Ontario. On the western side of the Rocky Mountains it is represented by the variety *fasciatus*.

LYNX CANADENSIS, *Geoff.*

Canada Lynx.

*Felis Canadensis*, Rich.*Pi-sioo*. Cree.*Pi-si*. Sauteaux.

In wooded country from the Atlantic to the Pacific, and in the summer migrating down the Mackenzie River to the Arctic Ocean.

CANIS LUPUS OCCIDENTALIS, *Rich.*

Wolf.

*Mu-hi-kun*. Cree.*Ma-ing-gun*. Sauteaux.

Rare in Nova Scotia and New Brunswick, but still occasionally seen in the wooded parts of Quebec, Ontario, the North-West Territories and British Columbia.

Var. *griseus*. Grey Wolf.

Is the common form east of the Rocky Mountains.

Var. *albus*. White Wolf.

On the northern barren grounds, and on the islands in the Arctic Ocean and occasionally further south.

Var. *ater*. Black Wolf.

From the Mackenzie and Saskatchewan Rivers to the Pacific coast.

CANIS LATRANS, *Say.*

Coyoté.

*Mista-chagonis* (big belly). Cree and Sauteaux.

Plains and partly wooded country throughout Manitoba and the North-West Territories, though much more plentiful on the Upper Saskatchewan than elsewhere; also on the plains in the southern portion of British Columbia.

*CANIS FAMILIARIS*, Say.Var. *borealis*, Desin.

Eskimo Dog.

Among the Eskimo on the north coast of America and on the islands of the Arctic Ocean.

Var. *lagopus*, Rich.

Hare Indian Dog.

Among the Hare Indians on the banks of the Mackenzie River.

*VULPES VULGARIS*, Fleming.Var. *fulvus*. Red Fox.Var. *decussatus*. Cross Fox.Var. *argentatus*. Silver or Black Fox.*Mu-ki-sioo*. Western Cree.*Ma-ka-sis*. N. Man. Cree.*Wa-kush*. Sauteaux.

All these varieties are more or less common in the wooded or partly wooded countries from the Atlantic to the Pacific.

*VULPES MACRORURUS*, Baird.

Prairie Fox.

Plains of southern British Columbia and also on Vancouver Island.

*VULPES VELOX*, Say.

Kit Fox.

*Canis cinereo-argentatus*, Sabine.

*Chi-kan-a-kow-esis*, (louse eggs with hair). Cree and Sauteaux.

*Wa-chi-koo-mi-sis*, (a lousy thing). Cree and Sauteaux.

On the plains and prairies from Manitoba westward to the Rocky Mountains.

*VULPES LAGOPUS*, Linn.

Arctic Fox. White Fox.

and Var. *fuliginosus*.

Blue Fox.

Barren grounds and northern shores of the Continent as far south into Hudson's Bay as Fort Churchill, and very far north on the islands in the Arctic Ocean. Mr. J. W. Tyrrell informs me that the blue variety breeds true to its own color, and remains of essentially the same color throughout the year. One that he trapped in January, 1886, on the north shore of Hudson's Strait, and which is now in the Geological and Natural History Museum in Ottawa, is of a beautiful dark blueish gray color.

GULO LUSCUS, (*Linn.*) *Sabine.*

Wolverene. Carcajou. Glutton.

Formerly found in New Brunswick, and now occasionally met with in the northern parts of Quebec and Ontario. Found principally in the wooded parts of the North-West Territories to the northern limit of trees, and in British Columbia south to the boundary line.

MUSTELA PENNANTI, *Eræl.*

Pekan. Fisher.

*Mustela Canadensis*, Linn.

and Var. *alba*, Rich.

*O-cheek*. Cree and Sauteaux.

Nova Scotia, New Brunswick, and westward in wooded country to the Pacific, being found as far north as Great Slave Lake.

MUSTELA AMERICANA, *Turton.*

Marten. Pine-Marten.

*Mustela martes*, Rich.

*Wa-pis-tan*. Western Cree,

*Wap-se-sivo*. N. Man. Cree.

*Wa-pi-sis*. Sauteaux.

From the Atlantic to the Pacific as far north as the northern limit of trees.

PUTORIUS VULGARIS, *Linn.*

Weasel.

*Putorius pusillus*, Aud. and Bach.

*Si-koos*. N. Man. Cree.

*Sin-goosh*. Sauteaux.

From the Atlantic to the Pacific, at least as far north as Great Slave Lake.

*PUTORIUS ERMINEUS*, Linn.

Ermine.

Everywhere in Canada from the Atlantic to the Pacific.

*PUTORIUS LONGICAUDA*, Bonap.

Long-tailed Weasel.

From the Plains of the Saskatchewan westward to the Pacific.

*PUTORIUS VISON*, Brisson.

Mink.

*Putorius lutreolus*, (Cuv.) Allen.

*Putorius nigrescens*, Aud. and Bach.

*At-jak-as* and *Shan-gwash*. Cree.

*Shan-gwa-si*. Sauteaux.

Throughout the whole of Canada from the Atlantic to the Pacific.

*MEPHITIS MEPHITICA*, Shaw.

Skunk.

*Mephitis Americana*, var. *Hudsonica*, Rich.

*Mephitis occidentalis*, Baird.

*Si-kak*. Cree and Sauteaux.

Abundant in wooded and partly wooded country from the Atlantic to the Pacific, as far north as Great Slave Lake.

*MEPHITIS PUTORIUS*, Linn.

Little Striped Skunk.

J. K. Lord records it from southern British Columbia.

*TAXIDEA AMERICANA*, Schreb.

Badger.

*Meles Labradoria*, (Sabine) Rich.

*Mis-tan-isk*. Cree.

*Mis-tan-ak*. Sauteaux.

On the plains and prairies from the Red River westward to the Rocky Mountains, as far north as the Saskatchewan and probably as far as Peace River. Also on the plains in southern British Columbia. Rapidly becoming extinct.

LUTRA CANADENSIS, *Turton*.

Otter.

*Lutra Californica*, Baird.

*Lutra destructor*, Barnston.

*Ni-kik*. Cree and Sauteaux.

From Nova Scotia and New Brunswick across the continent to Vancouver Island, and northward to the Arctic circle, or into the Barren Grounds.

ENHYDRA MARINA, *Steller*.

Sea Otter.

*Enhydria lutris*, (Linn.) Coues.

Western coast of British Columbia.

PROCYON LOTOR, (Linn.) *Storr*.

Raccoon.

*E-se-pun*. Cree and Sauteaux.

Nova Scotia, New Brunswick and westward to the west side of Lake Manitoba.

Var. *Hernandezii*.

Vancouver Island and southern British Columbia.

URSUS HORRIBILIS, *Ord*.

Grizzly Bear.

*Ursus ferax*, Rich.

*Mist-a-ya*. Cree.

Formerly when buffalo were plentiful, an inhabitant of the plains along the Saskatchewan, but now confined to the mountains through which they roam northward as far as the Yukon.

URSUS ARCTOS, Rich.

Barren-Ground Bear.

On the Barren Grounds in the northern parts of Canada.

URSUS AMERICANUS, *Pallas.*

Black Bear. Brown Bear.

*Mus-kwa.* Cree.*Ma-kwa.* Saukteaux.

Common throughout Canada from the Atlantic to the Pacific, as far north as the northern limit of trees.

THALASSARCTOS MARITIMUS, *Linn.*

Polar Bear. White Bear.

Along the shores and on the islands of the Arctic Ocean, sometimes straying about a hundred miles inland.

## PINNIPEDIA.

ODOBAENUS ROSMAREUS, *Malmgren.*

Walrus.

In comparatively recent times it inhabited the shores of Nova Scotia. Now it is confined to the shores of Labrador, Hudson's Strait and Bay and Davis Strait, as far north as explorers have reached. It appears to be very rarely met with between Melville Peninsula and Point Barrow.

EUMATOPIUS STELLERI, *Lesson.*

Sea Lion.

Shores of the North Pacific from Behring's Strait southward to California.

CALLORHINUS URSINUS, (*Linn.*) *Gray.*

Northern Fur Seal. Sea Bear.

West coast of British Columbia from Alaska to the International Boundary.

PHOCA VITULINA, *Linn.*

Harbor Seal. Fresh-water Seal.

*Ka-si-gia.* Eskimo.

This species inhabits both the Atlantic and Pacific coasts.



of Canada and ascends many of the larger rivers. It has been known to ascend the St. Lawrence to Lake Ontario, and the Ottawa River to the foot of the Chaudiere Falls at Ottawa. Found in Hudson's Strait, though not very abundantly at Ashe's Inlet, but in considerable numbers around the middle Savage Islands.

"The pups have a soft black glossy coat when born, but they soon become spotted, and as they grow older their coat becomes faded and coarser.—J. W. T."

*PHOCA (PUSA) FOETIDA, Fabr.*

Ringed Seal.

*Nit-chill.* Eskimo.

From the coast of Labrador around the north shore of the continent to Alaska. In Hudson's Strait it is the commonest species and is the principal food of the natives.

"The young are covered with a white fur."

*PHOCA (PAGOPHILUS) GROENLANDICA, Fabr.*

Harp Seal.

It sometimes strays as far south as Nova Scotia, but is especially abundant off the shores of Newfoundland and along the coast of Labrador into Davis Strait. In Hudson's Strait it is common on the south shore, but on the north shore it is rarely met with.

*ERIGNATHUS BARBATUS, Fabr.*

Bearded Seal. Square-flipper.

*Ug-joo.* Eskimo.

This species occurs in the Gulf of St. Lawrence, on the coast of Labrador, and on the shores of the Arctic Ocean, extending far north among the islands. The young has a soft grey coat of a little darker shade than that of the old one.

*HALICHAERUS GRYPUS, Fabr.*

Grey Seal.

A rare species confined to the North Atlantic, where it has been found as far south as Sable Island, Nova Scotia, whence it ranges northward along the coast of Greenland.

CYSTOPHORA CRISTATA, *Erxl.*

Hooded Seal. Jumping Seal.

*Cow-a-galee?* Eskimo.

Shores of the Gulf of St. Lawrence, coasts of Newfoundland and Labrador and far northward into the Arctic Seas.

## RODENTIA.

NEOTOMA CINEREA, (*Ord*) *Baird.*

Bushy-tailed Wood Rat.

*Neotoma Drummondii*, Rich.

Western and North-western Canada, from the Rocky Mountains westward to the Pacific coast.

HESPEROMYS LEUCOPUS, *Raf.*

White-footed or Deer Mouse.

*Cricetus myoides*, Gapper.*Hesperomys muoides*, Baird.*Hesperomys leucopus*, Baird.*Hesperomys Boylii*, Baird.*Wa-pi-kan-o-chi* (White Mud Thing). Saulteaux.

From Nova Scotia and New Brunswick to the Pacific coast and northward to the Arctic Ocean.

HESPEROMYS LEUCOPUS, var. *Sonoriensis*, *Leconte.**Mus leucopus*, Rich.

Hudson's Bay to the Pacific coast and as far north as the mouth of Mackenzie River.

HESPEROMYS MICHIGANENSIS, *Aud. and Bach.*

Michigan Mouse.

Recorded by Thompson from Manitoba.

HESPEROMYS LEUCOGASTER, *Maxim.*

Missouri Mole-mouse.

Found by Dr. E. Cones on the Red River, so that it will doubtless be found in Manitoba.

EVOTOMYS RUTILUS, *Pallas*.

Long-eared Mouse.

New Brunswick to the west coast as far north as Fort Good Hope on the Mackenzie River.

EVOTOMYS RUTILUS, var. *Gapperi*, *Vigors*.

Red-backed Mouse.

Has been found in Nova Scotia, Manitoba, and on the west coast of Hudson's Bay. General range south of that of true *rutilus*.

ARVICOLA RIPARIUS, *Ord*.

Meadow Mouse.

*Arvicola Pennsylvanicus*, (Ord) Rich.

*Kwa-skwan-da-pi-kan-o-chi* (Jumping Mouse). *Saulteaux*.

From Nova Scotia and New Brunswick to the Rocky Mountains and doubtless also to British Columbia.

ARVICOLA RIPARIUS, var. *borealis*, *Rich*.

Little Northern Meadow Mouse.

*Arvicola borealis*, Rich.

North-western America, especially in the Mackenzie River region.

ARVICOLA TOWNSENDI, *Bach*.

Townsend's Meadow Mouse.

Recorded from Puget Sound so that it doubtless also occurs in southern British Columbia.

ARVICOLA XANTHOGNATHUS, *Leach*.

Chestnut-cheeked Meadow Mouse.

In North-western Canada from the Hudson's Bay to the Pacific.

ARVICOLA XANTHOGNATHUS, var. *Richardsoni*, *DeKay*.

Large Northern Meadow Mouse.

*Arvicola riparius*, (Ord) Rich.

Range essentially the same as the preceding.

ARVICOLA OREGONI, *Bach.*

Oregon Meadow Mouse.

Southern British Columbia.

ARVICOLA NOVEBORACENSIS, (*Raf.*) Rich.

Sharp-nosed Meadow Mouse.

*Arvicola Drummondii*, Aud. and Bach.

On the eastern slope of the Rocky Mountains about the head of the Athabasca River.

MUS DECUMANUS, *Pallas.*

Grey or Norway Rat.

Throughout the more settled parts of the Dominion. In the North-West Territories, found sparingly along the lines of railway.

MUS RATTUS, *Linn.*

Black Rat.

Recorded from both the Atlantic and Pacific sea-boards, but it has never reached far into the interior.

MUS MUSCULUS, *Linn.*

House Mouse.

Common in all the more settled parts of the country, but in Manitoba and the North-West Territories not yet found away from the lines of railway.

SYNAPTOMYS COOPERI, *Baird.*

Found both in Minnesota and Alaska and so will doubtless be found in Manitoba and the North-West Territories.

MYODES OBENSIS, *Brants.*

Tawny Lemming.

*Arvicola helvolus*, Rich.*Arvicola trimucronatus*, Rich.

Found around Great Bear Lake, and in the Rocky Mountains as far south as Lat. 56°.

CUNICULUS TORQUATUS, *Pallas*.

Hudson's Bay Lemming.

*Arvicola (Georychus) Hudsonius*, Rich.*Arvicola Groenlandica*, (Traill) Rich.

From Labrador around the northern coast of the continent, and on the islands in the Arctic Ocean.

ZAPUS HUDSONIUS, (*Zimm.*) *Coues*.

Jumping Mouse.

*Meriones Labradorius*, Rich.

*Kis-chi-kwa-skwan-da-pi-kan-o-chi*. (Big Jumping Mouse). Saulteaux.

Nova Scotia and New Brunswick and westward along the Saskatchewan to British Columbia, reaching as far north as Fort Simpson on the Mackenzie River.

FIBER ZIBETHICUS, *Linn.*

Muskrat.

*Fiber Osoyoosensis*, Lord.*Wa-chask*. Cree.*Wa-shushk*. Saulteaux.

Throughout the whole of Canada as far north as the Arctic Ocean.

LEPUS TIMIDUS, *Linn.*, var. *arcticus*, *Leach*.

Polar Hare.

*Lepus glacialis*, (Leach) Rich.

Barren grounds in northern Canada as well as on the shores of the Arctic Ocean, reaching as far south into Hudson's Bay as Fort Churchill.

LEPUS CAMPESTRIS, *Bach*.

Prairie Hare. "Jack Rabbit."

*Lepus Virginianus*, (Harlan) Rich.*Mist-a-pus*, (big hare). Cree.

Plains from the western limit of Manitoba westward to the base of the Rocky Mountains as far north as the Saskatchewan River. Also on the plains in southern British Columbia.

LEPUS AMERICANUS, *Erx.*

Varying Hare. Rabbit.

*Wapus.* Cree.*Wapoos.* Sauteaux.

Found throughout the northern part of the Continent as far north as the northern limit of trees.

LEPUS SYLVATICUS, *Bach.*

Wood Hare. Grey Rabbit.

Becoming quite common throughout Ontario.

Var. *Nuttalli* (*Lepus Artemisia*) is inserted by Lord in his list of Mammals from southern British Columbia, but from a previous remark in the text one would be led to infer that he obtained his specimens from a locality some distance south of the International Boundary Line.

LEPUS CALIFORNICUS, *Gray.*

Californian Hare.

Mentioned in J. K. Lord's List of Mammals from British Columbia.

ERETHIZON DORSATUS, *Linn.*

Canada Porcupine.

*Hystrix pilosus*, (Catesby) Rich.*Kakwa.* Cree.*Kak.* Sauteaux.

New Brunswick and Nova Scotia north-westward to Hudson's Bay, along its western shore to Fort Churchill and westward to the Mackenzie River.

Var. *epixanthus*, Brandt.

Yellow-haired Porcupine.

On the Pacific slope, and in the Rocky Mountains northward to the Liard River.

LAGOMYS PRINCEPS, *Rich.*

Little-chief Hare. North American Pika.

*Lagomys minimus*, Lord.

From the eastern slope of the Rocky Mountains westward along the International Boundary Line as far as Chilùkweyuk Lake, and northward to Lat. 60°. Lord found his *L. minimus* near the banks of the Similkameen River, on the eastern side of the Cascade range, but at an altitude of 7,000 feet.

CASTOR FIBER, *Linn.*

Beaver.

*Castor fiber Americanus*, Rich.

*Castor Canadensis*, Kuhl.

*Amisk*. Cree.

*Amikh*. Saulteaux.

Throughout the whole of Canada to the northern limit of trees.

PEROGNATHUS MONTICOLA, *Baird.*

Mountain Pocket Mouse.

Recorded by J. K. Lord from southern British Columbia.

APLODONTIA LEPORINA, *Rich.*

Sewellel. Showt'l. Ou-ka-la.

*Haplodon rufus*, Cones.

Eastern and western slopes of the Cascade Range in British Columbia.

GEOMYS BURSARIUS, (*Shaw*) *Rich.*

Pouched Gopher.

Originally described from a specimen brought from eastern Canada.

THOMOMYS TALPOIDES, *Rich.*

Northern Pocket Gopher.

*Po-ta-chi-ka-sioo*. N. Man. Cree.

*Po-ta-chi-pin-gwa-si*, (The thing that blows up the loose earth). Saulteaux.

Very numerous in rich alluvial meadows from Manitoba westward along the Saskatchewan to the base of the mountains.

The surface is in many places undermined by this species to such an extent that a horse will repeatedly break through, thus making travelling both very tedious and unpleasant.

THOMOMYS TALPOIDES, var. *bulbivorus*, Rich.

Pacific Pocket Gopher.

*Diplostoma?* *bulbivorum*, Rich.

*Geomys Douglassii*, Rich.

Southern portion of British Columbia.

SCIUROPTERUS VOLUCELLA, Pallas.

Var. *Hudsonius*, Gmel.

Northern Flying Squirrel.

*Pteromys sabrinus*, Rich.

*Pteromys sabrinus*, var. *B. alpinus*, Rich.

*Pteromys Oregonensis*, Bach.

*Sa-ka-skan-da-wa-si*, (a thing that sticks close to anything). *Saulteaux*.

From the Atlantic to the Pacific as far north as Hudson's Bay, Great Slave Lake and Fort Liard.

SCIURUS HUDSONIUS, Pallas.

Red Squirrel. Chickaree.

*A-ni-wa-chask*. Cree.

*A-chit-a-moo*. *Saulteaux*.

From the Atlantic westward to the Rocky Mountains and northward to the northern limit of trees.

Var. *Richardsoni*, Bach.

Rocky Mountains to the Cascade Range in the vicinity of the International Boundary Line.

Var. *Douglassii*, Gray.

*Sciurus Hudsonius*, var.  $\beta$ , Rich.

Coast of British Columbia.



SCIURUS CAROLINENSIS, *Gmel.*

Grey Squirrel. Black Squirrel.

*Sciurus niger*, Rich.

*Sciurus leucotis*, Gapper.

*Sciurus migratorius*, Aud. and Bach.

From western New Brunswick, through southern Quebec and Ontario as far west as the north shores of Lakes Huron and Superior. Especially abundant, however, in the wooded parts of the Western Peninsula of Ontario.

SCIURUS FOSSOR, *Peale.*

California Grey Squirrel.

Given in Lord's list of Mammals from southern British Columbia.

TAMIAS STRIATUS, *Linn.*

Striped Squirrel. Chipmunk.

*Sciurus (Tamias) lysteri*, (Ray) Rich.

Common from the Atlantic coast westward to eastern Manitoba. Not found west of Lake Manitoba.

TAMIAS ASIATICUS, *Gmel.*

Var. *borealis*, Cones.

Northern Chipmunk.

*Sciurus (Tamias) quadrivittatus*, Rich.

*A-kwin-gwis*. Saulteaux.

Ranges from the western side of Hudson's Bay, on the Churchill and Nelson Rivers to the north shore of Lake Superior, westward to the Rocky Mountains and northward on the Mackenzie River to the Arctic Circle.

Var. *quadrivittatus*, Say.

Rocky Mountains, and mountains in British Columbia in the vicinity of the International Boundary Line.

Var. *Townsendi*, Bach.

Coast of British Columbia.

TAMIAS LATERALIS, *Say*.

Say's Chipmunk.

*Arctomys (Spermophilus) lateralis*, Rich.

Rocky Mountains from the International Boundary north to Lat. 57°.

SPERMOPHILUS EMPETRA, *Pallas*.

Parry's Spermophile.

*Arctomys (Spermophilus) Parryi*, Rich.*Arctomys Kennicottii*, Ross.

Barren grounds from the east side of Hudson's Bay to Alaska, as far north as the Arctic circle.

Var. *erythroglutæus*, Rich.

Rocky Mountains from the Boundary Line north to Lat. 57°.

SPERMOPHILUS RICHARDSONI, (*Sabine*) *Rich.*

Richardson's Spermophile. Grey Gopher.

*A-pis-chin-a-kwa-cha-shuk*, (a little squirrel). *Saulteaux*

From the Pembina Escarpment in Manitoba to the base of the Rocky Mountains, and northward to the Saskatchewan.

Var. *Townsendi*, *Bach*.*Arctomys (Spermophilus) guttatus*, Rich.

Southern portion of British Columbia.

SPERMOPHILUS FRANKLINI, *Sabine*.

Grey-headed Spermophile.

*A-pis-chan-as-koos*, (a little badger). *Cree*.*Mist-a-chit-a-moo*, (a big squirrel). *Saulteaux*.

Western Manitoba northward to the Saskatchewan River, but none were seen as far west as Fort Pitt.

SPERMOPHILUS TRIDECIMLINEATUS, *Mitchill*.

Striped Gopher.

*Arctomys (Spermophilus) Hoodi*, Rich.*Sa-sa-wa-pas-koos*. *Cree*.*Ta-chi-kow-kan-a-see* (striped back). *Saulteaux*.

From Red River westward to the base of the Rocky Mountains, as far north as the North Saskatchewan.

ARCTOMYS MONAX, *Linn.*

Woodchuck. Ground-hog.

*Arctomys empetra*, (Sabine) Rich.*Arctomys pruinosus*, Gmelin.*A-kwa-kwa-chis*. Saulteaux.

Nova Scotia and New Brunswick and westward around the shores of Hudson's Bay to the Mackenzie and Liard Rivers, as far north as Lat. 62°.

ARCTOMYS CALIGATUS, *Eschscholtz.*

Hoary Marmot.

*Arctomys pruinosus*, (Gmel.) Rich.*Arctomys Okanaganus*, King.

Rocky Mountains westward to the Cascade Range and northward to the Arctic Circle. Often seen among heaps of angular masses of loose rock. I can find no reference to its being found east of the Rocky Mountains.

The specific name *caligatus* has here been used instead of *pruinosus*, which latter name, as was pointed out to me by Prof. Macoun, appears to have been in all probability first applied to a light-colored specimen of *monax*. Pennant's description on which Gmelin's name *pruinosus* was founded, as given in Coles and Allen's "Monographs of North American Rodentia" p. 926, agrees so well with a specimen of *A. monax* from Hudson's Bay, the original locality, now in the Geological and Natural History Museum, that I have very little hesitation in placing Gmelin's species as a synonym of *A. monax*; and although the *A. pruinosus* of Richardson is undoubtedly the true *A. caligatus*, his name cannot stand on account of its having been formerly applied to a different species.

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 INSECTIVORA.
SCALOPS AQUATICUS, *Linn.*

Common Mole.

Common throughout Eastern Canada.

SCAPANUS TOWNSENDI, *Bach.*

Oregon Mole.

*Scalops Canadensis*, Rich.*Scalops latimanus*, Bach.*Scalops aeneus*, Cassin.

Southern portions of British Columbia.

SCAPANUS BREWERI, *Bach.*

Hairy-tailed Mole.

New Brunswick.

CONDYLURA CRISTATA, *Linn.*

Star-nosed Mole.

*Condylura longicauda*, (Ill.) Rich.*Condylura macroura*, Rich.

From the Atlantic Coast north westward to Hudson's Bay and westward to the Rocky Mountains.

UROTRICHUS GIBBSI, *Baird.*

Chilukweyuk River in southern British Columbia.

NEOSOREX PALUSTRIS, *Rich.*

Marsh Shrew.

Nova Scotia to the Rocky Mountains around the borders of lakes.

SOREX TROWBRIDGII, *Baird.*

Southern British Columbia.

SOREX FORSTERI, *Rich.*

Forster's Shrew.

From Nova Scotia to the Rocky Mountains, and as far north on the Mackenzie River as the Arctic Circle.

SOREX THOMPSONI, *Baird.*

Thompson's Shrew.

Halifax, Nova Scotia.

SOREX VAGRANS, (Cooper) *Baird.*

Southern British Columbia.

SOREX SUCKLEYI, *Baird*.

Southern British Columbia.

SOREX PACHYURUS, *Baird*.

Found at Pembina, Minn., so it doubtless will be found in Manitoba.

SOREX PLATYRHINUS, *DeKay*.

Nova Scotia and New Brunswick.

SOREX PERSONATUS, *Geoff*.

Cooper's Shrew.

*Ki-ni-ki-si-wa-pi-kan-o-chi*, (Sharp-nosed mouse).

Saulteaux.

New Brunswick to the eastern slope of the Rocky Mountains

SOREX BELLI, *Dobson*.

Near York Factory, Hudson's Bay.

SOREX SPHAGNICOLA, *Coues*.

Fort Liard in the north-eastern corner of British Columbia.

BLARINA TALPOIDES, *Gapper*.

Nova Scotia to Western Ontario.

BLARINA BREVICAUDA, *Say*.

Nova Scotia and New Brunswick, westward to Eastern Manitoba.

BLARINA AUGUSTICEPS *Baird*.

Nova Scotia.

BLARINA CINEREA, *Bach*.

Nova Scotia.

## CHEIROPTERA.

ATALAPHA NOVEBORACENSIS, *Tomes.*

Red Bat.

*A-pu-kwan-a-chis.* Cree. *A-pu-kwan-a-chi.* (A covering).

Saulteaux. Used generally for all species of bats.

Throughout Canada from the Atlantic to the Pacific.

ATALAPHA CINEREA, *Beauv.*

Hoary Bat.

*Vespertilio pruinus*, Rich.

Nova Scotia to Manitoba.

SCOTOPHILUS FUSCUS, *Beauv.*

Brown Bat.

Has been found in Ottawa city and also near Lake Winnipeg.

SCOTOPHILUS NOCTIVAGANS, *Leconte.*

Silvery-haired Bat.

From the Atlantic to the Rocky Mountains and northward to Hudson Bay.

VESPERTILIO SUBULATUS, *Say.*

Little Brown Bat.

Common throughout Canada east of the Rocky Mountains.

VESPERTILIO LUCIFUGUS, *Leconte.*

Blunt-nosed Bat.

From the Atlantic to the Pacific and northward as far as Hudson's Bay.

OTTAWA, February 23rd, 1888.

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## THE DEVELOPMENT OF LANGUAGE

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By HORATIO HALE.

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It is the characteristic of modern science that it seeks to account for all development and progress by the operation of existing causes. In an address delivered before the Section of Anthropology in the American Association for the Advancement of Science, at the meeting of 1866, I sought to show in what manner this general law is applied to elucidate the history of language. The origin of linguistic stocks or families has been deemed one of the most mysterious problems in philological science. There are, so far as our present knowledge extends, between two and three hundred of such stocks, differing totally from one another both in vocabulary and in grammar. Various hypotheses have been offered to explain their origin, but none has been generally accepted as satisfactory. Professor Max Müller, in his "Science of Language," considers the problem extremely difficult, but not insoluble. He compares it to the question of the plurality of inhabited worlds, but deems it not quite as hopeless. He believes (and, as I hope to show, with justice) that it may receive a solution which will demonstrate that all languages have proceeded from one source. On the other hand, Professor Hovelacque, in his excellent work "La Linguistique," presents the fact of the existence of "a multiplicity of irreducible linguistic systems," as "a capital argument" in favor of that polygenist view, which holds that man, originally speechless, acquired the faculty of speech in as many different places as there are different linguistic stocks.

This view, it will be seen, though maintained by a distinguished evolutionist, is in itself anti-evolutionary; for it assigns the origin of linguistic stocks to a cause no longer in operation. In the address

referred to, I endeavored to show that the origin of these stocks was due to a force which is in constant activity, and which I described as "the language-making instinct of very young children." Every parent must have noticed how his child, when beginning to talk, constantly uses novel expressions, apparently of its own invention, but doubtless often mere corruptions of words, perhaps misunderstood, uttered by its elders. Ordinarily these peculiar expressions are soon corrected and forgotten. But instances not unfrequently occur where two children of the same age or nearly the same age, who are left much together, proceed in their invention of these novel terms until they frame a complete language, sufficient for all purposes of their childish intercourse, but totally unintelligible to those about them. Several instances of the creation of such child-languages were cited, and the fact was pointed out that in the first peopling of every country, when, from various causes, families must often be scattered at very wide distances from one another, many cases must have occurred where two or more young children, left by the death of their parents to grow up secluded from all other society, were thus compelled to frame a language of their own, which would become the mother tongue of a new linguistic stock.

As the address has been published (in the volume of the Association for 1886) it will not be necessary to repeat the facts and reasoning which were offered in support of this theory. Though presented under serious disadvantages—for the restricted limits of a public address compelled the omission of much evidence which had been gathered in its support—the reception thus far accorded to it, by authorities of the highest rank, seems to afford a good augury of its ultimate general acceptance. The few objections which have been made to it are only such, I am confident, as a fuller discussion and a better understanding of its character and purport will remove. Most of them had in fact been already anticipated and answered in the original essay, of which the address in question was a brief and partial summary. I am grateful, therefore, to the Philological Committee of the Institute for the opportunity which their invitation affords me of laying before students of linguistic science some of the omitted portions of my essay, which may aid in commending to their judgment the views thus suggested on the origin of linguistic stocks, and on the natural laws which govern the development of speech.



Two widely different theories in regard to the formation and growth of language have been maintained by eminent philologists who have written on that much-vexed question. One class, at the head of whom may be placed the great name of Jacob Grimm, have argued that this formation must have been a gradual process, commencing with a few hundred monosyllabic roots, from which, by slow and progressive steps, continued from generation to generation, have sprung, first, the agglutinate type, and, finally, the inflective form of speech. On this theory, the Chinese represents the primitive east of language, the Manchu or Malay would indicate the secondary or intermediate form, and the Semitic and Aryan would display the latest and highest development. The linguistic process, however, does not rest here. According to the theory, as set forth by its most distinguished advocate,\* when language has reached its highest stage of synthesis, such as appears in the Sanscrit, the Greek, and the Latin, a disintegrating or analytic force makes itself felt. The too elaborate and cumbersome grammatical system is gradually decomposed; many inflections disappear, and the analytic tongues of modern India, Persia and Europe are formed.

These views are strongly combated by another class of scholars, among whom a high place is due to the eminent author of the "General History of the Semitic Languages." To cite the forcible argument of M. Renan in his own words:—"Grimm recognizes, with all linguists, the fact that the farther we go back in the history of languages, the more synthetic, rich, and complicated we find them; but he refuses to follow the induction to the end. Instead of concluding from this progression that the primitive language, if we could know it, would be a model of exuberance, he stops short, and supposes before the synthetic period a period of infancy, the reality of which there is no positive fact to prove. I do not think that it is allowable thus to escape from the rule of analogies; the human mind has no such sudden turns; its laws operate in a continuous manner. The advance of languages towards analysis corresponds to the advance of the human mind towards a reflection more and more clear. This common tendency of the human mind has existed from the first day; and it is, therefore, in the first day that we must place the highest degree of

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\* J. Grimm: "Über den Ursprung der Sprache;" Berlin, 1852. His views are summarized and discussed in the Preface to Renan's work, "De l'Origine du Langage," 5th edit. Paris, 1875

synthesis,"\* "That which," he continues, "so often induces linguists to regard the elementary monosyllabism of the Chinese as the primitive condition of all languages is the inclination which leads us to look upon simplicity as the mark of a state of infancy, or, at least, as the character of a high antiquity. But this is an error, from which philology should guard itself. The Chinese speech, wholly monosyllabic as it is, has served as the organ of a highly developed civilization. On the other hand, the languages of the barbarous tribes of America and of the people of Central and Southern Africa, which begin to furnish unexpected revelations to science, offer a truly surprising wealth of grammatical forms. According to Grimm's hypothesis, we must suppose in these populations a powerful effort, which at a certain epoch has caused them to issue from the infantile stage, and to pass into that of reflection. The grammatical system of the Hottentots being much more advanced than that of the Chinese, we should have to admit that the Hottentots have made greater progress than the Chinese in the path of intellectual development, and are farther removed from their primitive condition. This is a conclusion which it would be impossible to maintain."†

M. Renan's argument appears to be decisive against the theory of the great German philologist; but, strange to say, he does not observe that it is equally decisive against his own. If there is no fact which proves that the synthetic condition of the Sanscrit, the Greek and the Arabic has been preceded by a monosyllabic stage, there is equally no fact to show that the monosyllabic condition of the Chinese has been preceded by a polysyllabic or synthetic stage. Some writers have, indeed, suggested that such a stage once existed, and that the monosyllables which have been spoken for four thousand years in China are merely the relics of inflected dissyllables or longer words, which, by the combined influences of analysis and of phonetic decay, have been reduced to their present formless condition. This suggestion, however, fails to take in view the fact that the Chinese is only one of a large family of monosyllabic tongues. Several such languages are spoken in the region south of China and east of the Ganges. The Khasi, the Tai of Siam, and the Anamese are as purely monosyllabic.

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\* "De l'Origine du Langage," p. 11.

† *Ib.*, p. 14.

as the Chinese, and yet differ totally from it in vocables, and sometimes in that which constitutes the only grammar of this form of speech—the collocation of words. To maintain that all these languages, with their numerous dialects, spoken in many cases by barbarous or semi-barbarous populations, have been produced by the simplification of polysyllabic tongues, through a long course of development and reflection, would be a bold assumption, for which there are no historic or scientific grounds whatever.

The necessary conclusion from all the facts within our knowledge is that the mother-tongues of the various linguistic stocks were of widely different types, some monosyllabic, others agglutinative, and others inflective in different forms. This conclusion, which at first sight seems not to accord with the opinions either of Grimm or of Renan, is not perhaps entirely at variance with the theories of either. The former held that language began with monosyllables, and grew by gradual development to the inflective state. The latter, to use his own words, “regards language as framed at a single stroke (*d'un seul coup*,) issuing instantaneously from the genius of each race.”\* It may appear, singularly enough, that the two views, seemingly so irreconcilable, are both to a certain extent justified by the facts. A new language arising in one generation would doubtless be deemed by M. Renan to have been “formed at one stroke.” Yet this language might, in the process of its formation, have conformed to the theory of the German philologist, and have grown by gradual development from the monosyllabic to the inflected stage.

If every new mother-tongue began, as we suppose, in the lips of very young children, its first form would necessarily be in the main monosyllabic. No child in its first utterances willingly pronounces a dissyllable, unless it be a simple repetition, like *papa*, *mama*, *dada*. Some years ago the author took special notice of this fact in the early speech of a little boy of his household. He was a very intelligent child, with good vocal organs, and, as it subsequently appeared, with rather unusual aptitude for language. At the age of two years, he could say many words, but (except in a few cases of repetition, like those just referred to) they were all monosyllables, composed either

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\* “Je persiste donc, après dix ans de nouvelles études, à envisager le langage comme formé d'un seul coup, et comme sorti instantanément du génie de chaque race.”—De l'Origine du Langage; preface to 5th edition, p. 16.

of one vowel or diphthong alone, or else of a vowel or diphthong preceded by a single consonant. Every word ended with a vowel, and two consonants never came together. All his words were thus reduced to a form of the utmost simplicity; and, of course, the same syllable had many significations. *Co* signified clothes, coat, cold; *cā* was cat, cap, candy, scratch; *f*, which he could not manage, became *w*, and thus "walk" and "fall" were both pronounced *waw*. *R*, which he could not pronounce, became *l*, and thus both "ride" and "like" were sounded *li*. His sister's pet name, Florrie, became *Woy*, and Willie was sounded *Wee*. Yet, with this imperfect speech, the little fellow managed to make his meaning partly intelligible to his mother, and completely so to his brother, older than himself, who readily conversed with him, and became his interpreter to the older members of the family. Here, it will be seen, was already the commencement of a new language. What was particularly interesting was the fact that this language took a completely Chinese form. In the proper Chinese language, as is well-known, every word ends in a vowel, either pure or nasalized; and the great majority of words comprise but a single consonantal sound. Indeed, where in our orthography a Chinese word commences with two consonants, their utterance represents to the native ear a single sound,—this sound being a mute combined with an aspirate or a sibilant, as in *kho*, *tsa*. Occasionally both aspirate and sibilant follow the mute, still making with it, according to Chinese notions, a single consonant, as in *thso*, *thseng*. These combinations, however, are rare, the *k*, *p*, and *t* being the only consonants which can be followed by the aspirate or the sibilant, and the *t* alone being capable of receiving them both at once. The total number of syllables in the Chinese language—that is, of what we should consider words—is only 450, which is raised to 1203 by the variation of accents.\*

If we suppose that a new speech had to be framed by an isolated group of young children, in whom the linguistic faculty was naturally weak, and was exceptionally slow in development, we can understand how such a language might be arrested in its monosyllabic stage. Its four or five hundred words would be ample as a means of communication among children, and if these words were supplemented, as the speakers grew older, by the variations made by the tonic accents, giv-

\* Abel-Remusat: *Grammaire Chinoise*, p. 33.

ing thus 1200 distinct vocables, the language would be complete for all essential purposes. Few uncivilized communities have a greater number of primitive words in ordinary use. How the highly civilized and literary Chinese manage to express with their limited vocabulary a vast range of ideas is easily understood. Much is accomplished by the mere effect of position,—a method which is almost as fruitful in language as in arithmetic. Thus *tá* signifies great, or greatness; *jîn*, man or manly: *tá jîn* is “great man;” *jîn tá*, manly greatness. *Jîn* may become a verb, as in the expression quoted by Rémusat from the discourse of a Chinese author against the Buddhist monasteries, *jîn khî jîn*, literally “man those men,” i.e., make men of those persons who are not now acting the part of men. So, in English, we can say a “man-child” and a “child-man.” A merchant-captain will “ship a man” to “man his ship.” What is with us an occasional practice is the regular habit of the Chinese language. To this should be added the use of conjoint expressions, in which each part explains the other. Thus *táo* has twelve meanings in Chinese, and makes, in fact, twelve words, totally distinct, and each represented by its own written character. Among these meanings are to lead, to rob, to cover, a flag, cereal grain, and *way*. *Loú* has seven significations, with as many characters, comprising dew, cormorant, to suborn, and *road*. When these two words are united in the form of *táo loú*, to express a single idea, that idea can only be the one common to both, namely *way* or *road*.\* The combined form is not properly a compound or a dissyllable, as each word retains its tonic accent; but the method, nevertheless, gives to the language the same means of avoiding ambiguity, and of enlarging its vocabulary, which are possessed by the synthetic tongues. From *chóu*, book, and *fàng*, house, we have *chóu-fàng*, book-house, i.e., library; from *khî*, begging, and *jîn*, man, *khî-jîn*, beggar; from *thiân*, heaven, and *niù*, daughter, *thiân-niù*, heaven’s offspring, which, by a poetical metonymy, has become the ordinary name of the swallow.† In this way, the language, with its scanty list of primitive vocables, has been made sufficient for the needs of an elaborate culture and an extensive literature.

The child who at two years of age could pronounce only the sim-

\* Grammaire Chinoise, p. 108. The English “roadway” offers a curious resemblance to this expression.

† *Ib.*, p. 111. The pronunciation of the Chinese words is given in the French orthography.

plest monosyllables, and that very indistinctly, is able, when a year or two further advanced, to master words of two or three syllables, and to form sentences which are intelligible enough to all hearers. He has still, however, no comprehension of grammar, and dispenses not only with inflections, but usually with pronouns, articles, and the other auxiliary parts of speech. Instead of "Papa, will you tell me a story?" he says, "Papa, tell Harry story?" Instead of "the cat scratched me yesterday," he says, "cat scratch Harry yes'day." Instead of "I have just seen two pigeons flying overhead," he says, "Harry just now see two pigeon—pigeon fly high, high." Every parent will recognize this style of speech; and the philologist will see that, except in the absence of pronouns (and sometimes even in this respect,) it represents the simplest form of agglutinative speech, such as we find in the Malay and Manchu groups of languages. Our children, under the instruction of their elders, quickly pass beyond this stage; but we can readily understand how a group of young people, not endowed with a large measure of the language-making faculty, might, if left entirely to themselves, be satisfied to let their language remain in this stage.

If, however, in a family of children, such as we have supposed to be left to form a speech for themselves, the elders proved to be endowed with a good linguistic faculty, we may feel confident that, long before reaching maturity, they would begin to employ inflections, and that, if this faculty happened to be particularly strong, these inflections would, by the time the children were fully grown, have developed into a complete and elaborate grammatical system. The steps by which this stage would be reached are sufficiently evident. The most essential adverbs or adjectives of place and time, number and quality,—here, there, yonder—now, then, soon, yesterday, to-morrow—one, two, three, many, more—good, bad, much, little,—would first appear. From the adverbs of place would spring both the pronouns and the prepositions. If the language remained in the agglutinative stage, these auxiliary terms would continue isolated, or loosely attached to the principal words, the names of things or of actions. But a stronger language-forming faculty would not be satisfied to rest here. The qualifying particles would presently be incorporated with the nouns and verbs, to form cases, numbers, tenses and moods. The Aryan or the Euscarian speech would thus be developed. Or, perhaps, when

the qualifying adverbs had come into use, some youth in whom the linguistic instinct was particularly strong, would hit upon a compendious mode of expressing the sense of these qualifying words, not by incorporating them with the verb or the noun, but by changing the vowel of the verb or the noun to correspond with that of the adverb. The difference in the two methods is easily understood, and we can readily see how either of them might occur to an intelligent boy or girl. If *bodha* signifies "to know," and *am* or *ami* is "I," and *an* is "then," the Aryan lad might affix the pronoun to the verb, and for "I know," would say succinctly, *bodhami*, know I. If he wishes to speak of a past time, he will prefix the adverb in an abridged form, and for ease of pronunciation will shorten the suffixed pronoun. Instead of saying *an bodhami*, "then know I," he will say, briefly, but intelligibly, *abodham*, and thus produce the Aryan imperfect with its well-known "augment." Another lad, the leader in a second isolated group, has been accustomed to use the word *daraba* for "strike" or "struck," in a vague and general sense, with no particular reference to time. He wishes on some occasion to say distinctly, "now striking." *Hu* is "now" or "here," and he might say, "*hu daraba*;" but a quick sense of euphony suggests to him the happy idea of changing the vowels of the verb to correspond with that of the adverb; he says, "*durubu*," or, in an abridged form (with the pronoun prefixed) *yadrubu*, "he is now striking;" and his companions, with equally ready apprehension, at once catch his meaning, and conform to his method of speaking. The germ of a new system of inflection is thus formed, and is quickly developed into a language of the Semitic type. This, however, it should be observed, is not the only mode in which languages of this type may have originated. As we shall see presently, there is evidence to show that the method of inflection by internal vocalic change may have been, in some cases, among the very earliest products of the language-making faculty.

The logical result to which we are brought by our course of reasoning is evident enough. *The inflections of a language must be coeval with the language itself, and must originate with its first speakers.* This, as has been seen, is the view of Renan. But no writer has expressed more clearly and forcibly than Professor Max Müller the important truth, that the mould of each linguistic stock bears evidence of having been formed at once for all time. "In the gram-

matical features of the Aryan and Semitic dialects," he observes, "we can discover the stamp of one powerful mind, once impressed on the floating materials of human speech, and never to be obliterated again in the course of centuries." "Most words and grammatical forms in these two families," he adds, "seem to have been thrown out but once by the creative powers of an individual mind; and the differences of the various Semitic and Aryan languages, whether ancient or modern, were produced not so much by losses and new creations, as by changes and corruptions which defaced in various ways the original design of those most primitive works of human art." He affirms that "no new root has been added, no new grammatical form been produced, in any of the Aryan provinces or dependencies, of which the elements were not present at the first foundation of this mighty empire of speech." Thus he regards the Semitic and Aryan languages as "the manifestations and works of two individuals, which it is impossible to derive from one another." \*

The same proposition, of course, must apply to every linguistic family. The grammatical framework of each stock must have been struck out and put together once for all. It does not necessarily follow, however,—nor need we understand Professor Müller to assert,—that the framer of a new speech must, in all instances, have had a powerful mind or a strong linguistic faculty. On the contrary, it is evident enough that certain languages, such as the Chinese, the Thibetan, and the Malay, indicate but a weak development of this faculty. Nor does it seem literally correct to speak of one mind as engaged alone in the formation of a language. Speech implies at least two collocutors. It would be more exact to say that each linguistic stock must have originated in a single household. There was an Aryan family-pair, a Semitic family-pair, an Algonkin family-pair. And further, it is clear that the members of each family-pair began to speak together in childhood. No instance was ever known, nor can one be reasonably imagined, of two persons, previously speechless, beginning to speak together in a new language of their own invention, after they had attained maturity. On the other hand, many instances are known (as is shown in the address referred to) in which young children have devised and constantly used such a language.

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\* In Bunsen's "Philosophy of Universal History," Vol. I, p. 475.



It is unquestionably true, as Max Müller has said, that after this primitive household had been dispersed, no new grammatical form was ever produced, of which the elements were not present in the original speech. Careful reflection will show that this is not merely the proper deduction from all the known premises, but that it is the only reasonable conclusion. Let any person suppose that a language of uninflected roots had arisen, and had existed for several generations, until the population speaking it had been somewhat widely diffused; and let him then endeavor to imagine how an attempt to introduce inflected forms—as for example, a future tense, a subjunctive mood, or a possessive case—would be received. If the people had been able to make themselves understood without these new-fangled contrivances, why should they take the trouble to adopt them? There can be no doubt that some of the Latin and German inflections would be very useful in English, and would be highly conducive to clearness and force; but how hopeless would be the attempt to introduce them! Unless we are willing to suppose that human nature in prehistoric times differed utterly from the human nature of to-day, we must believe that the same difficulty, or rather impossibility, would have been found in those days.

To this general statement, however, there are certain apparent exceptions, which should be noticed. As will be seen, they simply confirm the rule, in the shape in which Prof. Max Müller has laid it down. A change in the form of inflections not unfrequently takes place. The Anglo-Saxon tongue had many ways of forming the plural. It might terminate in *s*, in *u*, in *a*, or in *n*, or it might be indicated by a change in the radical vowel. *Wulfa*, wolf, became *wulfas*; *scipa*, ship, *scipu*; *handu*, hand, *handá*; *tunge*, tongue, *tungax*; *bók*, book, *bék*. All these plurals have now in English but one termination, in *s*. We say wolves, ships, hands, tongues, books. In French and Spanish plurals, a similar change has taken place, from the variety of the Latin forms, to a single termination in *s*. The rule is, that when, from the habit of speech, the need of an inflection is strongly felt, and it happens that, for any reason, one form disappears, another, the simplest, and most convenient, is likely to be adopted, by a sort of common consent, in its place. A striking example is found in the future tense of the Romanic languages. In

the confusion of speech which followed the conquest of Latin Europe by the Teutonic barbarians, the southern dialects remained radically Latin, but many inflections, as, for example, the cases of nouns, disappeared altogether. The Latin future was also lost: but the need of this tense was so strongly felt, that a new one was formed by uniting the auxiliary verb "have" with the principal verb. Thus the Spanish provincial, instead of *amabo*, *amabis*, *amabit*, learned to say *amar he*, *amar has*, *amar ha*, literally, I have to love, thou hast to love, he has to love; and these expressions were easily compressed into the modern forms *amaré*, *amarás*, *amará*. \* It is well known that the Latin tense itself is (in the first and second conjugations) of a similar secondary formation, replacing an early Aryan future.

Thus in every instance, where any record exists, we are led back from these secondary formations to an earlier stage of the language; and the natural and indeed inevitable inference is that, in all languages of every stock, the same general law prevails. The various dialectical forms, either of words or of grammar, are in general mere corruptions or replacements of elements which existed in the original speech.

At this stage of our argument it becomes necessary to consider with some care an important question which has already been incidentally alluded to—that of the difference between synthetic and analytic languages. The fact that during the historic period the progress of language has in general been from the more to the less complex form is unquestionable. The process which strikes us in the rise of the Romanic languages on the ruin of the Latin is repeated in the Teutonic countries, in Greece, in Persia, in India, and in Arabia. In all these regions many inflected and composite forms have disappeared, and have given place to simpler and more analytic methods. Prepositions and auxiliary verbs have, to a greater or less extent, superseded the case-forms, tenses, and moods of the primitive tongues. This has been regarded as a progress from synthesis to analysis; and, as has been already shown, some eminent writers have been led to maintain that this progress represents the natural and necessary advance which a language makes, with the development of intellect and of culture in those who speak it. Some have even gone so far as to

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\* Marsh: "Lectures on the English Language: Lect. XV.

speak of highly complex and synthetic tongues as "barbarous languages," and the more analytic idioms as "civilized languages." A wider induction, however, appears to lead to a very different conclusion.

There is no doubt that, as a general thing, the less composite and more analytic of two allied languages is likely to be the more recent in its formation; or, to speak more precisely, if two languages stand to each other in the relation of mother and daughter, as the Anglo-Saxon to the English, the Latin to the Italian, the Greek to the Romaic, the Samoan to the Hawaiian, the daughter tongue is certain to be the simpler and less inflected of the two. But it is equally certain—and indeed these very examples are sufficient to show—that the change of form has nothing whatever to do with any intellectual or social advancement, and that to speak of it as a progress in any sense is wholly to misconceive its nature and origin. In fact it is more properly a degradation and an impoverishment. The modern languages of southern Europe assumed their present "analytic" form, as it is styled, during the middle ages, at a time when the communities speaking them were certainly, in every point of literary culture and social organization, very far below their predecessors who spoke the highly composite classic tongues. No one will maintain that the present inhabitants of northern Hindostan are intellectually superior to the contemporaries of Kalidasa, or that the modern Persians, who speak one of the most analytic of Aryan languages, are superior in intelligence to their ancestors of the Zoroastrian era, the speakers of the highly inflected Zend.

The causes to which all these modern languages owe their poverty in inflected forms are so well known, historically, that the disposition to ascribe it to intellectual progress is somewhat surprising. Primitive mother-tongues, as has been seen, vary in character, from the bare simplicity of the monosyllabic Chinese and Anamese to the extreme complexity of the Sanscrit and the Algonkin. When the community which speaks one of these original tongues remains in its pristine seat, with no admixture from any foreign source, there seems to be no reason why the language should undergo any material change. Children must continue to learn their speech from their parents; and grandfather and grandchild must so speak as to be mutually understood. There is doubtless a natural inclination for change in the

human mind ; but in the case of language this inclination is checked by many powerful conservative influences—by authority, affection, custom, and necessity. Accordingly, we see that the Chinese language has remained substantially the same for more than four thousand years. The Greek schoolboy of the fourteenth century after Christ read his *Hesiod* or his *Herodotus* far more readily than an English lad of the present day can read the works of Chaucer or of Mandeville. Two thousand years in the one case had wrought less change than four hundred have produced in the other.

The causes which originate the great changes in speech, rendering some languages obsolete, and creating new idioms in their place, are two in number, both powerful in their way, and neither of them having anything directly to do with intellectual advancement. In fact, as has been hinted, the first tendency of both of them would rather be toward impoverishment alike in the arts of life and in speech. These causes may be briefly defined as conquest and migration.

The English language affords the most familiar and the most striking example of the change produced by conquest. The subjugation of the Anglo-Saxons by the Normans reduced their language from a highly inflected tongue to what has been styled (though with some exaggeration) a grammarless speech. The three genders, which were carefully indicated in both noun and adjective, ceased to be distinguished. All but one of the five cases were lost. The half-dozen different modes of forming the plural were reduced to one—only a few faint relics of the older forms remaining to show that they had existed. The subjunctive mood, feebly kept alive by grammatical purists, disappeared from the common speech. Many of the formative particles—prefixes and suffixes—which abounded in the Anglo-Saxon, and gave it an exuberant life, died out of the language ; and in their place a few incongruous elements were adopted from the speech of the conquerors. In general, however, the grammatical forms which remained were relics of the original language. At the same time a vast number of Anglo-Saxon words disappeared entirely, the places of many, though not all, being supplied by words of Latin origin, usually much corrupted and distorted in pronunciation. In short, the English speech, as it finally emerged after this great linguistic cataclysm, was a mere jargon or “camp language,”—a *lingua franca*, in which

the people of the two foreign nations, now forcibly intermingled, managed to make themselves understood by one another. To speak of this mangled and degraded "pidgin English" as an analytic tongue, and to exult it as the product of an improved civilization, is simply preposterous. No doubt the strong intellectual powers of the two mingled races speedily made themselves manifest in this new medium of expression, and fashioned it into a language possessing many fine qualities of its own. It has drawn some valuable elements from both the idioms of which it is composed, and may thus be said in certain respects to surpass each of them, especially in the means of discriminating the nicer shades of thought. The highest poetry, eloquence, and philosophy have found it adequate to their needs. To discuss the question whether the language of Shakespeare and Chatham is superior or inferior to the languages of Cicero and Alfred would be idle. There is no arbitrator qualified to decide such a dispute. The question with which we are now concerned is different. It is quite clear that the paucity of inflections in the English nouns and adjectives is no more an evidence of progress than their abundance in the German is a proof of mental sluggishness and linguistic stagnation. The English Teutons were conquered by a people speaking a different language; the German Teutons remained independent. The English lost by the conquest many inflections which the Germans retained. To maintain that the English speech has reached its present state by a process of analysis is as absurd as it would be to say that the gardener who trims a shrub for the purpose of converting it into a hedge-plant is analyzing it. The bush was needed for a new purpose, and to subserve this purpose it has been forcibly reshaped and made less luxuriant, but more symmetrical, than before.

The same explanation applies to the Romanic languages, but with a difference. The Normans, when they conquered England, were, like those whom they subdued, a civilized and christianized people. In the mixed speech which arose after the conquest, the influence of the more numerous Saxons prevailed, so far as to secure the adoption of their Teutonic grammar; but a large mass of vocables was supplied by the language of the conquerors. The heathen and barbarous Goths, Vandals, and Franks, after their easy conquest of Roman and Christian Italy, Spain, and France, were content to renounce almost

entirely their own speech, and to learn in their rude way the language of their subjects, merely dropping many of the forms, and altering the pronunciation of the words to suit their own habits of utterance. Such and no other was the origin of the Italian, Spanish, and French languages, in which there is certainly no evidence of conscious analysis or of intellectual progress.

The other influence to which the loss of inflection and of vocal elements is due, is that of migration. A colony which leaves the mother-colony to found a new community is usually composed mainly of young people, and often of persons belonging to the lower orders. It will comprise comparatively few individuals advanced in years or belonging to the wealthy and governing classes. These, however, are the natural conservators of language. They remain at home, where the speech is preserved pure and unchanged. The emigrants, few in number and occupied by the toils and anxieties of their new life, have little regard for the accuracies of speech. The easiest utterance by which they can make themselves understood suits them best. If one past tense will answer as well as two, they will be satisfied with one. If any case-endings can be dispensed with, they will cease to use them. If any consonantal elements seem to them difficult of utterance, and not needed for the scanty vocabulary of their ordinary intercourse, they will drop them. The language will thus become gradually simplified and impoverished, both in its grammar and in its lexicon. The difference between the alteration produced in this manner and that arising from conquest is chiefly apparent in the fact that the change produced solely by emigration is mere loss, and is not complicated by the introduction of new words and forms, or by the distortion of those which are retained.

It is evident that in most cases these two causes of change,—migration and conquest,—will be acting together. Conquerors are usually emigrants, and emigrants are frequently conquerors. It is not always easy to judge how far the alteration of language is due to one cause or the other. There is, however, one region in which we are fortunately freed from doubt on this point. The islands of Polynesia have been settled within comparatively recent times; and in almost every case the uniform tradition of the natives affirms that the groups or single islands at which their colonizing ancestors arrived were uninhabited.

The traditions of the Hawaiians, with the evidence derived from a comparison of languages, show that their islands were settled by emigrants from the Marquesas (the nearest inhabited land) about forty-six generations, or about fourteen hundred years, ago. The inhabitants of the Marquesas trace their descent partly from Tahiti and partly from Vavau, one of the Tonga (or Friendly) Islands. And the people of Tahiti trace back their ancestry to the Navigator Group (Samoa) which, with the neighboring group of Tonga, was apparently the primary centre, or mother-country, of the Polynesian race. The emigrations from these western mother groups to the eastern clusters must have taken place at least two thousand years ago. The carefully preserved genealogies of the Marquesan and Hawaiian chiefs are sufficient evidence on this point.\*

Now in comparing the languages of the eastern, or emigrant, communities with those spoken in the western, or mother groups, we are struck by the very slight changes which they have undergone, in words and grammar, during this long period of over twenty centuries. They still constitute, in fact, but dialects of one general language. The Samoan is nearer in words and pronunciation to the Hawaiian than the Portuguese is to the Spanish, or than the Lowland Scotch is to the English. Hundreds of words in the eastern and western groups are absolutely identical. The remainder differ chiefly in certain regular permutations, of which the rules are easily understood. These permutations are all in the direction of simplicity and ease of pronunciation. The *f* and *s* of Samoa both become *h* in Hawaii. The Tongan (or original Polynesian) *k* is dropped altogether in Hawaiian (as it has also been in Samoan), its place being supplied by a slight catching of the breath. *Ika*, the word for fish in Tongan and New Zealand, is pronounced *i'a* in Samoa and Hawaii. The nasal *ñ* (*ng*) become simply *n* in Hawaiian. *Maña*, which in Samoan and Tongan is branch, becomes *mana* in Marquesan and Hawaiian.

The few grammatical changes are in the same direction of greater simplicity. The Samoan has several particles which are affixed to

\* See the subject fully discussed in the "Ethnography and Philology of the U. S. Exploring Expedition," (under Wilkes) p. 117, and in the elaborate work of the late Judge Fornander of Hawaii, on "The Polynesian Race." A great scientific authority, M. de Quatrefages, has summed up the facts and arguments in his volume "*Les Polynesiens et leurs Migrations*," which decisively settled this interesting question.

the verb to give it the sense of the passive participle. These particles are *a*, *ia*, *fia*, *ñia*, *tia*, and *ina*. Thus, from *ufiufi*, to cover, we have *ufiufia*, covered; from *tuofi*, to hinder, *tuofi-ia* hindered; from *sila*, to see, *silafia*; from *ita*, to hate, *itañia*; from *si'i*, (for *sik'i*) to lift up, *si'itia*; and from *ave*, to give, *ave-ina*. In Hawaiian, these affixes are reduced to two, *a* and *ia*, as in *lohe-a*, heard, *lawe-ia*, taken. Of two or three others, some traces remain in isolated forms, as in *auhuli-hia*, driven away; *tau-hia*, hung up, and *pili-hia*, crowded close. The Marquesan has *a*, *ia*, *hia*, and *tia*; while the Tahitian has reduced all the suffixes to the single form *hia*.

In the demonstrative pronouns, the Samoan makes a distinction between the singular and the plural, which is lost in the western dialects. *Lenei*, in the former, means this, and *lena* and *lela* (or *lea*), that; *nei*, *na*, and *ia*, are these and those. In Hawaiian, *teia*, *eia*, and *neia*, all alike, mean this and these; *tela* and *ia* both mean that and those. In our own language, it is well known that the plurals "these" and "those" are seldom used by the uneducated classes; they say not "those boys" but "them boys." If a boatful of illiterate men and women from England or the United States were to be cast on an unoccupied island, and to found a colony there, we may be sure that the proper plural forms of the demonstrative pronouns would not be found in the colonial idiom.

The result of our brief review of this most interesting linguistic field is to show that the Polynesian languages afford a crucial test and decisive proof of four most important principles of linguistic science:

1st. That the rate of change produced by lapse of time in unwritten languages, when not affected by conquest or other external influences, is extremely slow. The only change which the Samoan language seems to have undergone in two thousand years is the loss of the *k* sound, which is replaced by a slight hiatus or catching of the breath. It may be added that the evidence derived from the American languages is all in the same direction.

2nd. The change in a speech produced by emigration, when not complicated by intermixture with other languages, is considerably greater than that produced by mere lapse of time, but is still not rapid, and not important. After two thousand years the descendants



of the Samoan emigrants can still understand with little difficulty the language spoken in the mother-country.

3rdly. The changes caused by mere lapse of time or by emigration, unaffected by foreign influences, are usually governed by definite rules, and rarely lead to irregularities and distortions, either in phonology or in grammar.

4thly. The changes which are thus produced are invariably in the direction of greater simplicity. A vocal element or a grammatical inflection may be lost or modified, or exchanged for another; but no new element or inflection is ever introduced. The introduction of a new vocal element, like the Arabic guttural in Spanish, and the Hottentot "click" in the Zulu speech, is a sure mark of foreign influence.

The conclusions to which we have thus been brought as to the widely different effects produced on speech by conquest accompanied by mixture of languages, and by mere migration, not attended with such mixture, lead to very interesting results when applied to historical and ethnological questions. Among the most important of these questions is certainly that of the early peopling of Europe.

If the Aryan emigrants, who, in prehistoric times, overran Europe in successive waves of migration, had found their new abodes wholly unoccupied, there is no reason for supposing that the languages which their descendants now speak would differ much more from one another in grammar or vocabulary than the Polynesian languages now differ among themselves. The actual differences, however, are immensely greater, and are of such a nature as to leave no doubt that they have been caused by the attrition of different idioms and habits of utterance, brought together in forcible collision.

Recent researches have shown that Europe, or the greater portion of it, was occupied in early times by a non-Aryan population, belonging perhaps to more than one race. Scholars are agreed in recognizing in the Euscarians, or Basques, the survivors of at least one section of this primitive population; and most archæologists identify them with the Iberians, who in the earliest historical period still held large portions of France and Spain, and of whom Tacitus discovered traces in Great Britain. The language of the Basques belongs to the polysynthetic class, and, like all languages of that class, is exceedingly diffi-

cult of acquisition. The Aryan conquerors would naturally not attempt, like the Teutonic conquerors of southern Europe or the Norman conquerors of England, to acquire the speech of their subjects. Like the Roman conquerors of Gaul, they would retain their own language, but in such a simplified form as would adapt it for communication with the conquered people. The mingled race would speak an idiom which would be in the main Aryan, but would have lost many vocal elements and many grammatical inflections. The new language would be to the primitive Aryan what the English is to the German, or what the French is to the Latin. It would be a less complex speech, and more easy of pronunciation; and while the mass of its vocables would be of Aryan origin, but much corrupted and abbreviated, there would be in it a considerable number of words derived from a different source. This description applies to all the European languages of Aryan stock, from the Greek to the Celtic; but the change and corruption are greater, as might be expected, the further west we advance.

Thus the application of the elementary principles of comparative philology disposes of the hypothesis of the European origin of the Aryan race, which some eminent scholars have lately maintained on various and often contradictory grounds. The notion that the Aryan speech could have originated among the comparatively simple and formless idioms of western Europe, and, advancing eastward, could have yielded such highly complex languages as the Zend and the Sanscrit, is one which finds no countenance in the laws of linguistic science, or in any known example of a like evolution. Nor should it be objected that the ancient Aryan tongues of Europe, as they are known to us, are of later date than the ancient Aryan tongues of Asia, and may therefore have suffered more disintegration and loss by the mere lapse of time. The facts do not sustain this objection. We know the condition of the Greek and the Latin in the fourth century before Christ, when the Sanscrit and the Zend were flourishing tongues; and we know the character of the Mæso-Gothic language at a date not very much later. Greek, Latin and Mæso-Gothic alike show evidences of the loss and distortion caused by the violent impact of other tongues. Conquest and migration—the migration of the Aryan hordes into Europe, gradually overpowering and absorbing the earlier populations—will alone account for the

appearances which these ancient Aryan languages of Europe present to us.

The objections which have been made to the new theory of the origin of languages, in the form in which it was set forth, very briefly and imperfectly, in my former essay on the subject, resolve themselves into two, which take the form of questions. The first proceeds from philologists who are inclined to accept the theory, but ask for more evidence, and particularly for evidence that children would be able not only to invent a speech, but also, as they grew older, to endow this speech with inflections. The other objection comes from those who have heretofore held the common and, it may be said, natural view that inflected languages are the growth of ages of slowly accumulated culture. They ask for evidence that languages equal in variety of inflections, in the capacity for subtle distinctions, and in comprehensive power of expression, to the classic Aryan and Semitic tongues, have ever been found among barbarous peoples.

These objections, or rather inquiries, are both entirely reasonable ; and both have been presented, with equal courtesy and force, by very eminent authorities,—the first, for example, by Professor Sayce, who in his late most interesting address, as President of the Section of Anthropology in the British Scientific Association, while complimenting the theory as “very ingenious,” and pointing out, more clearly than its author had done, its utility in explaining some important linguistic problems, yet demurs to the sufficiency of the evidence thus far offered ; the second by an illustrious statesman and scholar, who has done me the honor of turning aside for an hour from the affairs of empire, and from Homer, to consider the views suggested by me, and to discuss them with his usual candor and acuteness. I need not add that any suggestions proceeding from Mr. Gladstone on a question of philology must always deserve the most respectful consideration.

On the question of the capacity of children for inventing entirely new words and forms, evidence is steadily accumulating. For the present, it will be sufficient to present one testimony which, alike from its source and its character, will be found eminently satisfactory. It comes from a very distinguished German professor, the first Sinologist of Europe, himself the son of a master of philological

science. The child-language to which it refers is that of his own nephew. What is specially remarkable is that the novel words and forms were not employed in converse with another child, but were the spontaneous products of the child's own linguistic faculty. That this faculty should be particularly strong in a grandson of Dr. Hans Conon von der Gabelentz, and a nephew of Dr. George von der Gabelentz, will surprise no one. I give the particulars precisely as they have been furnished to me by Professor von der Gabelentz, and in his own happily worded English :

"My brother Albert's eldest son George, before he had learned his mother-tongue, called things by names of his own invention. In these names the constant elements were the consonants, while the vowels, according as they were deeper or higher, denoted the greatness or smallness. For instance, his term for ordinary chairs was "*lukail*," apparently quite a self-made word. Now, he would call a great arm-chair "*lukull*," and a little doll's chair "*likill*." The root for round objects was *m—m*. He called a watch or a plate "*men*," but a large dish, or a round table "*mum*;" the moon was likewise "*mem*," but when he first saw the stars, he said "*mim—mim—mim—mim*." His father and, at first, every grown-up male person, was called *papa*, till he learned to distinguish between Papa and Gross-papa (*o-papa*), and henceforth called all other gentlemen *o-papa*. Now, I am a head taller than was my father. So, one day, when seeing my father and me together, baby called the former "*o-papa*," and me "*u-pupu*." One day in winter he saw his father in a large fur cloak and with his hat on. This impression he uttered with the word "*pupu*," meaning a very big papa. The boy soon gave up his idiosyncratic endeavors, learning German before his next-born sister had reached the age of beginning speech. So *that* language could have no further grammatical development."

In this most interesting case, we see clearly how the Semitic system of inflection, with internal vowel changes, may have originated. If this highly gifted child had been left with an equally intelligent girl, to grow up by themselves, after the death of their parents, in some sheltered or fruitful nook or oasis of Arabia, Oregon, Brazil, or Central Africa, can we doubt that they would, by the time they had reached maturity, have framed for themselves and their posterity a

language as elaborate, varied, and complete as the Arabic or the Sanscrit—or as any of those still more remarkable languages of which an account has now to be given, in response to the other class of inquiries?

The opinion which prevails widely among scholars, and is sustained by many treatises on philology of very high reputation, that the languages of the Aryan and Semitic families are the only tongues in which genuine inflections are found, and that the variations in all other languages are of a purely agglutinative character—which sometimes merely simulates inflection—is an opinion which, though once seemingly warranted, could only have retained its hold through the neglect of students to investigate fully the facts that have been steadily accumulating during the last half-century. It is now time to prove by the highest evidence, accepted by the best authorities, that this opinion is utterly erroneous. If it can be shown that languages as clearly inflectional and as happily expressive as any of the Aryan or Semitic tongues are spoken by tribes in a low, almost the lowest, stage of barbarism—in regard to whom the idea of a gradual growth of linguistic development by slow accessions of culture would be an utter absurdity—the propositions required by our theory will probably be deemed to be sufficiently established.

When, many years ago, it fell to my charge to make the first ethnographical survey of Oregon, I found in that region several families of languages remarkable for the great number, variety, and expressiveness of their grammatical variations. Among these, the most striking, so far as the knowledge which I then gained would enable me to judge, was the Sahaptin family, comprising two principal languages and several dialects. Of the leading language, the Sahaptin—then spoken by a tribe of about two thousand persons, commonly known among the whites as the Nez-percés,—I was so fortunate as to obtain a complete account from a very able and accomplished American missionary, the Rev. A. B. Smith, who had resided three years among them, and who kindly placed in my hands his manuscript grammar, comprising one of the most thorough and profound analyses ever made of an unwritten tongue. Its accuracy I had good opportunity of testing, while procuring an extensive vocabulary from the natives, with the aid of another highly educated and indefatigable

missionary, the Rev. Dr. Whitman,—whose deplorable fate, which befell him, with his family, a few years after I met them, (their massacre by another Indian tribe) forms one of the saddest tragedies in the history of modern missions.

The Sahaptin is throughout an inflected language. Its nouns have eight cases—nominative, genitive, accusative, two datives and three ablatives. They have two numbers, the plural being formed from the singular, for the most part, by a syllabic reduplication, similar to that which forms the perfect tense in the Sanscrit, the Greek and the Mæso-Gothic. Thus *pitin*, girl, makes in the plural *pipitin*; *atwai* old woman, *aatwai*; *tahs*, good, *litahs*. To this rule there is an exception in the case of words expressing the various family relations, where the plural is formed by adding *ma* to the singular, as *pika* mother, pl. *pikama*. The adjectives are varied like the substantives and agree with them in case and in number. The following are the case variations :

Nom.	<i>init</i> , house . . . . .	<i>tahs</i> , good
Gen.	<i>ininm</i> , of a house . . . . .	<i>tahsrinm</i>
Acc.	<i>inina</i> , house . . . . .	<i>tahsna</i>
1st Dat.	<i>initph</i> , to or for a house . . . . .	<i>tahsph</i>
2nd Dat.	<i>initpa</i> , in or on a house . . . . .	<i>tahspa</i>
1st Abl.	<i>initki</i> , with a house (instrument)	<i>tahski</i>
2nd Abl.	<i>initpkinih</i> , from a house . . . . .	<i>tahspkinih</i> .
3rd Abl.	<i>initain</i> , for the purpose of a house,	<i>tahsain</i> .

It will be seen at once, in the dative and ablative cases, how much more “profoundly reasoned and accurately classified” (to use an expression which I shall have occasion to quote from Professor Max Müller) are the Sahaptin case-distinctions than the Aryan.

It is possible, and indeed probable, that both in the Sahaptin and in the Aryan languages the case terminations, or many of them, are relics of primitive prepositions; but if so, all traces of such prepositions seem to have vanished, at least from the Sahaptin. If they once existed, it was, I believe, in the primitive household in which the language was first formed and brought to its fullest maturity, while all the members were still united.

There is, however, fair reason for questioning whether the case terminations may not, in some instances, have been, from the first,

pure inflections, or phonetic changes, suggested by the language-forming faculty, to express distinctions of meaning. As Professor Sayce has well suggested in his "Principles of Comparative Philology," the original Arabic case-endings, which are the three primary vowels, *a*, *i* and *o*, either pure or nasalized—and which, as Orientalists suppose, formerly prevailed throughout the Semitic languages—could hardly have originated in any other way. And certainly the variations by internal vocalic changes, so characteristic of the Semitic languages, and so common in the Aryan tongues, could not have sprung from any agglutinations.

These internal variations are frequent in the Sahaptin, and are particularly notable in the conjugation of the verb. The Sahaptin verb far surpasses both the Aryan and the Semitic in the variety of its forms and the precision and nicety of its distinctions. It has six moods—indicative, usitative, suppositive, subjunctive, imperative, and infinitive. There are nine tenses—present, perfect, recent past, remote past, aorist or past indefinite, present future, indefinite future, recent past future, remote past future. Each verb has two verbal adjectives or participles, three verbal nouns, and an adverbial derivative. Further, each verb has many forms, analogous to the Hebrew conjugations. Thus *hakisa*, to see, has a reciprocal form, *pihakisa*, to see each other; a reflective form, *inaksa*, I see myself; a causative form, *shapaksa*, to cause to see, to show; a successive form, *wiaksa*, to see one thing after another; and a transitory form, *takaksa*, to see suddenly, or for a short time. But it is impossible, in such a mere outline, to give anything like an adequate idea of the richness of the verb in this remarkable speech. The point, however, to which attention is particularly to be directed, is that the variations are evidently inflections, pure and simple. This is shown by the fact that many of them are produced by changes in the primary elements, both vowels and consonants: thus from *hakisa*, I see, we have (among a vast variety of similar changes) *aksaka*, (recent past) I have just seen him, *aksana*, (remote past) I did see him, *ahahna*, (aorist) I saw him, *aktatasha*, (present future) I am about to see him, *ahnna*, (future) I shall see him, *ahnah*, (usitative) I am wont to see him, *akinah*, (suppositive) if I see him, *ahnim*, (imperative) see him! *hahnash*, (infinitive) to see.

More remarkable, in certain respects, is the substantive verb. The common opinion, expressed in philological compendiums, is that the verb of pure existence is the highest outcome of culture and reflection in the Aryan and Semitic languages; and scholars have exhausted their ingenuity in tracing its supposed origin and primitive meaning. In the Sahaptin we find this verb used frequently, as the missionaries affirm, and in precisely the same sense as in Greek and English. By a curious coincidence, its form bears a remarkable resemblance to that of the Aryan verb. Its root is *ash*. In Sanscrit, the corresponding root is *as*, which some philologists suppose to have originally meant either "to breathe," or "to dwell." But the example of the Sahaptin would seem to show that there is no necessity for resorting to any such derivation, and that the verb may well have been an original invention of the earliest makers of each tongue. The first three tenses in the conjugation of this verb will show that its forms are as completely inflectional as those of the Sanscrit, the Greek, or the German :

## PRESENT TENSE.

<i>wash̄</i> , I am	<i>washih</i> , we are
<i>awash</i> , thou art	<i>athwashih</i> , ye are
<i>hiwash</i> , he, she, or it is	<i>hiushih</i> , they are

## PRESENT PAST TENSE.

<i>wāka</i> , I have just been	<i>wāsheka</i> , we have just been
<i>awāka</i> , thou hast etc.	<i>athwāsheka</i> , ye have, etc.
<i>hiwāka</i> , he has, etc.	<i>hiushēka</i> , they have, etc.

## REMOTE PAST TENSE.

<i>wāka</i> , I was	<i>washina</i> , we were
<i>awāka</i> , thou wast	<i>athwashina</i> , ye were
<i>hiwāka</i> , he was	<i>hiushina</i> , they were

*Wāka*, I have just been, differs from *wāka*, I was, solely in the different shade of the principal vowel sound, the *a* in the former having the sound of *a* in "wall," and the *ā* in the latter the sound of *a* in "father." A clearer instance of a pure inflection of the Semitic cast could not be found in any language.

Another very curious coincidence between this verb and the Aryan substantive verb deserves to be mentioned. The Sahaptin *ash*, like



the Aryan *as* or *es*, is deficient in several tenses and moods, and these are supplied, as in the Aryan, from another verb, meaning "to become." This verb in Sahaptin is *witsasha*, I become, which makes in the perfect *witsash*, I have become or been, (corresponding to the Latin *fi*, from a root meaning to grow,) in the aorist, *witsaia*, I became or was, and in the future *witsaia*. I shall become or be,—all purely inflective forms.

How completely the Sahaptin verb corresponds in meaning and in usage to the Aryan is shown by the examples given by Mr. Smith. Thus the phrase "what I have said is true," reads in the Sahaptin:—

<i>ioh</i>	<i>kah</i>	<i>tsakaku</i>	<i>ikuin</i>	<i>hiwash</i>
that	which	I-ha.ve-said	true	it is,

answering word for word, and inflection for inflection, to the Latin "*id quod dici verum est.*" So again,—with a slight idiomatic variation in the order of the words—a Sahaptin would say, for "one is about to go who is skillful,"—

<i>naks</i>	<i>hikutatasha</i>	<i>ka</i>	<i>ipi</i>	<i>wapsu</i>	<i>hiwash</i>
one	is-just-now-going	who	he	skillful	is.

Of the immense wealth of inflections possessed by the Sahaptin verb, some idea may be formed from the fact that the paradigm of the verb "to see," in its primary or simple conjugation, occupied in Mr. Smith's grammar no less than forty-six pages of manuscript; and this did not include the six derived conjugations, each of which possesses all the variations of the simple verb. It must not, however, be supposed that the Sahaptin is limited merely to inflectional forms, and that it has no capacity for agglutination. Were this the case, it would be far inferior to the Aryan languages, in which agglutination, or, in better phrase, composition, plays a most important part. In fact, it may be said to be chiefly in this capacity that the Aryan languages surpass the Semitic. And it is deserving of remark that our admiration is given to the Aryan languages in precisely the proportion in which they possess this power of composition or agglutination. If we deem the English, which can promptly manufacture at need such words as railroad, steambot, and firework, superior in the power of compact expression to the French, which can only say *chemin de fer*, *bateau à vapeur*, and *feu d'artifice*, we no less admit the much greater

superiority of the Greek, to which we constantly resort for such agglutinative forms as telegraph, photograph, spectroscope, pyrotechnics, electrotype, and hundreds like them. The power of composition in most of the American languages, instead of being, as some have imagined, a mark of inferiority, is in reality, as Duponceau long since pointed out, one of their chief claims to our admiration.

Before giving a typical example of this power in the Sahaptin, I may refer to the theory put forth by Professor Sayce in his "Principles of Comparative Philology," and maintained by him with much force of argument,—that all language begins with the sentence, and that the separate words which compose the primitive sentence are the product of later analysis. Against this view it has been urged that, in the nature of things, analysis, or, rather, the single elements, must precede synthesis. We must have the elements before we can put them together. The whole question, however, becomes clear if we bear in mind that all languages must have begun on the lips of children, and that no young child, when beginning to speak, ever yet uttered a sentence. As has been already remarked,—and as every parent knows,—the child begins with single words, and usually with monosyllables, or at the most dissyllables. As he grows older, he puts his words together; he compounds and inflects them. Finally, when full grown, he utters his thoughts in sentences, in which, unless with a conscious effort, he rarely thinks of the word, and never of their roots. Thus, since all completed language is only known to us in this final stage, or as it is spoken by grown people, Professor Sayce's theory, perplexing as it seems at first thought, is fully justified by the facts.

The word which Mr. Smith gave me as an example of the remarkable power of composition in the Sahaptin is one which, since it was first published, has been often quoted. Though long, it is anything but harsh or hard. On the contrary, it is both euphonious and, to one familiar with the language, evidently easy of comprehension. It is a word of nine syllables, forming several distinct groups,—*hi-tau-tu-tala-wihnan-kaw-na*; and it means "he travelled by on foot in a rainy night." This, it will be seen, is a complete sentence, and it is one which is very easily analyzed. The first syllable, *hi*, is the prefix of the third person singular; it bears a curious resemblance in sound and meaning to the English pronoun "he," but is used only as a

prefix—that is, as an inflection; for the separate pronoun meaning “he” is *ipi*. *Tau* has reference to anything done in the night—*tuala* to an action performed in the rain; but these expressions are never used alone, and are not derived, so far as is known, from any verbal root. *Wihuan* is from the simple verb *wihnasa*, to travel on foot. The verbal noun, which is the simplest form of the root, is *wihna*; the last *n* in the compound form seems to be added merely for euphony. *Kau* is from the verb *k'kauna*, (root *kokaun*) to pass by. *Na* is the suffix of the indicative mood, aorist tense, direction from the speaker. A literal version of this most picturesque and expressive sentence-word would be—“he, at night, in the rain travelling on foot, passed by, away from me.” By three additional, syllables we can bring the verb into the causative conjugation, and change the direction of the movement towards the speaker: *Hi-shap-a-tau-tuala-wihnan-kau-nim-a* will signify “he made him travel this way on foot in a rainy night.”

But it may be said that to form and preserve such a language as the Sahaptin or the Sanscrit, something more than a strong linguistic faculty is needed, both in its first framers and in their descendants. There must be higher endowments—powers of combination, of memory, of abstraction, of logical reasoning, working perhaps unconsciously, but still working effectively and constantly.

This view is apparently a just one, and it is proper to show that the circumstances in the present case fully confirm it. While gathering the language of this tribe, I had occasion to study their character, and an excellent opportunity of ascertaining it from the missionaries and other white residents. At that time I wrote of them—“The Sahaptins or (*Nes-percés*), are the tribe who, several years ago, despatched a deputation to the United States, to request that teachers might be sent to instruct them in the arts and religion of the whites. Their good dispositions have been much eulogized by travellers, and there seems to be no reason to doubt that they are superior to the other tribes of this territory in intellect and in moral qualities.” Nearly thirty years after this measured commendation was published, the whole continent rang with the praises of the intellectual power, the eloquence, the military skill, the unconquerable firmness, the magnanimity, the humanity, and the other noble qualities of these remarkable barbarians. In the admirable work of that able and

fair-minded historian, Mr. J. P. Dunn, entitled "The Massacres of the Mountains," a narrative is given, drawn from official documents and other authentic sources, of the outbreak of the Nez-percés in 1876. After enduring many wrongs with unexampled patience, they resisted at last an order so manifestly unjust that the military officers charged with its execution had protested against it—an order to deprive them of their lands. They were led by their famous chief, "Nez-percé Joseph," whom the historian pronounces "the ablest uneducated chief the world ever saw." In the preliminary negotiations, the American commissioners reported that "he exhibited an alertness and dexterity in intellectual fencing that was quite remarkable." His influence long withheld his people from rising. When they could no longer be restrained, he put himself at their head, and displayed as a leader talents worthy of Hannibal or Sertorius. He gained battles by most ingenious strategy, and, when repulsed by numbers, proved himself as formidable in retreat as in advance. Unable to maintain his ground against the forces of the American army, he adopted a bold resolution. The famous "Retreat of the Ten Thousand" was about to be surpassed by these indomitable barbarians. Gathering his whole tribe, old and young, women and children, with his mounted warriors in front and rear, Joseph took up his desperate march, far eastward and northward, towards the Canadian line. The distance was a thousand miles. The track led over the Rocky Mountains in their ruggedest defiles, through wide rivers treacherous with quicksands, and across long stretches of broken and arid plains. The pursuing troops, guided by Indian scouts—the savage Bannocks—hung upon the rear of the fugitives. Other troops from the forts on the plains came hurrying to intercept them. Joseph fought his way through all, defeating them, capturing horses and ammunition, and in one instance a howitzer. His warriors who fell were scalped and mutilated by the Bannock scouts; their women when captured were subjected to every indignity. The Nez-percés refused to retaliate. No slain enemy was scalped by them. The white women who were taken were dismissed by them unharmed. Their conduct and their wrongs awakened the sympathy even of the rude pioneer settlers. When these were called upon to assist the soldiers, they replied, in their expressive frontier phrase, that they "had not lost any Indians," and consequently had no occasion to hunt for any. They traded

peacefully with them, and let them pass. At length the much harassed and weakened, but still undaunted, band reached a position within thirty-five miles of the British boundary. One day's march would have placed them in safety, when a powerful force from Fort Keogh—cavalry, infantry, and artillery—suddenly confronted them and barred the way. Surrounded on all sides, the Nez-percés fortified themselves and stood so resolutely at bay that their pursuers—fortunately led by an officer noted for his benevolent disposition, and detesting the task cast upon him—were glad to give them almost their own terms of surrender. “Thus,” says General Sherman, in his official report as Commander-in-Chief of the American army, “has terminated one of the most extraordinary Indian wars of which there is any record. The Indians throughout displayed a courage and skill that elicited universal praise, they abstained from scalping, let captive women go free, did not commit indiscriminate murder of peaceful families, which is usual, and fought with almost scientific skill, using advance and rear guards, skirmish lines, and field fortifications.” To this our author adds that when the captives were taken down the Missouri River, the people along that stream, who had been used to Indians all their lives, were constantly remarking, “What fine-looking men!” “How clean they are!” “How dignified they appear!”

To sum up our argument,—if we affirm that the Aryan speech, with its many excellences, could only have originated among a people of singular intellectual capacity—a capacity which, as we proudly, if somewhat vaingloriously, claim that they have transmitted to their descendants—is it not a clearly logical conclusion, from similar premises, that the exquisitely framed and admirably expressive Sahaptin tongue was composed by speakers endowed with at least equal genius, which they, too, have bequeathed to their posterity?

But the Sahaptin is not the only inflected language of this superior stamp in America. There are others whose excellence is attested by authorities of the highest rank in philological science. Among these are the languages belonging to the great Algonkin family. This widespread family might well be styled the Aryan stock of America—stretching as it does, or did, from Nova Scotia to the Rocky Mountains, and from Hudson Bay almost to the Mexican Gulf, and comprising more than twenty languages as different from one another as

the Portuguese is from the Roumanian. All these languages—the Lenâpé (or Delaware), the Micmac, the Massachusetts, the Mohegan, the Ojibway, the Cree, the Miami, the Blackfoot, and the rest—are remarkable for their abounding inflections, their subtle distinctions, their facility of composition, and their power of expressing abstract ideas. It was Duponceau, the father of American philology, who first brought these qualities to the notice of students more than sixty years ago, in his published correspondence with the missionary Heckewelder (1816), in his preface to his translation of Zeisberger's Delaware Grammar (1827), and in his famous "Mémoire" on the subject, which received from the French Institute the "Volney Prize," in 1837. From his preface to the Delaware Grammar a few paragraphs may be cited, which will amply confirm all that I have stated on this question. After describing their happy mode of forming compound words, he adds:—"They have also many of the forms of the languages which we so much admire—the Latin, Greek, Sanscrit, Slavonic and the rest—mixed with others peculiarly their own. Their conjugations are as regular as those of any language that we know, and for the proof of this I need only refer to the numerous paradigms of Delaware verbs that are contained in this grammar, in which will be found the justly admired inflections of the languages of ancient Europe." "There is," he adds "no shade of idea in respect to the time, place, and manner of action which an Indian verb cannot express." As an instance, he gives the Delaware phrase for "if you do not return," and compares it with a similar expression in European tongues. The Delaware is, "*mattatsh gluppiweque*," which is thus explained: *matta* is the negative adverb, no; *tsh* is the sign of the future, with which the adverb is inflected; *gluppiweque* is the second person plural, in the present subjunctive, of the verb *gluppiechton*, to return. The sentence thus clearly expresses every idea intended to be conveyed, including both the futurity and the uncertainty. "The Latin phrase, *nisi veneris*, expresses all these meanings; but the English, "if you do not come," and the French, "*Si vous ne venez pas*," have by no means the same elegant precision. The idea which in Delaware and Latin the subjunctive form conveys directly is left to be gathered in the English and French from the words *if* and *si*; and there is nothing else to point out the futurity of the action. And where the two former languages express everything

with two words, each of the latter requires five, which yet represent a smaller number of ideas. To which of these grammatical forms," asks Mr. Duponceau, "is the epithet 'barbarous' to be applied?"

He then proceeds to express his conclusion on the whole question in measured but weighty words. The astonishing art and method which have presided over the formation of these Indian languages are not, in his opinion, to be considered a proof (as many have been inclined to believe) that this continent was formerly inhabited by a civilized race of men. It is more natural, he holds, to suppose that men were endowed from the beginning with a natural logic, which leads them, as it were, by instinct, to such methods in the formation of their idioms as are best calculated to facilitate their use. He is brought to this decision because he finds that "no language has yet been discovered, either among savage or polished nations, which was not governed by rules and principles which nature alone could dictate, and human science never could have imagined."

Such were the views formed and expressed nearly seventy years ago by the profoundest and most philosophic reasoner that had then devoted himself to the study of the American languages—a reasoner, I may venture to add, who has not yet been surpassed, either in breadth of learning or in depth of thought, by any one who has written on this subject. Fifty years later, another very high authority reaffirmed these views, in even more decided terms. The opinion expressed by Prof. Whitney, in his "Life and Growth of Language," though apparently referring to American idioms in general, evidently relates more especially to those of the Algonkin stock. I have had occasion to quote it elsewhere, but the quotation well deserves to be repeated. "There are," he remarks, "infinite possibilities of expressiveness in such a structure; and it would only need that some native-American Greek race should arise to fill it full of thought and fancy, and put it to the uses of a noble literature, and it would be rightly admired as rich and flexible, perhaps, beyond anything else that the world knew."

To this eloquent passage I would only venture to take one exception. The native-American Greek race has already arisen, and speaks the language in question. A highly endowed language can only have originated with a highly endowed race. When we consider the succession of singularly able leaders whom the Algonkin tribes have pro-

duced during the brief term of our intercourse with them, we must feel satisfied that the people to whom these leaders belonged were far above the common rank. As men like Solon, Miltiades, Themistocles, Pericles, Epaminondas, Phocion, and the rest of the long line of Greek worthies, must have sprung from a highly gifted community, so we may be sure that forest statesmen and leaders like Powhatan, Philip of Pokanoket, Miantonomah, Pontiac, Tecumseh, Black Hawk, and, in our own day, Poundmaker and Crowfoot,—men who have won the respect and admiration even of their enemies,—could only have arisen among a people of character and talents corresponding in elevation to their own.

Still another American race may be mentioned, the Iroquois, about whose remarkable abilities there can be no question. As is well known, their famous confederacy, the Five Nations, held, for a long time after the French and English colonies were founded, the balance of power in North America. If they had not, by their hostility to the Huron and Algonkin allies of the French, been led to cast their influence on the side of the English, it is the opinion of competent historians that the whole region west of the Alleghanias, from Canada to the Gulf of Mexico, would now be French. Their happily devised political system, unsurpassed in ancient or modern times, has been well elucidated by the penetrative genius of Morgan. Their oratory, their sagacity, and their prowess have been celebrated by many eminent writers. In their highest prosperity, their numbers did not exceed, probably did not reach, twenty thousand souls. It may fairly be affirmed that, since the world began, so much intellectual force, public spirit, eloquence, statesmanship, and military skill have never, to our knowledge, been elsewhere concentrated in so small a community as that which composed the Iroquois cantons of northern New York in the seventeenth and eighteenth centuries.

The language spoken by this people,—a highly inflected, rich, and sonorous tongue,—is too well known to American scholars to need a minute description. Its stately vocables, fortunately preserved in the names of places, have rescued some of the finest natural features of our continent from the ignoble baptism which has elsewhere degraded others. Onondaga, Oneida, Ontario, Saratoga, Toronto, Ticonderoga, Adirondack,—each a descriptive compound,—mark the euphonic



character of the speech. We may well be grateful to an idiom which has preserved the world-famous torrent of Niagara from the too possible designation of "Tompkins' Falls." The wealth of forms and the power of expression in the language have impressed every student. Two hundred and fifty years ago, the scholarly Jesuit, Brebeuf, compared it to the Greek, and found it in some respects superior. In our own day, this opinion has been reinforced by an authority of the greatest weight. Professor Max Müller, who learned the language from a Mohawk undergraduate at Oxford,—now an esteemed physician in Canada,—has written of it in terms of singular force. To his mind, he declares, the structure of the language "is quite sufficient evidence that those who worked out such a work of art were powerful reasoners and accurate classifiers." Powerful reasoners and accurate classifiers! To appreciate the full strength of these expressions, we must consider whether they could be properly applied to the framers of the great classical tongues of the old world, the Aryan and the Semitic; and we must honestly decide that they could not. The irrational and confused gender system of the Aryan, and the imperfect tense system of the Semitic stock, must exclude them from the comparison. It is a noteworthy fact that the two foremost philologists of Europe and America, both devoted students and admirers of the Aryan speech, have compared this speech in its highest development with the leading American tongues, and that both, though differing widely in their linguistic theories on other points, have pronounced in the strongest terms their opinion of the structural superiority of these American languages.

It will perhaps be asked why, if the American language and their framers were of this superior character, the results achieved by the latter have been so small. How did it happen that the Algonkins, the Iroquois, and the Sahaptins remained barbarians of the Stone Age, while the Aryan nations attained the highest pitch of civilization. The question is a fair and pertinent one. The answer is found in a single word,—opportunity. We recognize the prime importance of occasion and surroundings to an individual, but are apt to forget that they are equally essential to a race. We admit that Milton, condemned by fate to ignorance and penury, would probably have remained "mate and inglorious." If the American civil war had not

occurred, General Grant would, in all likelihood, have lived and died an industrious tanner in an obscure Illinois town, utterly unconscious of the powers which were destined to make him one of the most famous commanders of modern times. If the Aryan race had been so unfortunate as to make its first appearance on the shores of the St. Lawrence, or on the western prairies, or amid the uplands of Oregon—possessing no domestic animal but the dog, no cereal but maize—surrounded not by civilized nations like the Accadians, the Assyrians, the Phœnicians, the Egyptians and the Chinese, qualified to teach it architecture, astronomy, the alphabet, the smelting of metals, ship-building, the use of the mariner's compass, but by wandering hordes of hostile savages—we have no ground for supposing that this race, whatever might be its natural endowments, would have attained any height in culture beyond that which was reached by the most capable American tribes, whose ill-fortune placed them in that hopeless position.

This is a point which, in its connection with our thesis, requires some further consideration. The doctrine of evolution, whose importance I would in no way depreciate, has, in reference to the intellectual powers of the human race, been strangely misapplied, to such an extent as to lead to serious errors. The misapplication, it must be said, began with Darwin himself; but he, with that noble candor which distinguished him, admitted and corrected the mistake, in which some of his followers still persist. We know how frankly and fully, near the close of his life, he withdrew, on better information, the opinion which he had originally expressed of the low intellectual and moral character of the Fuegians. By just implication, this reversal of his opinion will apply to all savages—for the Fuegians have always been ranked among the lowest of the low. On further consideration, it becomes apparent that this final judgment of the great investigator of nature was in strict accordance with the law of evolution. It is certain that there has been, from one geological age to another, a steady though somewhat irregular increase in the size and complexity of the brains of vertebrate animals. But this increase appears to occur in the transition from one species to another. When a species is once established, there is no evidence (as I am assured by high zoological authority) to show that any material change in the quantity

or quality of its brain occurs from first to last. When "speaking man" appeared as a new species on the world's stage, the size and power of his brain was fixed, *once for all*. There are variations in different races, as there are differences in this respect among children of the same parents; but the variations do not pass certain defined limits, and are constantly tending, as Mr. Galton has shown of the human stature, towards the general average.

Thus it becomes apparent that in the case of man, or at least of speaking man—for if there was a speechless *homo primigenius*, he belonged to another species—the process of evolution, or, more properly speaking, of development, applies, not to his natural capacity, but to his growth in knowledge. Just as his bodily stature and strength have remained the same from the earliest times and in all stages of culture—as his osseous remains and the measurements of existing races clearly show—so there can be no reasonable doubt that his mental stature and force have remained unaltered. We have no reason to doubt—we have every reason to believe—that the earliest Aryans, savages as they undoubtedly were, could reason as profoundly and feel as keenly as the most cultivated of their descendants. As the structure of language depends entirely on the natural capacity of its earliest framers, it is clear that the Aryan tongue, in its primitive form, must have possessed every quality and every power of expression which have ever belonged to it. If, among other barbarians, there have been tribes equal in natural capacity to the barbarous Aryans, their languages will equally show these eminent qualities.

To apply these propositions,—if the language of the latest Aryans possesses and constantly exercises the power of expressing abstract ideas, we may be certain that this power was possessed and constantly exercised by the first Aryan family. And further, among the barbarous tribes of the present day, we may expect to find the same power possessed and exercised, with greater or less fulness, in proportion, not to their degree of cultivation, but to their natural capacity. We should expect that highly endowed communities of barbarians, like the Algonquins and Iroquois, would have languages abounding in abstract and general expressions. Such, in fact, we find to be the case. If we take what Professor Max Müller styles abstract terms of the second degree—the most elaborate if not the most metaphysical of all

—we find them abundant in both tongues. Each language, in fact, has, like each Aryan tongue, a special termination to express these abstractions. In the Iroquois this termination is *sera* or *tsera*; in the Ojibway branch of the Algonkin, it is *win*. Thus, from the Iroquois *katehens*, to be ashamed, (root, *ateh*) we have *atehensera*, shamefulness, ignominy; from *kennontomions*, to meditate, (root, *ennoute*) we have *ennontomiontsera*, meditation; from *katerios*, to fight, (root *erio*), *ateriosera*, strife; from *kkwenies*, to be able, (root, *kweni*) *kakweniatsera*, ability. The Ojibway *bimadis*, to live, yields *bimadiswin*, life; *sagia*, to love, *sagiiwewin*, affection; *jiga*, widow, *jigawiwwin*, widowhood, *bekadis*, mild, *bekadisiwin*, mildness; *binis*, clear, pure, *binisiwin*, clearness, purity. *Bisan*, quiet, yields two verbal forms, *bisanab*, to be still, and *bisanis*, to be peaceful, and two abstract nouns, *bisanabiwin*, stillness, silence, and *bisanisiwin*, peacefulness—and so on, interminably, through the dictionary.

But it is, perhaps, in the abstract terms of the first degree, the most primitive and in a certain sense the profoundest of all, that this original mental capacity is most strikingly shown. Professor Max Müller, in his "Science of Thought," well observes that, when certain ethnologists "tell us that there are savages who have not a single abstract term in their language, they ought first of all to give us the names of the savages to whose language they refer, and, secondly, they ought to explain how these savages could possibly have formed the simplest names, such as father, mother, brother, sister, hand and foot, etc., without previously possessing abstract concepts from which such names could be derived." To illustrate this pregnant suggestion, let us take some instances drawn from the Indian languages by writers of the best authority. The first word in Professor Max Müller's list is "father." The Hon. J. H. Trumbull, than whom no higher authority on the Algonkin tongues can be adduced, derives this word, *noosh*, in the Massachusetts dialect, from the root *ooch*, which means "from," "out of." "*Noosh*," he observes, "expresses, primarily, not paternal but filial relation—'I come from him;' *ooshoh* (his father) 'he comes from him,' or with transposition of subject and object, 'he *froms* him.'" In the Iroquois, according to the distinguished Canadian philologist, the Rev. J. A. Cuoq, the word has its origin in a conception perhaps even more subtle.

*Rakienha*, my father, comes from the verb *wakien*, (root, *ien*), "to have," in what is styled the "diminutive form," which is indicated by the suffix *ha*. *Rakienha* means, strictly, "he who has me little." *Wakienha*, my mother, is the feminine of the verb, and means "she who has me little." The same verbal root supplies the word for son. *Rienha*, my son, means "I have him little."

In the Algonkin, Mr. Trumbull tells us, one of the words for man has for its root *apè*, or (nasalized) *onbè*, which signifies an animal that walks upright, or, more exactly, the one uplifted, from a root *ap* or *omp*, which forms verbs signifying to raise, lift, rise, ascend, and the like. Another is from the demonstrative *in*, this, which is cognate with *nin* or *ni*, I; a man is "such as I," or "such as this one." Dr. Brinton, in his recent work, "The Lenâpé and their Legends," has shown how this demonstrative or pronominal root, *in*, or *ni*, is developed into an extraordinary number of derivatives, abundantly confirming Mr. Trumbull's views. Another root *gisch* or *kich* (where the *ch* is the German guttural), which embraces the general concept of "successful action,"—an idea as purely abstract as can well be imagined,—flowers, according to this author, into an amazing multitude of derivative terms, including *gischigan*, to begin life, to be born, *gischihan*, to form, to make with the hands, *gischelamen*, to create with the mind, to fancy, *gischiknamen*, to increase, to produce fruit, *giken*, to grow better in health, *kikey*, long lived, old, *gischilen*, "it is proved true," *gischuch*, the sun, *gischapan*, daybreak, *gichten*, clear, bright, shining—and so on, almost without end.

Another careful and philosophical investigator, Professor Horsford, in seeking the origin of the Indian name of Boston, "Shawmut," has had occasion to determine the primary sense of its root, the monosyllable *sha*. He finds it to be "parallel-sided," and that this abstract term must have existed in the language earlier than the concrete nouns which have been formed from it, such as *mishash*, the trunk of a tree, *mishashonk*, the trunk of the human body, *mishashonh*, the throat, *shameek*, eel, and the like. *Um* is a noun-making particle, and *ut* is a locative suffix, signifying "at" or "near." Thus *SHAum* was the parallel-sided strip of land, the well-known "Neck," which connects the peninsula of Boston with the mainland; and *SHAWmut*, "At (or near) the Neck," became the name of the peninsula itself.

But—admitting that primitive men, barbarians as they were, had the mental capacity which enabled them to invent these general or abstract roots—it will naturally be asked how we can suppose that very young children, whom our theory regards as the first framers of every language, can have possessed this remarkable faculty. Fortunately, we are able to answer this question, not by argument, but by a direct instance; and in such a case, one instance is as decisive as a thousand. The little nephew of Professor von der Gabelentz, a mere baby, just beginning to speak, had invented a root as abstract as the Algonkin *sha* or *gisch*, and with it a formative system seemingly more subtle and metaphysical than the Algonkin, inasmuch as the changes of meaning were indicated, after the Semitic fashion, not by affixed particles, but by internal vowel changes. *Mum* was a flat, circular object of the largest size, the table; *mem* was a smaller disk,—a plate, a watch, or the moon; and when the child was shown at night the “floor of heaven,” as Shakspeare’s fanciful lover styles it, “thick inlaid with patines of bright gold,” he exclaimed, with an instant application of his most diminutive inflection, “*mim, mim, mim.*” Here is an indubitable root, springing from the language-making instinct of an infant, which equals, and in some respects surpasses, those primary elements of speech with which the able investigators of the Aryan, Semitic, and American languages—the Benfey’s and Max Müllers, the Ewalds and Renans, the Trumbulls and Brintons—have made us familiar. Yet there is really nothing in this which need astonish us. If the language-making faculty is, like the faculty of sight, a natural endowment and instinct of the human being, we might reasonably expect that a child who can, without effort or consciousness, see a table, a plate, or a star, as clearly as a sage can see them, should be able, without effort or consciousness, to name these objects as aptly as a sage could name them.

We are thus brought back, by the clearest facts and inductions, to the thesis with which our study of the subject began. We find by evidence drawn from the most varied and the most authentic sources—from the utterances of children and the idioms of the most uncultivated tribes—that language owes its origin to a cause which is as active at the present day as it was when speaking man made his first appearance on the earth. To this cause—the language-making instinct of young children—all the great variety of primitive languages, or linguistic

stocks, may be confidently ascribed. The explanation thus afforded removes the weightiest stumbling-block which has impeded the progress of philological science, and, at the same time, lays a solid foundation for ethnology, which that science has never before possessed. If this explanation, which has already been accepted as probable by authorities of the first rank, like Huxley, Parkman, Romanes and Sully, and for which other scholars of similar eminence, like Mr Gladstone and Professor Sayce, have only asked further evidence, shall be finally received as the true scientific solution of a great linguistic problem, it will largely modify, not only the sciences which have been named, but also the prevalent opinions on many points of mental, social, and political philosophy of the highest interest. It may therefore fairly claim the serious and candid consideration of all scholars who are interested in these important studies.

NOTE.--Since the foregoing paper was written, my attention has been drawn to the important use which M. Taine, in his profoundly philosophical treatise, "De l'Intelligence," makes of the language of children in explaining the origin of general terms. The portions of the work relating to this subject will be found in his First Book, chapter 1, "on Signs," and in his Fourth Book, chapter 1, on "General Characters and General Ideas." In the former he observes: "The formation of these general names may be narrowly watched with little children; we take them in the act." He gives several examples of childish expressions assuming a general sense through the natural tendency to association of ideas, which at that age is specially powerful. "In it," he proceeds, "we have the faculty of language." Some of his instances curiously recall those related by Professor Von der Gabelentz, though none of the children displayed the peculiar inflecting turn of the Professor's nephew. "A little boy a year old," writes M. Taine, "had travelled a good deal by railway. The engine with its hissing sound and smoke, and the great noise of the train, struck his attention, and the first word he learned to pronounce was *fufir* (*chemin de fer*). Henceforward a steamboat, a coffee-pot with spirit lamp—everything that hissed, or smoked, or made a noise, was a *fufir*." This is interesting. With the German child it would have been still more so. The steamboat would have quickly become (in French orthography) *foufou*; a tea-kettle would have been *fefer*; and the coffee-pot with spirit-lamp *fifir*. In his Fourth Book the author returns to the subject, and elucidates it by further explanations and examples. "The infant invents and discovers incessantly, and of its own accord; there is no period of life in which his intelligence is so creative. The names suggested to him by his parents and the persons about him are but starting points for his innumerable efforts." "There is not.

even need on all occasions for the words to be transmitted to him with deliberate intention, and by a human mouth; sometimes *the child seizes them in the involuntary sounds he utters*, or in the accidental sounds he catches." And he cites a remarkable example from Francis Lieber ("Smithsonian Contributions to Knowledge," Vol. 2, p. 15):—

"A member of my own family," says Mr. Lieber, "showed, in early infancy, a peculiar tendency to form new words, partly from sounds which the child caught, as to *wah* for *to stop*, from the interjection *wah* used by waggoners when they wish to stop their horses; partly from symphenomenal emissions of sounds. Thus, when the boy was a little above a year old, he had made and established in the nursery the word *nim* for everything fit to eat. I had watched the growth of this word. First, he expressed his satisfaction at seeing his meal, when hungry, by the natural humming sound, which we might express thus, *hm*. Gradually, as his organs of speech became more skilful, and repetition made the sound more familiar and clearer, it changed into the more articulate *um* and *im*. Finally, an *n* was placed before it, *nim* being much easier to pronounce than *im*, when the mouth has been closed. But soon the growing mind began to generalize, and *nim* came to signify everything edible; so that the boy would add the words *good* or *bad*, which he had learned in the meantime. He now would say *good nim*, *bad nim*, his nurse adopting the word with him. On one occasion he said *fie nim*, for *bad*, *repulsive* to eat. There is no doubt but that a verb to *nim*, for to eat, would have developed itself, had not the ripening mind adopted the vernacular language, which was offered to it ready made."

M. Taine, though he dwells much and forcibly on the physiological view, including especially the functions of the brain, does not indicate the peculiar light which that study casts on the subject in question. This has been lately done by his countryman, the distinguished anthropologist, Dr. Topinard, in his notable lecture on "The last stages of the genealogy of man," published in his *Revue d'Anthropologie* for May, 1888. After referring to the fact—suggested by an argument of Professor Vogt—that the young monkey is more intelligent than the adult, Dr. Topinard remarks:—"But this greater intelligence of the young is the rule with all animals, including man, if we consider the facts. At this stage the brain is larger, relatively to the body; it is in a manner virgin, more impressionable; it grows extremely fast, and seeks only to absorb, to work, to turn to use the blood which it receives. What is more marvellous than the way in which our children learn to speak, to read, to write! Should we be capable, we adults, of the amount of rapid memory demanded by the mass of words and ideas which we impress upon them?"

It is satisfactory to be able to adduce, in confirmation of the ideas set forth in the preceding paper, these striking facts and arguments, from two of the highest authorities in Europe on questions of mental philosophy and physiology. For the reference to the passage in M. Taine's book I am indebted to the courtesy of Professor Max Müller, who is naturally interested in the results of an



inquiry tending so remarkably to sustain the opinions expressed by him in Bunsen's work, more than thirty years ago. Those opinions, then far advanced and much contested, have now been overtaken and confirmed by the conclusions of inductive science.

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A BRIEF NARRATIVE OF THE JOURNEYS OF  
DAVID THOMPSON IN NORTH-WESTERN  
AMERICA.

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BY J. B. TYRRELL, B. A., F.G.S.

*Field-Geologist of the Geological Survey of Canada.*

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The following brief sketch of the journeys of David Thompson has been drawn from his Field note-books and journals which are preserved in the office of the Crown Land Department of Ontario. Unfortunately some of the books in the series are wanting, leaving blanks in the record of his travels. Wherever any of these breaks occur the fact is stated, but in some cases I have been able to partially fill them in from records of astronomical observations evidently often dotted down in the book that was most convenient, or sometimes tabulated apart from his journal. This latter is especially the case in regard to his later journeys in the mountains, for which time his journal is not among the books preserved, but there is a carefully tabulated series of a great number of astronomical observations taken during these years, from which his course can be followed with considerable certainty.

For the dates of his birth, marriage and death, I am indebted to the kindness of his daughter, Mrs. Shaw, who is now living in the town of Peterboro', Ontario.

David Thompson was born in the parish of St. John, Westminster, England, on the thirtieth of April, 1770. Of his early life, all that I have been able to learn is that he was educated at Christ's Hospital, or the "Blue Coat School," London, and was perhaps for a short time a student at Oxford. When about nineteen years old he must have entered the service of the Hudson's Bay Company, as in October, 1789, when in the middle of his twentieth year, his journal opens at this Company's establishment at Cumberland House, on the south

shore of Pine Island Lake, in the Canadian North-West Territories. He states in a letter written in 1817, that a large brass sextant of Dollond's, of 10 inch radius, and reading to 15" had been his constant companion for twenty-eight years; so that he had doubtless brought this instrument with him from England in the summer of this year. That he had been trained in its use, and that he also took a lively interest in general natural phenomena is shown by the fact, that during the winter, from October 10th, till the summer of 1790, he kept a careful meteorological journal, in which were noted the readings of the thermometer three or four times a day, the direction and force of the wind, and general remarks on the climate. During the same time he took a series of astronomical observations, six being meridian altitudes of the sun for latitude; and thirty-five lunar distances for longitude. The result of these observations as worked out by him, placed the House in Lat.  $53^{\circ} 56' 44''$ , Long.  $103^{\circ} 13'$ , a position almost identical in latitude, and only about three to the east of the position given for Cumberland House in the latest Dominion Lands map.

On the ninth of June, 1790, he left Cumberland House, and descending the Saskatchewan, entered "Great Lake" (Lake Winnipeg) on June 15th, passing through which he entered Play Green Lake, and followed the Hudson's Bay Company's regular route through Trout River, Kneec Lake, and Hayes River to York Factory where he arrived on July 7th. Throughout the whole of the distance from Cumberland House, he made a careful track-survey of his course, taking his bearings with a compass, and estimating the distances by the rate of travel, checking the survey by numerous observations for latitude and longitude, taken with the above-mentioned sextant and an artificial horizon.

Between July 1790 and September 1791 the note-books do not show any entries, so that his whereabouts during that time are uncertain, but from this latter date to April, 1792, he was at York Factory, as is shown by the record of a number of astronomical observations taken by him during this period.

The next entry is in September of the latter year, on the 5th of which month, at 8 a.m., he left York Factory with two canoes, and

rounding the Point, entered the Nelson River, which he ascended, making as careful a survey as possible of the route, till he reached Seepaywisk House, on October 8th, which he places in Lat.  $55^{\circ} 3', 15''$ , Long.  $94^{\circ} 41' 30''$ . Here he remained till May 28th, 1793, trading with the Indians and keeping a careful meteorological register. On the above date he left Seepaywisk and crossed to Chatham House, on Chatham Lake, which house he places in Lat.  $55^{\circ} 23' 40''$ , Long.  $97^{\circ} 45' 34''$ . On May 31st, he left Chatham and travelled in a westerly direction to Burnt-wood River, up which he travelled to Burnt-wood Lake, then round to Missinippi River, which he ascended, intending to proceed to Reindeer Lake. He was, however, unable to find the Indians whom he expected to meet, and in Latitude,  $55^{\circ} 35' 20''$ , Longitude,  $102^{\circ} 10' 49''$ , he turned back and made his way down the Churchill and Nelson Rivers to York Factory, which he reached on July 21st. This is the only instance that I can find in his long career of travel and adventure where he set out with the intention of reaching a certain point and returned before he had accomplished his purpose, though, as will shortly appear, he performed the journey a few years afterwards. On September 1st, of this year, (1793) he started to ascend the Hay's River on his way to the Saskatchewan, the mouth of which he reached on September 22nd, and Cumberland House, on October the 5th. On October the 8th he left Cumberland House, and ascended the Saskatchewan to the Forks, when he turned up the South Branch, and after three days travel, reached South Branch House on October 18th. Here, he took horses and journeying overland reached Manchester House on October 18th, and Buckingham House on October 31st. Of these three places, the first was situated on the South Saskatchewan River, not far from Batoche's Crossing, while the other two were on the North Saskatchewan; Manchester House, being three-and-a-half miles below the mouth of Horse Creek, in Tp. 48, R. 21st, west of the 3rd Initial meridian and Buckingham House, four miles above the mouth of Moose Creek, about the line between Ranges five and six, west of the fourth Initial meridian. He afterwards rode out to the Beaver Hills and reached Buckingham House again on November 29th. There he remained till the following Spring, keeping, as usual, a meteorological register, taking observations for latitude and longitude, and working out his former traverses by latitude and departure when not engaged in trading with the Indians.

In the following Spring, on May 16th, 1794, he left Buckingham House for York Factory, making a survey of the Saskatchewan River on his way down. Besides Manchester House, he mentions two places named Hudson House, which he places respectively 3 and  $14\frac{1}{2}$  miles below the lower Crossing Place, the latter being 15 miles above Setting (Sturgeon) River. This would place them respectively in Ranges 3 and 2, west of the 3rd Initial meridian. On the 27th, he passed the mouth of the South Branch, which he calls Pekakemew, below which were several houses kept by Canadians, probably belonging to the North-West Company, namely: Isaac's House,  $9\frac{3}{4}$  above Nepoin House, kept by Messrs. Porter & McLeod; and Hungry Hall, by Messrs. Ross & Thorburn, 14 miles above the mouth of Sturgeon River. On reaching Cumberland House he did not again return to the Saskatchewan, but followed up and surveyed Sturgeon-Weir and Goose Rivers and Goose and Athpupuskow Lakes, from which he crossed Cranberry Portage into Cranberry Lake, and from this lake he went north-east, down Elbow River to Ithenoostosequan Lake, then south, down Grassy River, and then east to Reed Lake. Here he left Mr. Ross and proceeded on his journey by Crooked and File Rivers and Burnt-wood Lake to York Factory, where he arrived on July 5th.

On July 26th, he started on his return to Reed Lake, where he built a house in Lat.  $54^{\circ} 36' 17''$ , Long.  $100^{\circ} 36' 50''$ . There he remained, as shown by his meteorological journal, till May 28th, 1795.

In the Autumn of 1795, he built a house on the south side of the Duck Portage, in Lat.  $55^{\circ} 40' 36''$ , Long.  $102^{\circ} 7' 37''$ ; and his meteorological register shows him to have remained there from September 6th to May 23rd, 1796.

Having gone from here to Fairford House on the Missinippi, one mile below the mouth of Deer River, in Lat.  $55^{\circ} 33' 28''$ , he left this latter House on June 10th, 1796, and ascended Deer's River to Deer's Lake, thence into Hatchet Lake, and down the Black River to its mouth in Athabasca Lake, which he reached about July 2nd, and returning, he reached Fairford House on July 21st. With regard to the survey made during this journey, he states that the course was

worked out from rough sketches which were saved when most of his notes were lost in a wreck on Black River. Returning to Deer Lake he built Bedford House in Lat.  $57^{\circ} 23'$ ; Long.  $102^{\circ} 58' 35''$ , and remained there till May 23rd, 1797, keeping his customary meteorological journal, and taking a long series of observations for latitude and longitude.

On Tuesday, May 23rd, 1797, he left the service of the Hudson's Bay Company and entered that of the North-West Company, the following entry being written in his journal of the above date. "This day left the service of the Hudson's Bay Co., and (entered) that of the Company of Merchants from Canada. May God Almighty prosper me." On the same date he left Bedford House, and on May 28th, arrived on foot at Alex. Fraser's house at the head of the Deer's River. On June 7th, he left this House and descending the Deer's River, proceeded as quickly as possible to Cumberland House, meeting on the way Messrs. McLeod, Roderick McKenzie and Simon Fraser, members of the North-West Company for which he was now working.

He reached Cumberland House on June 23rd, and left it on the 27th, reached Lake Winnipeg on the 28th, and travelling by way of Winnipeg River, he reached Lake Superior on July 22nd, having as usual, made a survey of his route.

Here, being thrown among new associates, he makes a note of the men composing the North-West Company, and having charge of the different districts. The following list includes the most of those named :

Wm. McGillivray and Alex. McKenzie, agents; Rod. McKenzie, Angus Shaw, and James Finlay for Montreal; Cuthbert Grant, back of Red River; Wm. Thorburn, Red River; Daniel McKenzie, Fort Des Prairies and Red Deer River; Wm. McKay, Muskeiko Country; Simon Fraser, Grand Portage; Sayer, Lake Superior.

Clerks; Donald McTavish, Beaver River; Alex. McKay, Isle a la Crosse; John McGillivray, Muskrat River Country; Duncan McGillivray, Upper Fort Augustus; John McDonald and J. Hughes, Fort George; Arch. Todd, Lower Fort Des Prairies; McGillis, Red Deer River; John McDonald and George McKay, Red River and back countries.

On August 9th he left the "Grand Portage," at the mouth of Pigeon River near Lake Superior, in company with Mr. McGillis, and descended through Rainy Lake and Lake of the Woods to Lake Winnipeg, which he reached on September 1st. Crossing this Lake and ascending the Little Saskatchewan or Dauphin River, he reached Lake Manito (Manitoba) on September 10th. He crossed this lake and reached Lake Winnipegosis by way of the Meadow Portage. On September 17th, being camped near the mouth of the Little Dauphin River, provisions were received from Fort Dauphin, on or near Dauphin Lake. They immediately started northward, and on the 19th, Mr. McGillis left to go up the Red Deer River, while he himself went on, and reached the mouth of "Swan" (Shoal) River. Ascending the Shoal River and passing through Swan Lake he ascended the Swan River for  $4\frac{3}{4}$  miles, by the windings of the stream, to Swan River House.

Setting out from here on horseback in company with Mr. Grant, he ascended to Swan River valley and reached Belleau's House on Snake Creek on the following day. From here he turned south, and passing the H. B. Fort at the elbow of the Assiniboine, descended to Grant's House on the Assiniboine, near the mouth of Little Boggy Creek. Here he remained till Oct. 14th, when he returned to Belleau's House on Snake Creek, in order, if possible, to obtain guides to take him up the Swan River to the Red Deer River, and around to the head waters of the Assiniboine. From this date to November 28th his journal was lost, but he states, "I surveyed the Stone Indian (Assiniboine) River upward, and its sources, and the Red Deer River and its sources, and from thence returned to the house of Mr. Cutlbert Grant, at the Brook's, on the Stone Indian River," or as before stated, near the mouth of Little Boggy Creek. He however worked out traverses by latitude and departure which show his course to have been from Belleau's House on the Assiniboine and thence to where he arrived on November 4th. From here he travelled down the bank of the valley to Grant's House, then to Thorburn's House on Calling River, and on to McDonald's House near the mouth of the Souris River, after which he made a short traverse of the Assiniboine, above McDonald's House. He also incorporates a survey made by Mr. McGillis from the Upper to the Lower Settlement on the Red Deer River, giving at the same time the latitudes and longitudes of all the above places as obtained by observation.

On November 28th, he left McDonald's House on his way to the Mandan villages on the Missouri River. On Dec. 7th, he reached old Ash House on the Souris River, "settled two years ago and abandoned the following Spring." Having been unable to procure a guide here, he himself assumed the lead, and struck across to Turtle Mountain, beyond which he again crossed to the Souris or Mouse River, which he followed up to its "bight" whence he crossed the plains, a distance 37 miles to the Missouri River, reaching it on Dec. 29th at a point six miles above the upper of the Mandan villages. These villages are stated to have been five in number, and contained in all 318 houses and 7 tents, inhabited by Mandan and Willow Indians in about equal numbers; and the number of Willow Indians in another place in his notes (there called Fall Indians) is placed at 2,200—2,500. He remained at these villages till January 10th, trying to induce the Indians to come north to trade, but with very little success, as they were afraid of the Sioux. While here he wrote down a vocabulary of the Mandan language, containing about 375 words.

On January 10th, 1798, he left the villages, but being delayed by severe storms, it was the 24th before he reached the Souris River, and February 3rd when he arrived at McDonald's House at the mouth of Souris River.

There he remained till Feb. 25th, plotting his work and preparing for a long trip on foot to connect the waters of the Red River and the Mississippi, and thence over to Lake Superior, a trip which his companions ridiculed as being impossible to accomplish before the advent of summer. On Feb. 25th, however, he started out on foot with a dog team, and descended the Assiniboine to its mouth, making as he always did, a survey of his route; passing on his way Pine Fort and Poplar House both of which had been abandoned, and some houses a little below the portage to Lake Manitoba. On March 7th he reached the mouth of the Assiniboine, and, walking on the ice, turned up Red River: and on the 9th reached Rat Brook,  $\frac{1}{4}$  mile up which was the N. W. Coy's House of Mr. Chaboillez. On March 14th, he reached the house of Mr. Charles Chaboillez, at the mouth of the Summerbury or Pembina River, in Lat.  $48^{\circ} 58' 29''$ , where he stayed till March 21st. He then continued up the Red River past a N. W. Coy's House, kept by M. Roi, and turning into Red Lake River, ascended it to



the mouth of Clear River where there was a N. W. Coy's Post, kept by Baptiste Cadotte. After trying for several days to proceed further on foot, he was obliged to return to this place and wait for the breaking up of the ice. He places this Post in Lat  $47^{\circ} 54' 21''$ , Long  $97^{\circ} 45'$ . On 9th April he started up the Clear River with three men in a canoe, on the 11th passed the mouth of Wild Rice River; on the 15th, carried across to the Red Lake River, and reached Red Lake the 17th, at a point which he places in Lat.  $47^{\circ} 58' 15''$ , Long.  $96^{\circ} 30'$ . From here he turned southward, and after carrying over several portages and through small brooks and lakes he reached Turtle Lake on April 27th, from which flows "Turtle Brook" which he states to be the source of the Mississippi, since it is from here that the river takes the most direct course to the sea. Thus to this indefatigable but hitherto almost unknown geographer belongs the honor of discovering the head waters of this great river, about whose source there has been almost as much discussion as about those of the Nile itself. His course is well laid down on his "Map of the North-West Territory of the Province of Canada, made for the North-West Company in 1813-1814;" on a scale of about 15 miles to an inch, and now in the possession of the Government of the Province of Ontario.

An excellent account of the early expeditions to the head waters of the Mississippi is given by Mr. N. H. Winchell, in his Historical Introduction in the Final Report on the "Geology of Minnesota," 1884. In giving an account of Lieut. Pike's journey to Red Cedar (Cass) Lake 1806, he there states that "Mr. Thompson's maps and papers never having been published, Lieut. Pike is to be accredited with the first authenticated examination of the Mississippi valley from the St. Francis River to Red Cedar Lake." The first who is stated to have travelled through the country north of Red Cedar Lake was J. C. Beltrami, an Italian gentleman, who accompanied Major Long's expedition as far as Pembina. He ascended Bloody (Red Lake) River to Red Lake and from thence followed Thompson's route to Turtle Lake whence he descended the Mississippi to its mouth. This was in the summer of 1823, nine years after Thompson had recorded his discoveries on the above mentioned map, and twenty-five years after he had made the survey of his course.

In a note at the end of this Historical Introduction however, it is

stated that Neil in the 4th edition of his History of Minnesota gives a short account of Thompson's journey across the State in A. D. 1798, which appears to be approximately correct. I have not been able to see a copy of this edition of Neil's History and cannot speak further of it.

From Turtle Lake, Thompson descended Turtle Brook to Red Cedar (Cass) Lake, on which there a N. W. Coy's House kept by Mr. John Sayer, which he places in Lat.  $47^{\circ} 27' 56''$ ; Long.  $95^{\circ}$ . Remaining here from April 29th to May 3rd, he again embarked and struck across to the head of the Mississippi River, down which he travelled through "Winnipegoo" Lake to the mouth of Sand Lake River, where he left the main stream and turned up Sand Lake River to Sand Lake, on which was a House of the N. W. Co., S  $14^{\circ}$  E.  $1\frac{1}{4}$  mile from the head of the river, and in Lat.  $46^{\circ} 46' 39''$ .

From this House he crossed the Lake to the mouth of Savannah Brook, which he followed up to Savannah Carrying Place, a deep bog four miles across. Crossing this portage to a small creek that flows into the St. Louis River, he descended the latter stream to Fond du Lac House, two miles and a half up the river from Lake Superior. He reached this Post on May 10th, 2 months and 18 days after leaving the mouth of Souris River.

From here he surveyed the south shore of Lake Superior, arriving at the Falls of Ste. Marie on May 28th. Leaving here in a light canoe with 11 men, he reached the Grand Portage on June 7th, and remained there till July 14th. The time was a very busy one at this, the central Post of the Company; and he gives a very interesting account of the men who were almost daily arriving from and departing for many widely separated points throughout the west.

On July 14th he started for the interior reaching the Fort at the mouth of the Winnipeg River on July 31st, and on August 3th, the mouth of Saskatchewan, having travelled along the eastern shore of Lake Winnipeg. On the 18th of August he reached Cumberland House, where he states that Mr. Peter Fidler was stopping at the time. This gentleman was in the service of the Hudson's Bay Company and travelled and made extensive surveys throughout the North-West. His journal has been stated to be still in existence, and if

made public, might be almost as absorbingly interesting as that of David Thompson himself. On August 19th he again set out, his destination being Lac la Biche or "Red Deer Lake." Ascending the Sturgeon-Weir River and passing through Beaver Lake he reached the Missinippi by way of the Trade Portage, on August 24th. He ascended the Missinippi to Lac la Ronge, on which he mentions an old House where Simon Fraser and Versailles wintered in 1795-96. He crossed the Lake and came to a House kept by Versailles at the mouth of Rapid River,  $1\frac{1}{4}$  mile beyond which is an English House. From here, ascending to Isle a la Crosse Lake, he reached the N. W. Coy's House on September 6th. Thence, travelling south, up Beaver River as far as the mouth of Green River, he ascended this latter stream to Green Lake, on which was a Post which he places in Lat.  $54^{\circ} 17' 9''$ , Long.  $107^{\circ} 40' 35'$ . There he took horses and travelled westward to Fort George on the Saskatchewan, a short distance above the mouth of Moose Creek and close to the Hudson's Bay Company's Fort, Buckingham House. From here he again turned northward and reached the Beaver River at the mouth of Mouse Lake Creek, from which point he ascended the Beaver River, and crossing the water-shed reached "Red Deer Lake" or Lac la Biche on October 4th. Here he built a House in Lat.  $54^{\circ} 56' 30''$ , Long.  $112^{\circ} 12'$ , and remained through the winter trading with the Indians. His journal states that he was here on March 14th, 1779; but on April 4th he was at Fort Augustus on the north Saskatchewan, and remained there till April 19th. On this date he set out with 3 men and 5 horses, and travelling north-west-ward, reached the Pembina River. Here a canoe had been built for him, so that, sending back the horse he started down the river and reached the Athabasca on April 25th, down which he paddled to the mouth of Lesser Slave Lake River. He turned into this stream and surveyed it up to the lake, and then returning he continued down the Athabasca River to the Fort at the mouth of the Clearwater, where he remained for a few days. On May 10th, however, he again set out and ascending the "Methy Portage" (Clearwater) River, crossed the Portage, and descending through Buffalo Lake, reached Isle a la Crosse on May 20th.

Here he was married on June 10th, to Charlotte Small, a young girl who had not yet entered on her fifteenth year.

From Sept. 11th to the 28th he was at Fort George, and on March

25th of the following year, 1800, he started from this fort overland to Fort Augustus, travelling along the north side of the "Chain of Lakes." After staying here for a few days he set out on March 31st for Rocky Mountain House, travelling to the east of Bears Hills, across two branches of Battle River, down the Wolf's trail and across Wolf Creek (Blind Man River), to a crossing of Clearwater River two miles above its mouth, arriving at Rocky Mountain House on April 7th. The old House of the North-West Company was situated on the north bank of the Saskatchewan, a mile-and-a-quarter above the mouth of Clearwater River. From here he had intended to cross over to the Red Deer River and descend it in a boat, but having been lamed in some way, he sent four men, Chauvette, La Gasse, Clement and Jacco Cardinal on this journey. As he records the fact that they started from Rocky Mountain House and that a boat had been built for them beforehand, and as some of them at all events are afterwards mentioned in his journal, it seems probable that these men successfully descended the Red Deer and South Saskatchewan Rivers, being in all probability the first white men to accomplish this journey. He himself descended the North Saskatchewan. Five miles below the Elbow, where there are very high banks he "found the English encamped for building" at the mouth of a creek flowing in from the right which he calls Sturgeon Creek (Buck Lake Creek), and passing White Mud House, a fort of the North-West Company with Mr. Hughes in charge, he reached Fort Augustus on May 9th, and on May 12th arrived at Fort George. On May 18th he left Fort George and on May 21st passed the Island House, a mile-and-a-half above the mouth of Birch Brook, and the next day passed Turtle River House, a mile-and-a-half below the mouth of Turtle Brook. On June 7th he reached the mouth of the Saskatchewan.

From this time till the Autumn nothing is seen of him, but he evidently returned up the Saskatchewan to Rocky Mountain House, as on October 5th he set out from this place on horseback with five men and three pack-horses, up the Clearwater River and over to the Red Deer River, which he ascended till he reached the mouth of William's Creek, a small brook in Lat  $51^{\circ} 41' 41''$ , Long  $114^{\circ} 56' 40''$ . There he pitched his camp for several days, and during the time he states that he rode 22 miles due west to the foot of the abrupt cliffs of the Rocky Mountains where some Kootanic Indians were camped.

Inducing them to return with him to the fort, he again reached Rocky Mountain House on October 19th.

There he remained till November 17th, when accompanied by Duncan McGillivray, and attended by four men, he set out from the above fort, and travelling on horseback southward along the trail up Clearwater River, he crossed Red Deer River and reached Bow River at a point opposite to where the town of Calgary now stands in Lat.  $51^{\circ} 2' 56''$ , Long.  $113^{\circ} 59'$ . From here he followed the north-east side of the river to a short distance below the bend, where he crossed it and went on to the Spitchee or Highwood River, which he reached two miles above its mouth. From here he turned a little west of south, and reached a camp of the Pikenows or Peikans in Lat.  $50^{\circ} 35' 30''$ ; probably on Tongue Flag Creek. After stopping here for a short time in order to establish friendly relations with the Indians, he turned north-westward and again reached Bow River at a point which he places in Lat.  $51^{\circ} 13' 57''$ , Long.  $114^{\circ} 48' 22''$ , apparently a short distance above the mouth of Ghost River. From here he ascended the south side of the Bow River to the Gap, which he places in Lat.  $51^{\circ} 3' 4''$ , Long.  $115^{\circ} 21'$ . From here he returned to his old camp on the Bow River, and crossing the stream, struck northward to Rocky Mountain House, which he reached on December 3rd.

During the same year Duncan McGillivray is stated to have made a traverse westward from Rocky Mountain House, up the north side of the North Saskatchewan to the small lake at its head three miles beyond which he crossed the centre range of the Rocky Mountains, beyond which he travelled four miles down a stream flowing towards the south-west, from which point he returned to Rocky Mountain House. His traverse is carefully laid down in Thompson's note book.

During the winter of 1800-1801 Thompson remained at Rocky Mountain House trading with the Indians, working out old observations and taking new ones, though the last record that I can find for the winter is dated March 18th.

In June he made a "journey into the Rocky Mountains by land," which is found in his note books worked out by latitude and departure. Starting from a point on the Saskatchewan River in Lat.  $52^{\circ} 27' 39''$ , Long.  $115^{\circ} 30' 50''$ , he travelled at first a little south of west,

and then a little west of south, to a point in Lat.  $51^{\circ} 57' 2''$ , Long.  $116^{\circ} 27' 54''$ , from which point he returned to the fort.

Between August 30th and September 2nd he travelled on horse-back from Rocky Mountain House to Fort Augustus passing by the south end of Long (Gull) Lake.

He is now lost sight of for a considerable time, and it is not till November, 1802, that we find him travelling from the head of Lesser Slave River to the Fort on the west end of Lesser Slave Lake, which he places in Lat.  $55^{\circ} 32' 36''$ . By the beginning of the following year he has reached the Fort on the Peace River, five miles above the mouth of Smoky River, which he places in Lat.  $56^{\circ} 8' 17''$ , Long.  $117^{\circ} 13' 14''$ , with a variation for the compass of  $23\frac{1}{2}^{\circ}$  east.

From January 18th to June 5th he kept a meteorological journal at this Post, jotting down at the same time many interesting notes, one being that he had measured the river opposite the fort and had found it to be 420 yards and 2 feet wide. On the latter date he states that a canoe of the X. Y. Company arrived and put up 100 yards above them where they are going to build.

From June 5th to 24th he was hunting, &c., in the vicinity, and from June 25th to December 11th the meteorological journal is kept regularly. Between the latter date and Dec. 29th he made a trip with dogs to Lesser Slave Lake and back. From this latter date to February 28th 1804, he continued his meteorological journal. In it are many notices of the X. Y. men.

On February 29th he started on foot with dogs and ascending on the river reached Rocky Mountain House on March 6th. This house he places in Lat.  $56^{\circ} 12' 54''$ , Long.  $120^{\circ} 38'$  with a variation of the compass of  $25^{\circ}$  east. On March 13th he again arrived at the Forks, and on the 15th started down the river on the ice and reached Horse Shoe House on the 20th. This House he placed in Lat.  $57^{\circ} 8'$ , Long.  $11^{\circ} 39' 49''$ , with variation  $24^{\circ}$  east.

On April 30th the ice had broken and he left Horse Shoe House in a canoe, passing Fort Vermilion on May 2nd, and descended the river to Lake Athabasca, on which Athabasca House was situated in Lat.  $58^{\circ} 42' 50''$ , Long  $111^{\circ} 8' 30''$ . He arrived here on May 12th, and

leaving it on 15th, embarked for Isle a la Crosse, keeping a survey in the Forks of the Athabasca River, where he arrived on May 19th. From Isle a la Crosse he proceeded directly to Kaministiquia, afterward known as Fort William, to which place the North-West Company had lately removed its headquarters from Grand Portage. On July 25th he again left Kaministiquia and proceeding now through Lac Mille Lacs and Lac la Croix instead of down the St. Francis and Rainy Rivers, he reached the mouth of the Saskatchewan River on September 1st and Cumberland House on September 8th. From here, on September 10th, he proceeded through Sturgeon Goose and Athapupuskow Lakes to Cranberry Portage. At the narrows in Cranberry Lake he left men to build a house. He himself went on through Reed Lake, up the Little Swan River, and through Burntwood Lake, reaching the Missinippi on September 30th, down which he travelled for a short distance to an old fort, which was reached on 1st. After provisioning a house here he set off down the river and arrived at Musquawegan on October 6th in Lat.  $56^{\circ} 13' 7''$ , Long.  $100^{\circ} 25' 50''$ , Var.  $12^{\circ} 30'$  east. He remained here till the following spring, and his journal during the winter is filled with remarks about the N. Y. and H. B. Companies and the fur trade generally.

On May 27th and 28th, 1805, he made a journey to the post on Indian Lake, in Churchill River, which he places in Lat.  $56^{\circ} 48' 20''$ . On June 1st he left Musquawegan and ascended to the forks of the Missinippi, and from there, by Burntwood Portage, &c., to Cumberland House, where he arrived on June 17th. Here he heard that the N.W. and N.Y. Companies had united. Leaving Cumberland House on June 23rd he returned to the fort on Cranberry Lake, where he stayed till July 25th. On this date he set out for Deer Lake. He carried across Cranberry Portage, paddled through Arthapupuskow and Goose Lakes, up the Sturgeon-weir River to Beaver Lake, and on to Trade (Frog) Portage, then down the Missinippi and up the Deer River to Deer Lake, where he arrived on August 4th. Leaving Mr. Frobisher at the lake to build a house, he returned to Cumberland, where he arrived on August 24th. He remained here till September 10th, on which date he set off to Rat River by Cranberry Portage, arriving at his destination on September 19th. Here he built a house and remained during the winter up till June 10th, 1806. On this date he set out for Cumberland, where he arrived on June 14th. He

immediately proceeded eastward to Kaminstiquia. There is now a break in his journal till October 10th, but Harmon states he met him at Cumberland House on September 11th on his way west from the New Fort (Kaminstiquia) to Fort des Prairies. This latter appears to have been a general name used for the principal fort for the time being on the North Saskatchewan. On October 11th he is just arriving at Rocky Mountain House, where he remained trading with the Indians throughout the following winter.

On May 10th, 1807, he set off on horseback for the Rocky Mountains, along the north side of the Saskatchewan, while Mr. Finnan McDonold took a canoe with provisions up the River. On June 3rd they reached the Kootanie Plain, a wide, open flat on the north side of the river within the mountains, which he places in Latitude  $52^{\circ} 2' 6''$ . and on June 6th they reached the Forks. They turned up the south branch of the stream, but, after ascending it for three miles, were obliged to stop as they could take the canoe no further. They remained here till June 25th, when packing everything that they wished to take with them on the backs of their horses they started to cross the mountains. At one o'clock on the above day they reached the height of land in Lat.  $51^{\circ} 48' 27''$ , from which point they descended along the banks of a mountain torrent to "Kootanie" (Columbia) River, which they reached on June 30th in Lat.  $51^{\circ} 25' 14''$ , Long.  $116^{\circ} 52' 45''$ , having thus come through the mountain by what is now known as the Howse Pass down the Blaeberry River; a pass that was afterwards examined by Dr. Hector in 1859, and described by him in Palliser's Report to the British Government. This pass was not used by Howse till 1810, three years after Thompson made his first trip over it. He remained at his camp near the mouth of the Blaeberry till July 12th, repacking the stuff and building canoes. On this date, having placed all the trading goods in canoes, he set out and ascended the river, reaching the Lower Columbia Lake on July 18th. At the north end of this lake he began to build in Lat.  $50^{\circ} 31' 24''$ ; but finding the place unsuitable, on July 29 he moved down the river to about a mile from the lake, and built Fort Kootanie on the west side of the Columbia River, in Lat.  $50^{\circ} 32' 15''$ , Long.  $115^{\circ} 51' 40''$  Var.  $24\frac{1}{2}^{\circ}$  E. There is now a village of Shuswap Indians about opposite to where the old fort used to stand.



He remained at this for the rest of the year, and till April 20th, 1808, trading with Kootanie Indians, and, as usual, taking meteorological and astronomical observations. He also carefully measured the heights of some of the neighboring mountains, from a measured base of 6,920 ft. Mt. Nelson, to the west of the fort, he found to be 7,223 ft. above the surface of the lake, which would give it a height of 9,900 ft. above the sea; a height 100 ft. lower than that given on Dr. Dawson's map of 1885. On April 20th, 1808, he set out with canoes towards the south, and the next day reached the portage to the "Flat Bow" or "McGillivray's" (Kootanie) River, which he calls McGillivray's Portage. From here he descended the "Flat Bow" (Kootanie) River in a canoe, making a careful survey with a compass, by latitudes. On April 24th, he passed the mouth of the "Torrent" (St. Mary's) River, and on the 27th reached the mouth of the "Fine Meadow" (Tobacco) River. On May 6th, he reached the Falls and portaged past them, and on the 8th reached a camp of Flatheads Kootanies in Lat.  $48^{\circ} 42' 52''$ , Long.  $116^{\circ}$ . Having induced these Indians to promise to trade with him, he again set off on the 13th, and on the next day reached Flat Bow or Kootanie Lake. From here he returned up the river to the camp of the Flatheads, whence he took horses and travelled in a north-easterly direction up "McDonald's" (Moyie, or Choecocoo, or Grand Quête River; and on May 18th reached McGillivray's (Kootanie) River, which he crossed and following up the Bank of this stream across Skirmish and Lussier Rivers, the latter called after one of his men, reached the Fort on June 5th. From here he continued northward down the Columbia to the mouth of Blaeberry River, from which place he crossed the mountains with the furs obtained during the year, reaching the height of land on June 21st, and Kootanie Plain on June 22nd. On this journey they were obliged to kill and eat several of his horses, as he was unable to obtain other provisions.

At Kootanie Plain he embarked in a canoe and descended the Saskatchewan, passing Rocky Mountain House on 24th; Muskako Fort on the 26th, four and a-half hours after passing Wolf Brook; and reaching Fort George on June 30th, having passed "Old Island Fort" three hours and a half before. Next day he descended to Fort Vermilion, to which place the head-quarters of the district had been removed from Fort George. This fort is stated by Alexander Henry to have been situated in Lat.  $53^{\circ} 51' 7''$ , on the north side of the

Saskatchewan River, "in a long flat bottom of meadow directly opposite the Vermilion River." On July 3rd he again embarked, and on the following day passed "burnt Fort de L'Isle." On July 6th he reached the Crossing Place (at or close to Fort Carlton) at 2 p.m., Fort de Milieu at 4.30 p.m., old Hudson House at 6.30 p.m. On July 7th he reached the Forks at 2 p.m., Fort St. Louis at 5 30. p.m., and Fort la Corne at 6.15 p.m. On July 9th he arrived at Cumberland House, and on August 2nd Rainy Lake House. On August 4th he again set out for the west reaching Cumberland House on the 26th, Fort Vermilion on September 14th, and Fort Augustus, on the 23rd. On October 1st he passed old Muskako fort and on October 3rd arrived at Boggy Hall, in Lat.  $53^{\circ} 1' 19''$ . This fort according to Alexander Henry was abandoned in the fall of this year. Writing in 1811 he says:—"The remains of the buildings stand upon a small plain on the north side of the river, about half a mile from the river, through thick woods. The situation of the house is very pleasant, having a beautiful meadow on one side, sufficiently large for a horse-race, the whole is bound in by tall poplars aspen and pine." Here, sending on the canoes he took men and horses, and on October 9th passed old Rocky Mountain Fort, and travelled till 17th, when sharp frosts setting in the canoes could be brought no further. Having therefore camped for a few days to arrange the packs, he set out with pack-horses on October 22nd, passed the Kootanie Plain on the 24th, and on the 27th crossed the height of land.

Here he killed two buffaloes, and he states that there was a herd of cows still ahead of them; being, therefore, some distance down on the western side of the water-shed. On Oct. 31st, he again reached the Columbia River. From here he sent the horses southward through the woods, while he ascended the river in a boat as far as a hoard that had been built beside the river the year before, in Lat.  $50^{\circ} 53' 34''$ , which must be not far from the mouth of the Spilimichene River.

In this course he speaks of the "Rapid" (Kicking Horse) River. From here he sent Mr. Finnan McDonald southward with the canoes, who established a fort and wintered near the falls on Kootanie River, while he himself went on horseback to the old Kootanie Fort where he arrived on November 10th. He remained here during the winter trading with the Kootanie Indians.

On April 17th, 1809, he removed a short distance down the river and camped till the 27th. He then descended the Columbia River in a canoe, the horses being at the same time driven through the woods to the Mountain Portage, and crossed the Mountains to the Saskatchewan, reaching Kootanie Plain on June 13th. During the winter he had obtained in all, about 40 packs of furs. At the Kootanie Plain a canoe was built and some of the furs being put into it he started down the river reaching Fort Augustus on June 24th. On the 27th two canoes were sent eastward with his furs, but he himself remained at the fort till July 18th. On this date having sent the canoes up the Saskatchewan a day or two before him, he set off on horseback towards the mountains and caught up to and joined the canoes near the mouth of Wolf Creek, sending the horses back as they had come. Travelling up the river he reached Kootanie Plain on August 3rd. Here he remained till the 8th, arranging the packs for the journey across the mountains, and on this date he started westward on horseback. Next day he met Mr. Howse, an officer of the North-West Company, who had left Fort Augustus a short time before on an exploring trip, returning again to the east. On the 11th he crossed the height of Land, and on the 13th reached the "Kootanie" (Columbia) River. Ascending this river he reached McGillivray's portage on the 20th and started down the Kootanie River, and on the 29th reached the Great Road of the Flatheads, where he had come to the large camp of these Indians in the spring of 1808. On September 6th, having obtained horses from the Indians he set out towards the south and reached Pend d' Oreille Lake on the 8th, and next day the mouth of Clark's Fork, where it empties into the lake, near which there was a large camp of Indians. On the 10th he found a spot on a peninsula on the east side of the lake in Lat.  $45^{\circ} 12' 14''$ , where he built a house. He himself remained here for about two weeks to see that building operations were being pushed on as quickly as possible. On the 27th he rode around the south side of the lake and a short distance down the river flowing from it, returning to the house on October 6th. On the 11th he again set off on horse-back, and travelled for a considerable distance in a south-easterly direction up the Seleesh River or Clark's Fork. Turning from this river he travelled first north-east and then north-west, till he reached the Kootanie River above the Falls, where having obtained canoes he descended

to the Flat Head Road and crossed to the House on Pend d'Oreille Lake which he reached on October 30th.

On November 2nd he again set off up the river, and on November 9th reached a point where he built a house in Lat.  $47^{\circ} 34' 35''$ , Long.  $115^{\circ} 22' 51''$ . He remained at this point till February 23rd, on which date he left it to travel among the Indians, returning on March 6th. Setting off again immediately he journeyed on horse-back till March 13th, when being a considerable distance up the Saleesh River he embarked in a canoe and came down to the House, which he reached on the following day, making, as usual, as careful a survey as possible of his route. He then remained here till March 24th, when he again started down the river and the next day reached the "House Road," where he remained till April 19th, when he embarked and reached the House on Pend d'Oreille Lake on April 23rd. From here he crossed to the Kootanie River, ascending which he reached McGillivray's Portage on June 6th, and descending the Columbia reached the Mountain Portage on June 16th. From here he crossed to the Saskatchewan arriving at the Forks in the mountains, on the 19th, having left the men to come after with the pack-horses.

Embarking in a canoe from here he soon passed the ruins of Fort Augustus, which, since he left it in the previous July, had been destroyed by the Blackfeet, and on the next day reached White Mud Brook House, where Mr. Henry was in charge for the N. W. Co. and Mr. Hellet for the H. B. Co. This house appears to have been at the mouth of White Earth River, a short distance below the present site of Victoria. On July 4th he reached Cumberland House, and on July 22nd Rainy Lake House.

From this date to May 6th, 1812, no journal could be found in the offices of the Crown Lands Department of Ontario, but a long series of astronomical observations is given from which his course has been traced out as follows:—

Having returned from the east he was at the site of Boggy Hall on the Saskatchewan on October 23rd of this year (1810). From here he took a north-westerly course across the country, being on November 2nd in Lat.  $53^{\circ} 8' 3''$ , Long.  $115^{\circ} 3'$ ; on November 13th,

in Lat.  $53^{\circ} 16' 36''$ , and on November 21st in Lat.  $53^{\circ} 24' 42''$ , Long.  $116^{\circ} 50'$ . On November 26th he left McLeod River, in Lat.  $53^{\circ} 30' 39''$ . and on November 28th was at a Brook in Lat.  $53^{\circ} 37' 54''$ . On December 1st he reached Athabasca River, and on the 5th and 6th was at the depot in Lat.  $53^{\circ} 33' 33''$ , Long.  $117^{\circ} 30'$ . From here he ascended the Athabasca River, and crossing the mountains by the Athabasca Pass reached the Columbia at the mouth of the Canoe River, where he spent the remainder of the winter, and where the N.W. Co. had a Post, perhaps built by himself after his arrival. From here, in the spring 1811, he ascended the Columbia River to its source, crossed McGillivray Portage, and, descending the Kootanie River, was at the "Great Kootanie Road" on May 19th, which road strikes up a stream from the south-east bend of the Kootanie River. He crossed on this road, or on the "Lake Indian Road," north of the Pend d'Oreille Lake to the Saleesh (Clark's Fort) River, and then on the "Sheetshoa Road," which runs north-west from Saleesh River, about ten miles below Pend d'Oreille Lake, to the "Sheetshoa" (Spokane) River, and on June 15th he was at Spokane House on this river, which house he places in Lat.  $47^{\circ} 47' 4''$ . He then descended the Spokane River to the Columbia and ascended the Columbia to "Ilthkoyape" or Kettle Falls, near the present site of Colville, which he places in Lat.  $48^{\circ} 37' 30''$ , Long.  $117^{\circ} 55'$ . Here he remained for a few days, and then descended the Columbia to its mouth, where he arrived on July 15th or 16th. Alexander Ross and Gabriel Franchère state that it was on the 15th, but Thompson's record of his observations seems rather to point to the 16th as the date of his arrival. The "Pacific Fur Company," under which the two gentlemen above named were clerks, had in the spring of this same year founded a fort at the mouth of the Columbia which they named Astoria, a name that was afterwards changed to Fort George, when it was sold to the North-West Company in the autumn of 1813.

After spending a few days with Mr. McDougall, the hospitable commander of Astoria, Thompson started back up the Columbia and on July 24th was camped in the mouth of the Willamette River, near the site of the present town of Portland. From here he continued his ascent of the Columbia (several observations being given) to the mouth of "Shaupatin" (Lewis or Snake) River, which he ascended to

Lat.  $46^{\circ} 36' 13''$ , Long.  $118^{\circ} 50'$ , where he was on Aug. 8th and 9th. Here he says, "we laid up our canoes," and he must then have crossed by land to Spokane House, where he was from Aug. 12th to 15th. The trail that he probably took was not far from the present line of the Northern Pacific Railway. From Spokane House he followed the Spokane River to its mouth, after which he ascended the Columbia to Boat Encampment, at the mouth of the Canoe River, and thus completed the survey of the stream from its source to its mouth. On October 4th he was at "Mr. Wm. Henry's Campment," at the headwaters of the Athabasca River in Lat.  $52^{\circ} 53'$ , Long.  $118^{\circ} 35'$ .

From this date till the beginning of the following May all that we know of his whereabouts from his notes is that he records two observations for longitude at Ilthkoyape Falls on April 21st, 1812, so that it appears not impossible that he wintered either at that or at Spokane House.

On the 6th of May of this year he set out on foot from Boat Encampment on the Columbia River, and travelling eastward by the Athabasca Pass crossed the height of land on May 8th, and on the 11th reached the house of Mr. Wm. Henry on the Athabasca River, in Lat.  $52^{\circ} 55' 16''$ . On the 13th he started down the river from here in a canoe, making his last survey in the North West Territories. On the 20th he reached the mouth of Lesser Slave River, up which he pushed to the house at its head. Descending the river again he left its mouth on May 24th, and on the following day reached the Red Deer or La Biche River,, which he ascended, reaching Red Deer Lake or Lac la Biche on May 27th. Crossing the portage from this lake he descended the Beaver River at least as far as Lat.  $54^{\circ} 22' 14''$ , Long.  $110^{\circ} 17'$ , where the survey that we have been following is broken off. It is not certain by what course he travelled to Cumberland House, but below this he doubtless followed on the ordinary trade route to Lake Superior. On August 12th he left Fort William and resurveyed the northern shore of Lake Superior to Sault Ste. Marie where he arrived on the 24th of the same month. Before October 20th he had arrived at Terrebonne, in Lower Canada, where he took up his residence, and the two following years were spent in preparing a map of Western Canada for the North West Company, on a scale of about fifteen miles

to an inch, from the observations and surveys that he had made during the previous twenty years. This map, which is in possession of the Crown Lands Department of the Province of Ontario is entitled "Map of the North West Territory of the Province of Canada, 1792-1812, embracing region between Latitudes  $45^{\circ}$  and  $56^{\circ}$ , and Longitudes  $84^{\circ}$  and  $124^{\circ}$ ;" "Map made for the North West Company in 1813-1814."

And now our notice must be drawn to a close as quickly as possible, as the object of this paper is to trace Mr. Thompson in his travels through the North-west rather than to write a sketch of his life, though such a sketch would undoubtedly be of absorbing interest.

From 1816 to 1826 he was engaged in surveying and defining the Boundary Line, on the part of Great Britain, between Canada and the United States, being employed in 1817 in the St. Lawrence, and having proceeded westward around the shores of the great lakes, he reached the Lake of the Woods in 1825. In 1834 he surveyed Lake Francis. In 1837 he made a survey of the canoe route from Lake Huron to the Ottawa River and a few years later he made a survey of Lake St. Peter.

His last years were spent either in Glengarry County, Ontario, or in Longueuil, opposite Montreal, where he died on the 10th of February, 1857, at the ripe old age of nearly 87 years. His wife survived him by only about three months, dying on the 7th of May of the same year, and they are both buried in the Mount Royal Cemetery in Montreal.

He died in extreme poverty, and it was due to the kindness of some of his old friends that he received a Christian burial.

H. H. Bancroft, who has collected very many interesting details about the old travelers and traders in the west, but to whom the labors of this remarkable man have, up to the present, remained almost entirely a mystery, gives the following account of his personal appearance; "David Thompson was an entirely different order of man from the orthodox fur-trader. Tall and fine looking, of sandy complexion, with large features, deep-set, studious eyes, high forehead and broad

shoulders, the intellectual was well set upon the physical. His deeds have never been trumpeted as those of some of the others, but in the westward exploration of the North West-Company no man performed more valuable service, or estimated his achievements more modestly.'

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LIST OF FORTS AND TRADING POSTS, THE POSITIONS OF  
WHICH ARE GIVEN BY DAVID THOMPSON IN HIS  
FIELD NOTE-BOOKS

BELONGING TO THE HUDSON'S BAY COMPANY.

- York Factory, on Hudson's Bay, in Lat.  $57^{\circ} 1' 26''$ , Long.  $92^{\circ} 29' 20''$ .  
 Seepaywisk House, on Seepaywisk Lake, in Lat.  $55^{\circ} 3' 15''$ , Long.  $97^{\circ} 41' 30''$ , Var. of Compass (1792)  $12^{\circ} 30'$  east.  
 Chatham House, on Chatham (Wintering) Lake, in Lat.  $55^{\circ} 23' 40''$ , Long.  $97^{\circ} 44' 34''$ .  
 Reed Lake House, on Reed Lake. in Lat.  $54^{\circ} 36' 17''$ , Long.  $100^{\circ} 36' 50''$ , Var (1795)  $10\frac{1}{4}^{\circ}$  east.  
 Duck Portage House, on the south side of Duck Portage, in Lat.  $55^{\circ} 40' 36''$ , Long  $102^{\circ} 7' 37''$ . Var. (1796)  $15^{\circ}$  east.  
 Fairford House, on the Missinippi, one mile below the mouth of Deer River, Lat.  $55^{\circ} 33' 28''$ , Long.  $103^{\circ} 10'$ .  
 Bedford House, on the west side of Deer Lake, in Lat.  $57^{\circ} 23'$ , Long.  $102^{\circ} 58' 35''$ .  
 Cumberland House, on the south side of Pine Island Lake, in Lat.  $53^{\circ} 56' 44''$ , Long  $102^{\circ} 13'$  Var. (1790)  $11^{\circ} 30'$  east.  
 South Branch House, on the South Saskatchewan River, (probably near Batoche).  
 Lower Crossing of the North Saskatchewan River, Lat.  $52^{\circ} 57' 48''$ , Long.  $106^{\circ} 30' 30''$ .  
 Upper Hudson's House, on the North Saskatchewan, 3 miles below the Lower Crossing, (in Sec. 32, Tp. 46, R. 3, west of the 3rd Initial Meridian).  
 Lower Hudson's House, on the same river,  $11\frac{1}{2}$  miles below the last named place.



Manchester House, on the same river,  $3\frac{1}{2}$  miles below the mouth of Horse Creek, and 25 miles above the mouth of Turtle River.

Buckingham House, on the same river, about 4 miles above Moose Creek, in Lat.  $53^{\circ} 52' 7''$ , Long.  $110^{\circ} 41' 7''$ , Var. (1794)  $18^{\circ}$  east.

White Mud Brook House, close to the N. W. Co's post of the same name on the North Saskatchewan river.

Swan River House, on Swan River, near the N. W. Co.'s house of the same name, Lat.  $52^{\circ} 23' 40''$ , Long  $100^{\circ} 36' 53''$ .

BELONGING TO THE NORTH-WEST COMPANY.

*West of the Rocky Mountains.*

Kootanic Fort on the west bank of the Columbia River, 1 mile below the Lower Columbia Lake, in Lat.  $50^{\circ} 32' 15''$ , Long.  $115^{\circ} 51' 40''$ , Var. (1807)  $24\frac{1}{2}^{\circ}$  east.

"Hoard," on the River in Lat.  $50^{\circ} 53' 34''$ .

Kullyspel House on the east side of Kullyspell or Pend d' Oreille Lake in Lat.  $48^{\circ} 12' 14''$ .

Saleesh House on the Saleesh River or Clark's Forks in Lat.  $47^{\circ} 34' 35''$ , Long.  $115^{\circ} 22' 51''$ .

Boat encampment near the mouth of Canoe River on the Columbia, in Lat.  $52^{\circ} 8' 1''$ , Long.  $118^{\circ} 18' 18''$ .

Spokane House on the Spokane River, in Lat.  $47^{\circ} 47' 4''$ , Long.  $117^{\circ} 27''$ .

Iltikoyape Falls on the Columbia River in Lat.  $48^{\circ} 37' 30''$ ; Long.  $117^{\circ} 56''$ .

*East of the Rocky Mountains.*

Rocky Mountain House on Peace River in Lat.  $56^{\circ} 12' 54''$ , Long.  $120^{\circ} 38'$  Var. (1804)  $25^{\circ}$  east:

Fort on Peace River 5 miles above the mouth of Smoky River in Lat.  $56^{\circ} 8' 18''$ , Long.  $117^{\circ} 13' 14''$ , Var. (1803)  $23\frac{1}{2}^{\circ}$  east.

Horse Shoe House on Peace River in Lat.  $57^{\circ} 8'$ , Long.  $117^{\circ} 39' 49''$ , Var. (1804)  $24^{\circ}$  east.

Vermilion Fort on Peace River below Horse Shoe House.

Athabasca House on Athabasca Lake in Lat.  $58^{\circ} 42' 50''$ , Long.  $151^{\circ} 8' 30''$ .

Old Athabasca House (by Mr. Turner) Lat  $58^{\circ} 38'$ , Long.  $110^{\circ} 26\frac{1}{2}'$ .

Wm. Henry's campment at the head waters of the Athabasca River in Lat.  $52^{\circ} 53' 24''$ .

Henry's House on the same river in Lat.  $52^{\circ} 55' 16''$ .

Depot on Athabasca River in Lat  $53^{\circ} 33' 33''$ , Long.  $117^{\circ} 30''$ .

Lesser Slave Lake House at west end of Lesser Slave Lake in  $55^{\circ} 32' 36''$ .

Fort "on the west point" on Athabasca River at the mouth of the Clearwater in Lat.  $56^{\circ} 44' 6''$ .

Lac la Biche House on Lac la Biche in Lat.  $54^{\circ} 56' 30''$ , Long.  $112^{\circ} 12'$ .

Green Lake House in Lat.  $54^{\circ} 17' 9''$ , Long.  $107^{\circ} 40' 35''$ , Isle a la Crosse House in Lat.  $55^{\circ} 26' 15''$ , Long.  $107^{\circ} 46' 40''$ .

Versailles House on Lac la Ronge at the mouth of Rapid River.

Fraser's House at the head of Deer's River in Lat.  $56^{\circ} 20' 22''$ , Long  $103^{\circ} 18' 47''$ .

Indian Lake House, Churchill River, Lat.  $56^{\circ} 48' 20''$ .

Musquawegan on the Mississippi (Churchill) River in Lat  $56^{\circ} 13' 7''$ , Long.  $100^{\circ} 25' 50''$ , Var. (1805)  $12^{\circ} 30'$  east.

Rocky Mountain House on the north bank of the North Saskatchewan River,  $1\frac{1}{4}$  mile above the mouth of Clearwater River, in Lat.  $52^{\circ} 21' 30''$ ; Long.  $114^{\circ} 52'$ .

Boggy Hall on the same river between the mouths Brazeau River and Wolf Creek in Lat.  $53^{\circ} 1' 19''$ .

Wuskako Fort on the same river,  $4\frac{1}{2}$  hours journey below Wolf Creek.

White Mud Fort on the north bank of the same river, at the mouth of White Mud Creek.

Fort Augustuss on the same river, a mile and a half above the mouth of Sturgeon River, in Lat  $53^{\circ} 44' 52''$ , Long.  $103^{\circ} 11''$ , Var. (1799)  $20'$  east.

White Mud Brook Fort on the same river, a days journey below Ft. Augustus.

Isle of Scotland or Island Fort  $3\frac{1}{4}$  hours journey above Fort George.

Fort George, close to the Hudson's Bay Company's establishments of Buckingham House.

Vermilion, 5 hours journey below Fort George.

Fort de l' Isle, a mile and a half above the mouth of Birch Brook, (apparently not far from Manchester House.)

Turtle River House a mile and a half below the mouth of Turtle Brook.

Fort de Milieu, two and a half hours journey below a Crossing Place (Ft. Carlton).

Hudson's House, two hours journey below the last, and 15 miles above Setting (Sturgeon's) River.

Fort St. Louis, three and a half hour's journey below the Forks.

Fort la Corne, three-quarters of an hour's journey below the latter.

Isaac's House, 38' Long below the Forks,

Nepoin House, 9 $\frac{3}{4}$  miles below Isaac's House.

Hungry Hall, on this same river 14 miles above the mouth of Sturgeon River.

Cumberland House, near the H. B. Co's. Post.

Upper House on Red Deer River, Lat.  $52^{\circ} 47' 44''$ , Long.  $102^{\circ} 14'$ .

Lower House on Red Deer River, 60 miles below the Upper House.

Upper House on Stone Indian (Assiniboine) River, Lat.  $51^{\circ} 46' 58''$ , Long.  $102^{\circ} 24' 55''$ , Var. (1797)  $14^{\circ} 40'$  east.

Belleau's House on Snake Creek, half a mile north of Lat.  $51^{\circ} 51' 9''$ .

Swan River House on the Swan River,  $4\frac{1}{2}$  miles above its mouth, Lat.  $25^{\circ} 24' 5''$ , Var. (1797)  $9^{\circ} 47'$  east. Two other houses are mentioned on Swan River one  $33\frac{1}{2}$  and other  $35\frac{1}{2}$  miles above Swan River House.

Fort Dauphin on Dauphin Lake.

Grant's House on the east bank of the Assiniboine near the mouth of Little Boggy Creek, in  $51^{\circ} 26' 10''$ , Long.  $101^{\circ} 57' 3''$  Var. (1797)  $13^{\circ}$  east.

Thorburn's House, on Calling River a few miles above its junction with Assiniboine River, in Lat.  $50^{\circ} 28' 57''$ , Long.  $101^{\circ} 45' 45''$ .

McDonald's House on the Assiniboine near the mouth of Mouse (Souris) River, in Lat.  $49^{\circ} 40' 26''$ , Long.  $99^{\circ} 27' 15''$ . Ash House on the banks of Mouse River, in Lat.  $49^{\circ} 27' 32''$ . Principal Mandan village on the Missouri in Lat.  $47^{\circ} 17' 26''$ , Source of Missouri, worked out from accounts of the Mandan Indians, Lat.  $45^{\circ} 11' 7''$ , Long.  $110^{\circ} 17' 8''$ . (A very good result for so rough a method).

Pine Fort, on the Assiniboine River,  $16\frac{1}{2}$  miles below the mouth of the Mouse River.

Poplar House, on the Assiniboine River,  $16\frac{1}{2}$  miles below the mouth of the Mouse River.

Popular House, on the same river,  $53\frac{1}{2}$  miles below the last, and 5 miles above Portage la Prairie.

Cheboillez's Old House, on Rat Creek,  $\frac{1}{2}$  mile up from its mouth in Lat.  $49^{\circ} 33' 58''$ .

Cheboillez's House, at the mouth of Summerberry (Pembina) River, in Lat.  $48^{\circ} 58' 29''$ .

Baptiste Cadotte's House, on Red Lake River, in Lat.  $47^{\circ} 54' 21''$ , Long.  $97^{\circ} 45'$

Cadotte's old House, on Red Lake, in Lat.  $47^{\circ} 56' 15''$ , Long.  $95^{\circ} 37'$ .

Sayer's House on Red Cedar (Cass) Lake, in Lat.  $47^{\circ} 27' 56''$ , Long.  $95^{\circ}$ .

Sand Lake House, on Sand Lake, in Lat.  $46^{\circ} 46' 39''$ , Long.  $93^{\circ} 20'$ .

Fond du Lac House, 2 miles up the St. Louis River from Lake Superior, in Lat.  $46^{\circ} 44' 2''$ , Long.  $92'$ .

Lake Superior, in Lat.  $46^{\circ} 44' 2''$ , Long.  $92^{\circ}$ .

Mille Lac Fort in Lat.  $48^{\circ} 48' 37''$ , Long.  $90^{\circ} 49' 31''$ .

Also a number of other forts between Grand Portage or Fort William and the mouth of the Winnipeg River.

Ottawa, February: 25th, 1858.

A CONTRIBUTION TO THE STUDY OF THE  
FRANCO-CANADIAN DIALECT.

BY J. SQUAIR.

I spent a few weeks last summer in the parish of Ste. Anne de Beaupré in the Province of Quebec, and while there I carefully noted the expressions, words and pronunciation of words which struck me as peculiar in the speech of the *habitants* of that parish, and the present paper is an attempt to present the results of my observations.

In the matter of words and expressions I have noted those only which are not to be found in Oscar Dunn's *Glossaire Franco-Canadien*, (Quebec, 1880).

VOWELS.

(1) (*a*, *â*, in this list pronounced like *a* in English *hat*.)

aller	caractère	embrasser	hache	pacage
archet	carotte	engager	hardi	par
ardent	carte	érable	hardes	partir
argent	casquette	escalier	image	patience
arpent	chapeau	esclave	impatient	place
arrière	charger	étable	installer	pratique
attacher	charité	étage	jardin	quartier
bagage	chasse	fable	large	race
bague	chatte	face	larme	radis
balai	châtiment	filasse	maçon	rame
baptême	cirage	frapper	mal	ravage
baril	claquer	fromage	marbre	(je)regarde*
battre	compagnie	gage	marcher	retarder
cabaret	compâtir	galette	mariage	sage
cacher	dame	garde	marteau	spectacle
café	désastre	garder	massacre	tarder
cage	détachement	glace	ménage	trace
canal	écarlate	grappe	misérable	vache
canne	écarter	gratter	montarde	
canon	éclater	grave	nappe	
cap	égal	grimace	orage	

\* I have however heard the *a* of *regarde* pronounced at Ste. Anne like *aw* in English *saw*

(2) (*a, â, à*, in this list pronounced like *aw* in English *saw*.)

(il) <i>a</i>	<i>carré</i>	<i>déjà</i>	<i>gras</i>	<i>plat</i>
accabler	<i>carreau</i>	<i>délicat</i>	<i>ingrat</i>	<i>ramasser</i>
achat	<i>carrosse</i>	<i>embarras</i>	<i>là</i>	<i>ras</i>
amuser	<i>cas</i>	<i>entasser</i>	<i>las</i>	<i>raser</i>
-atior.	<i>casser</i>	<i>estomac</i>	<i>mâcher</i>	<i>rat</i>
avocat	<i>chat</i>	<i>état</i>	<i>mâchoire</i>	<i>repas</i>
bas	<i>combat</i>	<i>fracas</i>	<i>miracle</i>	<i>soldat</i>
bâtiment	<i>condamner</i>	<i>gagner</i>	<i>pas</i>	<i>tracas</i>
bras	<i>crachat</i>	<i>gars</i>	<i>passer</i>	<i>va</i>
ça	<i>dammer</i>	<i>gâteau</i>	<i>pâté</i>	
cadenas	<i>débat</i>	<i>gâter</i>	<i>pâtisserie</i>	

(3) (*a, â*, in this list pronounced like *au* in French *chaud*.)

<i>âge</i>	<i>canard</i>	<i>épars</i>	<i>papa</i>	<i>regard</i>
<i>âme</i>	<i>châle</i>	<i>espace</i>	<i>pâque</i>	<i>relâcher</i>
<i>âne</i>	<i>char</i>	<i>fâcher</i>	<i>pare</i>	<i>renard</i>
<i>arbre</i> (first <i>r</i> silent)	<i>charette</i>	<i>grâce</i>	(il) <i>part</i>	<i>retard</i>
<i>base</i>	<i>chassis</i>	<i>hasard</i>	<i>plâtre</i>	<i>sable</i>
<i>hasse</i>	<i>charron</i>	<i>hart</i>	<i>pâte</i>	<i>Richard</i>
<i>bâtard</i>	<i>château</i>	<i>infâme</i>	<i>plupart</i>	<i>sabre</i>
<i>bavard</i>	<i>classe</i>	<i>jars</i>	<i>quart</i>	<i>tâche</i>
<i>bazar</i>	<i>déclarer</i>	<i>lâche</i>	<i>racler</i>	<i>tâcher</i>
<i>bizarre</i>	<i>départ</i>	<i>lard</i>	<i>ramasser</i>	<i>tard</i>
<i>blâmer</i>	<i>diable</i>	<i>lasse</i>	<i>râpe</i>	<i>tasse</i>
<i>brancard</i>	<i>disgrâce</i>	<i>mâle</i>	<i>rare</i>	<i>tâter</i>
<i>buvard</i>	<i>écraser</i>	<i>marli</i>	<i>râteau</i>	<i>vase</i>
<i>cadavre</i>	<i>égard</i>	<i>mars</i> ( <i>s</i> silent)	<i>râteler</i> *	
<i>cadre</i> ( <i>d = t</i> )	<i>encadrer</i>			

N.B. There is a tendency to drawl the *a* or *â* of many of these words so that it comes to have almost the sound of *ou* in English *house*.

(4) (*ai* in this list pronounced like *è* in French *très*.)

<i>affaiblir</i>	<i>aigre</i>	<i>aile</i>	<i>araignée</i>	<i>bedaine</i>
<i>aigle</i>	<i>aiguille</i>	<i>aimer</i>	<i>baïsser</i>	<i>caisse</i>

\* In the 2nd Sing. impera. of this verb the form *ôte* is often used.

capitaine	fontaine	laine	maison	saison
combinaison	fraise	laisser	raison	traiter
faïble	graine	maigre	retraite	

(5) (*ai, ai*, in this list pronounced like *è* in French *très* with a tendency to the sound of *a* in English *father*.)

*anglais	épais	jamais	mauvais	raide
aurais	essai	laid	monnaie	souhait
avais	extrait	laide	palais	trait
balai	fait	lait ( <i>t</i> pro-	parfait	vais
délaï	frais	nounced)	plaît	vrai
engrais	harnais	mais	portrait	

(6) (*ai, ai*, in this list pronounced like *é* in French *été*.)

fanlaise	chair	engraisser	haine	punaïse
affaire	chaïse	épaïse	maï	rafraïchir
aider	clair	faïre	maïtre	rosaïre
aïné	comparaïtre	fournais	mauvais	taïc
aïr	connaitre	fraïche	militaïre	traïner
aïsé	contraïre	gaï	naïtre	traïtre
baisier	craïnte	graisse	plaïre	
chaïne	distraïre			

(7) (*a, á*, in this list pronounced like *aw* in English *saw*; *il* and *ille* have the normal French pronunciation.)

baïller	écaïlle	muraille	poulailler	tiraïller
bataïlle	maïlle	paille	raïller	volaïlle
caille	mangeaïlle			

N.B. *aïl, aïlle*, in the following words pronounced as commonly pronounced in French.

aïlleurs	gaïllard	médaille	travail	vaïllant
				vaïlle

\* So also *écossais, français*, etc.

† So also *écossaise*, etc.

(8) In *faine*, *ai* is a real diphthong, pronounced very much like *i* in English *fine*.

(9) (*e*, *è*, *ê*, in this list pronounced like *è* in French *très*.)

accepter	caresse	-elle	fièvre	pécher
arrêter	chef	empêcher	flèche	pièce
avec	ciel	espèce	lèvre	prêcher
baptême	conquête	être	mèche	règle
bêche	crème	-ette	mêler	rêver
bête	cruel	extrême	même	suprême
bref	dépêche	fidèle	messe	trêfle

(10) (*e*, *è*, *é*, in this list pronounced like *è* in French *très*, with a tendency towards the sound of *a* in English *father*.)

* alphabet	* après	* arrêt	direct	† elle	grève
		nord-est	( <i>st</i> silent.)		

(11) (*e* in this list pronounced like *a* in English *father*.)

affermir	conserver	herse	personne	servir
auberge	convertir	infertile	persuader	terme
averse	couverture	merci	perte	ternir
avertir	diverse	percer	perversion	traverser
bercer	divertir	perche	refermer	verbe
cercle	enfermer	perdre	remercier	verge
cercueil	ferme	perdrix	renverser	vermine
certain	fermer	perfide	réserve	vernis
cerveau	fervent	perle	serment	verser
chercher	gerbe	permettre	serpent	verte
cierge	germer	persécuter	serpette	vertu
commerce	herbe	persévérer	service	viège

(12) (*e*, *è*, *é*, *ê*, in this list pronounced like *é* in Fr. *été*.)

* abbé	acier	* arière	* caractère	chêne
* accabler,	amer	assez	carême	cher

^ So in all words with same termination.

† *elle* is often pronounced *a* (*a* in *father*).

chez	enfer	hier	personnage	terre
citerne	enterrement	hiver	pied	tiers
clef	entêté	honnête	pressé	travers
clergé	envers	infernal	prêtre	univers
collège	errer	lanterne	proverbe	université
concert	éternité	liberté	quête	ver
couvert	évêque	liège	sergent	verdure
crêpe	gêner	mevercredi	serrer	verre
crête	grêle	(first <i>r</i> often	(il) sert	vers
désert	guêpe	silent)	tête	vert
dessert	guerre	perpétuel		

(13) In *reine* and *teinte*, *ei* is a real diphthong. In *peine* and *reine*, it is pronounced like *è* in Fr. *très*. In *neige*, it is pronounced like *é* in Fr. *été*.

(14) (*oi, oi, oy, oë*, in this list pronounced like *ou* in Fr. *oui* + *é* in Fr. *été*.)

adroit	cramoisi	étroite	moisir	poivre
angoisse	croire	foire	mouchoir	soir
apprivoiser	(je) crois	gloire	noir	tiroir
* avoir	(je) croyais	histoire	oiseau	toi
boire	(je) croirai	joindre	passoire	toison
boisson	croiser	jointe	poêle	victoire
boîte	croître	mâchoire	pointe	voici
boiteux	désespoir	mangeoire	pointu	voilà
chinoise	droite	mémoire	poire	(je) vois
choisir	éloigner	miroir	poison	(il) voit
cloison	entonnoir	moi	poisson	voisin
coiffer	espoir	moindre	poitrine	

N.B.—In this list the following peculiarities are to be noted :— In *adroit*, *droite*, *étroite*, *oi* is often pronounced like *è* in Fr. *très*; in *croire* and (je) *crois* it is often pronounced like *é* in Fr. *été*; in *cloison* the *l* is often silent, and in *croiser* and *croître* the *r* is often silent.

(15) (*oi, oy*, in this list pronounced like *ou* in Fr. *oui* + *è* in Fr. *très*.)

bourgeois	choix	courroie	demoiselle	détroit,
chinois	comptoir	croix	déployer	doigt

\*So all verbs with same termination.



(je) dois	étroit	loi	poing	soigner
(que je) doive	exploiter	loin	point	soit
droit	foi	moins	quoi	toile
effroi	foie	moisson	(je) reçoit	toit
emploi	foin	noix	roi	voile
empois	fois	oie	soi	voiture
empoisonner	froid	patois	soie	voix
endroit	joie	poignet	soif	

N.B.—The following peculiarities are to be noted in this list:—In *étroit*, *froid*, *oi* is pronounced often like *è* in Fr. *très*; *d* in *froid* is pronounced like *t*.

(16) (*oi*, *oy*, in this list pronounced like *ou* in Fr. *oui* + *a* in Eng. *father*).

bois	foyer	mois	pois	trois
employer	incroyable	moyen	renvoyer	voyage
envoyer	loyer	poids	soyons	

(17) *an* and *en* in *avant*, *argent*, *vent*, are often pronounced like *in* in Fr. *vin*.

(18) *au* becomes *a* (*a* in Eng. *hat*) in *sauvage*.

#### CONSONANTS.

*b* often becomes *m* in *houblon* (pronounced *omnon*).

*c* = (*k*) has sometimes a peculiar sound between *k* and *t* as in *aucun* (almost *otien*).

*c* = *g* in *canif*.

*ch* = *j* (as in Fr. *jour*) in *cheval*.

*d* = *d* + *g* (as in Eng. *gender*) before *i* and *u* in *dit*, *dur*, &c.

*d* = *l* sometimes in *cadenas*.

*d* is sometimes inserted in *genre* between *n* and *r*.

*d* = *t* in *cadre* and *froid*.

*g* = *c* often in *glas*.

*h* is never heard as far as I have observed.

*l* = *r* sometimes in *allaiter*.

*l* often becomes *l mouillée* in such words as *aller*, *ballade*.

*l* is often silent in *cloison*.

*l mouillé* is completely vocalized.

*l* = *n* in *omelette* and *houblon*.

*r* is often silent in *croître*, *arbre*, *mercredi* (first *r* in each) etc.

*Comprenait* often becomes *comprenait*.

*t* = *k* often in *amitié*, *patate* (second *t*.)

*t* = *t* + *ch* (as in Eng. *church*) before *i* in *parti*, etc.

#### WORDS NOT FOUND IN OSCAR DUNN'S

##### *Glossaire Franco-Canadien* :

*autre. Vers le quinze de l' autre mois* : towards the fifteenth of next month. (Heard once.)

*belouet* (*Vaccinium Canadense* and *corymbosum*), blue berry or huckle-berry.

(This is no doubt the word *bluet*. See Littré.)

*bête puante* (*Mephites mephitica*), skunk.

*biseau* (?), a small sheaf.

*bois blanc* (*Tilia Americana*), basswood.

*brayer* (no doubt *broyer*), to crush flax ; *braie*, instrument for crushing flax ; *brayage*, action of crushing flax ; *brayeur*, the person using the *braie* ; *braierie*, the place where the *brayeurs* work. (These words are used by M. LeMay in his *Pèlerin de Ste. Anne*. Quebec, 1877.)

*corvée*, bee. A gathering of friends and neighbours to assist in some piece of work such as threshing, cutting wood or the like.

*crine*, horse's mane.

*devers*, towards.

*épinette rouge* (*Larix Americana*), tamarac.

*épinette blanche* (*Abies alba*), spruce, (in Littré : *Abies Canadensis*).

*fiche*, iron bolt, (general term ; in Littré : *Cheville de fer sur laquelle on roule les cordes des instruments, tels que pianos etc.*).

*filer*, to grind (scythe etc.).

*gibier*, tame fowl.

*gond* (?), staple (for a latch etc).

*icite* for Fr. *ici*.

*javelier*, grain cradle.

*mi* (?) (*Phleum pratense*), timothy (a grass).

*morfiler*, to whet (scythe etc).

*pierre de meule*, whetstone.

*planche*, ridge (in a field) ; also a sort of four-wheeled carriage, called by English Canadians a " buckboard."

*pruche* (*Abies Canadensis*), hemlock, (Littre gives *prusse* or *pruce*).

*quinteau* (?), stook of grain.

*raie*, furrow, (in Littre) ; *sillon* not used.

*râle* (?), branch (of tree).

*râpe savage* (*Lappa major*), burdock.

*sapin* (*Abies balsamea*), balsam.

*par secousses*, off and on.

*sifleur* (?) (*Procyon lotor*), racoon.

*taure*, heifer, (in Littre) ; *génisse* not used.

*N.B.*—Words whose orthography is doubtful are followed by (?).

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REMARKS ON THE DISTINCTIVE CHARACTERS  
OF THE  
CANADIAN SPRUCES—

*SPECIES OF PICEA.*

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BY GEORGE LAWSON, PH.D., LL.D., F.R.S.C., PROFESSOR OF CHEMISTRY,  
DALHOUSIE COLLEGE, HALIFAX, NOVA SCOTIA.

Our native spruces (belonging to the genus *Picea*) have received attention at different times from many botanists, but their conclusions in regard to the number of species, and the exact relations of these to each other, have not been concordant. It seemed desirable to invite attention again to the subject, and this was done in a preliminary paper read in Section IV of the Royal Society of Canada, at the Meeting held at Ottawa in May last (1887). The discussion on that occasion, and subsequent correspondence, have shown that the matter is not without interest, and have suggested the desirability of publishing some of the facts then stated, as well as results subsequently reached, together with some historical details,—so as to indicate our present knowledge on the subject, the information still needed, and the directions in which profitable enquiry may be made. Local observers and collectors throughout the Dominion, and travellers visiting northern points, may do much to aid in determining the geographical range of the several species, varieties, and forms, and the continuity or intermittence of their distribution in different regions.

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The beautiful evergreen coniferous trees called "spruces," form a marked feature of the wild forest lands of the Canadian Dominion, especially in the Atlantic maritime districts, and in the tracts of country lying around the great lakes. The spruces are valued, not only for their large yields of useful lumber, applicable to so many purposes of life on land and sea, and for the summer shade and winter shelter which, as living trees, they afford our dwellings, but they are likewise regarded with interest, and as having some importance, from scientific points of view. How far the differences in structure and habit presented by the several species, and their aberrant or so-called intermediate forms, are to be regarded as indicative of genetic differences, or may be accounted for by the mere effects of past or present external conditions, is a question of more than incidental interest. It naturally leads to a comparison of these trees with their allies in other parts of the northern hemisphere, far beyond the range of the present Canadian forest, immense as it is, and to the consideration of other facts bearing upon their probable ancestry, in regard to which, however, the results, so far, are insufficient to warrant satisfactory conclusions.

These trees, and their extra-Canadian allies, have been variously described by botanists, at different times, under the several generic names: *Pinus*, *Abies*, *Picea*. Linnæus, upon whose system our nomenclature is founded, embraced under *Pinus*: the true pines, the Lebanon cedar, the larch, the silver (or balsam) fir, and the hemlock. In selecting specific names for the silver fir and spruce, he adopted those used by Pliny and other classical writers, who called the spruce *Picea*, and the silver fir *Abies*. But he unfortunately transposed these names, calling the spruce *Pinus Abies*, and the silver fir *P. Picea*. This opened the way for much confusion, for when the old aggregate genus *Pinus* came to be successively divided up into segregate genera, and the classical names were adopted as generic ones, choice had to be made between two courses,—either to apply these names so as to denote the trees intended by the classical writers, or to use them, at variance with classical usage, in accordance with the Linnæan nomenclature. As has just been indicated, succeeding botanists separated the true pines, and other marked groups of the Linnæan genus *Pinus*, into separate genera; at first the spruces and

firs were classed together under the one generic name *Abies*. Link, in 1841, separated the two groups into distinct genera, restoring the classical names, *Picea* for the spruces, and *Abies* for the firs. But in Britain, where Coniferæ have been grown to an enormous extent, both for ornament and use, especially since the middle of the present century, a silver fir continued to be almost universally called a *Picea*, and a spruce an *Abies*,—until within the last few years, when English scientific writers have adopted Link's use of the names, and thus adapted their nomenclature to continental custom and classical usage. Among English foresters, gardeners, and nurserymen, however, the old way, so long familiar, will be given up slowly, and not without regret.

The Canadian Spruces, so far as regards their distinctive specific characters, have been a puzzle to botanists. They were not known to Linnaeus. Miller and Aiton recognized two species, *alba* and *nigra*, and Lambert introduced a third (*rubra*) that had been recognized by the younger Michaux as a variety of *nigra*. Accordingly, in most of the works on Coniferæ published since Lambert's (1825) by European and English botanists,\* we find the three species described without hesitation. But, there have not been wanting expressions of doubt as to the permanent distinctness of the third species, and of suspicion even, that all three were connected by intermediate forms so closely as to be doubtfully entitled to rank as more than varieties of one species. A full statement of synonymy would occupy too much space, and indeed be out of place, in this publication; a brief indication of the views held by a few prominent botanists will suffice for the present.

In Persoon's *Synopsis Plantarum*, 1807, (the authorship of which is believed to belong to Richard), *rubra* is described with rubicund cones, slightly bilobed scales, and red brown bark, and is curiously enough assigned geographically to Hudson Strait; *alba*, with incurved leaves, lax subcylindrical cones, entire scales, whitish bark; *nigra*, with straight leaves, ovate black-purple cones, scales undulated at the margins, bark blackish

Endlicher, in the standard work on Coniferæ for the time (1847), "*Synopsis Coniferarum*," characterized three species as follows: (pp. 112-15): *alba*, cones subcylindrical, lax, pendulous, scales broadly

\* Persoon, Antoine, Don, Loudon, Link, Parlature, Endlicher, Gordon, etc.

obovate undivided, entire, (faces of leaves whitened glaucous, pulvinuli pale brown, cone long-stalked, cylindrical or ovoid oblong, 2 to 2½ inches long, largest diameter, ½ inch., scales quite entire, at first green, changing to pale brown); *rubra*, cones ovate-oblong, scales split into two lobes, margin otherwise quite entire, (doubtfully distinct from the next, leaves more acute, cones larger, green when young, scales constantly and evidently split-lacerate irregularly, margin otherwise entire, the wood becoming reddish); *nigra*, cones ovate-acute, scales obovate, undivided, erose, denticulate, bark blackish, faces of leaves white-dotted; cones shortly peduncled, drooping, an inch and a-half long, at first purpurascens, finally reddish brown, scales with thin margins becoming undulate-lacerate.

Professor Beck, in the Botany of the Northern and Middle States, (1833), which formed the precursor of Dr. Asa Gray's standard Manual, described three species (p. 340), as: *nigra*, \* \* \* leaves straight, strobile ovate, scales elliptical, undulate on the margin, erose denticulate at the apex; *rubra*, \* \* \* strobile oblong, scales rounded, somewhat two-lobed, entire on the margin; *alba*, leaves incurved, strobile subcylindrical, loose, scales obovate, very entire.

I have not been able to refer to the first edition of Dr. Gray's Manual of Botany of the Northern United States, (published in 1848), but in the second edition (1856) the red spruce of Beck is dropped, and only *nigra* and *alba* described,—the former with dark rigid sharp green leaves, cones ovate, or ovate-oblong, (one to one and a-half inch long), the scales with a thin and wavy or eroded edge,—a common variety in New England having lighter coloured or glaucous-green leaves, rather more slender and loosely spreading, and indistinguishable from *alba* except by the cones. *A. alba* is characterized as having oblong-cylindrical cones (one to two inches long), the scales with firm and entire edges; otherwise as in the lighter-colored variety of the last. The remark is added. probably these two, with the red spruce, are mere forms of one species.

In subsequent editions of the same work, the descriptions are amended, the leaves of *nigra* being characterized as either dark green

or glaucous-whitish, and the cones are said to be recurved, persistent, whilst those of *alba* are two inches long, nodding, cylindrical, pale, deciduous, the thinner scales with an entire edge, (the latter a handsomer tree than the former, more like a balsam fir). These descriptions point to the red and black spruces being both included under *nigra*.

Professor Alphonso Wood, in his Class Book and Flora of the United States and Canada, also characterized only two species: *alba*, with incurved leaves, cones lax, subcylindric, with entire two-lobed scales; *nigra*, with straight leaves, ovoid cones, scales erosely dentate at the edge.

Dr. Chapman, in the Flora of the Southern United States (1860) likewise gave two species (pp. 434-5): *nigra*, leaves dark green, cone one and one-half inch long, ovate, or ovate-oblong, the scales with a thin wavy or denticulate margin; *alba*, leaves more slender and less crowded, light green, cones 1 to 2 in. long, oblong cylindrical, with the scales entire.

The late  $\Gamma$  of Brunet, of Laval University, an acute and careful botanist of whom Dr. Gray had a high opinion, described three forms: *alba*, *nigra*, and a variety *grisea* (Canadian Naturalist, new series, vol. iii., p. 108).

The Abbé Provancher, in Flore Canadienne, characterized *alba* and *nigra* clearly.

The late Andrew Murray, who took so much interest in American Coniferæ, in his later writings ignored *rubra*.

Professor Fowler, in his carefully prepared list of the plants of New Brunswick, gives two species, *alba* and *nigra*, as common throughout that province.

Prof. Parlatore, in the Monograph of Coniferæ in De Candolle's Prodromus, Vol. xvi., second section, pp. 413-14, published in June, 1868, recognizes our Canadian species as three: *nigra*, the black spruce or double spruce of Anglo-Americans; *rubra*, with leaf-faces albo-glaucous (indicating that he probably had a form of



*nigra* in view); and *alba*, with oval-oblong, or oval-cylindrical cones, pendulous, on longer branchlets than the others, (the geographical range extending to the Rocky Mountains, on authority of specimen from Bourgeau).

In Dr. Robert Bell's chart of the northern limits of trees forming the Canadian forests, the two spruces, *alba* and *nigra* are lined together.

Prof Macoun, in the Catalogue of Canadian Plants of the Geological Survey of Canada, gives two species, combining *rubra* with *nigra*.

Sir Joseph Hooker, in his tabulation in the Outlines of Distribution of Arctic Plants (Linnaean Transactions, 1864), gives only *alba* and *nigra*, and Sereno Watson, in the Botany of California, also dismisses our spruces in N.E. America as "two species."

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The following descriptions of the several species are not thrown into systematic form, being merely intended to call attention to points of difference, and to suggest observation and enquiry, so that the necessary information may be obtained for the formation of accurate and permanent diagnostic characters :

1. *PICEA ALBA*.—Link, in *Linnaea*, xv. p. 519.

*Picea alba*, the white spruce of Canada, is recognized at a distance from the allied species, by the comparative massiveness of the foliage with which its horizontal or pendant boughs are clothed, and by its glaucous or whitish-green tint,—the leaves when newly expanded being pale and silvery, as if covered with the most delicate coating of hoar frost. This appearance, however, is caused by the individual leaves not being wholly green, but having longitudinal rows of apparently white or colourless dots or spaces, owing to the non-development of chlorophyll in certain surface cells at regular intervals. The old bark of the stem is grayish, not dark-colored, and the young shoots of the year present a smooth, shining, ivory-white surface, altogether destitute of trichomes or roughness of any kind. The leaves vary in actual size with the vigour of the tree, but are longer in proportion than those of either of the other species; the leaf-bases from which they arise are arranged uniformly around the horizontal

branches, but, although spreading in direction at their bases, are more or less curved upwards in a second manner, presenting a nearly uniform flattened brush-like surface of foliage. The cones vary in absolute size, according to vigour of tree, etc., but are always of much greater length and usually more slender than those of the other species, being nearly cylindrical, not sensibly thickened in the middle as in *nigra*, nor below the middle as in *rubra*. Dr. Bell well expresses their form as finger shaped. The scales are also more numerous than in the allied species, and the spiral arrangement is different. The cones are green at first, the individual scales being sometimes clouded with a slight brown band-like patch on the exposed part, but not extending to the edge. In ripening, the green color mellows into a more or less decided straw color, but the cones when mature are never either dark or decidedly reddish. When of a lively straw-color, and profusely produced all over the tree, as we often see them along the shore, hanging down from the drooping tips of the young branchlets, the contrast with the bright silver-frosted needle foliage is very pleasing, so that the white spruce is one of the most ornamental of our native trees, and admirably adapted for sea-side shelter. The edges of the cone scales are always quite entire.

Prof. Bell, M.D., President of the Fourth Section of the Royal Society, has very kindly made careful observations, and communicated them to me, on the several points of difference between the white and black spruces. Through his kindness, also, I have had opportunity of examining specimens from widely separated localities throughout the Dominion. His opportunities of travel, for observation and collection of specimens, during his long connection with the Geological Survey of Canada, have been exceptionally favorable. Dr. Bell points out that the most obvious distinctions between the black and white spruce are (1) that the latter is a larger tree than the black, coarser, lighter in general color, as well as in color of bark, twigs, etc.; (2) that, in the white spruce, the boughs are stiffer, more vigorous, and flatter than in the black; (3) that the cones differ in many ways; in the white, they are scattered all over the tree, although most abundant near the top, and drop off every year, whereas the black spruce cones adhere for two, three, four or five years—the current year's crop being at the top (mostly), the previous year's next

below, that of the year before still farther down, etc., the quantity of cones diminishing downwards and their age increasing. (4). The white spruce cone is finger shaped, and green in color till it dries and opens, whereas the black is deep purple and plum-shaped, bulging in the centre. (5). The white is attached by a straight peduncle, the black by a curved thickening one. (6). The number of scales in each is very different, numerous counts of the scales of cones from many trees in northern regions of the Dominion yielding the following results: the white spruce cone seldom has fewer than 60 scales or more than 90—average about 70; whilst the black seldom has many over 30, the average may be about 33,—so that the white spruce cone has more than double the number that the black has. Eleven white spruce cones from a tree at Kingston, Ontario, gave an average number of 77, and of five cones of the same from a tree at the Emerald Mine near Buckingham, (Co. Ottawa, P.Q.), the average is 61.

The white spruce is observed especially along the shores of the ocean, estuaries and lakes, as in Cape Breton Island, around the Atlantic and Bay of Fundy shores of Nova Scotia and New Brunswick, also around the shores of the St. Lawrence Gulf and up the St. Lawrence River, and along the Ontario lakes. Dr. Bell sends a beautiful photograph of this species, showing its characters well, from Grand Lake House, on the Upper Ottawa. I have a specimen collected at Lake Winnipeg by his Hon. Lieut.-Governor Schultz, M.D., in the summer of 1860.

I desire specially to call the attention of observers to one point in regard to the geographical distribution of *Picea alba*. For many years it has appeared to me to be essentially a maritime species, growing around the Atlantic and northern coasts of Canada, and extending by way of the St. Lawrence westward to the great lakes, as far, at least, as shewn by Governor Schultz's specimen, as Lake Winnipeg. Its absence in *inland* localities is not noticed, so far as I have ascertained, in published works, yet, even in the narrow peninsula of Nova Scotia, bounded on one side by the Atlantic Ocean, and on the other by the Bay of Fundy and waters connecting with the Gulf of St. Lawrence, the absence or scarcity of this tree in inland localities,

or even in such as are only a few miles distant from the shore, is very marked. It appears, therefore, to be especially desirable, in recording localities for its occurrence, to note their distance from seaboard or great lakes. I have already endeavored to impress upon observers the consideration that the only reliable material for tracing geographical distribution must consist of substantial data, actual local observations carefully noted and authenticated by specimens, corrected, reduced and compared, after the manner of H. C. Watson, and left on record in such form as to render elimination of errors possible, and that mere general impressions received by travellers over the country, although often of great practical value, are not to be regarded as absolute scientific results. \* In the early days, when Douglas and Thomas Drummond were solitary wanderers over the Continent, and Menzies was touching the coast at Chebucto and nameless points on the Northern Pacific shores, every scrap of information, and especially their notes on range of species, was of substantial value, but now we have the means of working out problems by more systematic and scientific methods, and of eliminating the errors of individual observation.†

2. *PICEA NIGRA*, *Link*, in *Linnaea* xv, p. 520.

The black spruce is a sombre tree, the old bark of dark color, the surface of young shoots of the year of a dark brown, and clothed with a short sparse fur of thick short curved trichomes. The foliage is of a decidedly dark green colour, but distinctly glaucous or hoary. The leaves are short, almost straight, radiating from the branch in a bottle brush fashion at a nearly uniform angle except that they are turned away from the lower surface of the branch. The leaves (as in other species) vary in size with vigor of tree, but are always much shorter than in the other species, and blunt at the apex. The cones, when young, are of a deep purple, or purpurascens color, becoming reddish-brown as they ripen, darkening with age, and ultimately changing to a deep dark gray-black when old. The other species drop their cones during the first winter after they are formed; *P. nigra* retains them for several years, the recent crop of the

\* See Trans. Royal Soc. of Canada, Vol. II. Sec. iv. p. 16.

† *Abies arctica*, Murray, *Seeman's Journal*, 1867, p. 273, cum ic., is referred by Parlatore as a variety of *alba*.—DC, *Prodromus*, XVI., p. 414. On same page there is description of something no doubt quite different, *Abies arctica*, Cunningham., ex Henk. & Hochst. This is referred to *rubra*.

year being near the top of the tree mostly, the previous years next below, that of the year before further down, and so on, the cones diminishing in quantity downwardly as their age is increased. The cone is attached to its branchlets by a curved stalk (whereas that of *P. alba* is straight), and the cone itself is conspicuously much wider in the middle than towards base or apex; several of these differences are taken from Dr. Bell's notes, but are entirely in accordance with my own observations.

This species appears to be widely distributed, both in coast and inland districts, extending apparently far north, and in the south ascending the mountains. Black spruce is famed among lumbermen as a tree yielding sound, strong and lasting timber. In Nova Scotia it is found, not on dry ground, but on wet flats, apparently irrespective of atmospheric moisture. In inland districts, groves of it occur in the red spruce forests, on the wet lands around lakes, and along river sides, and on shelving terraces on the hill sides, but it also grows down to the sea-shore intermixed with *P. alba*—the favoring condition apparently being a retentive moist soil. In the north and north-west, the tree appears, from accounts and photographs received, to be more vigorous than along the Atlantic region of Nova Scotia.

### 3. *PICEA RUBRA*, *Link*, in *Linnaea*, xv, p. 521.

*Picea rubra*, the red spruce, is readily known by its clean, uniform bark (not broken into large scales) of a distinctly reddish color, by its long slender shoots, giving it the appearance of being a more rapid grower than *nigra*, but not so robust in habit as *alba*, and by its bright green foliage, without any trace of hoariness or glaucescence. The leaves, as compared with those of the allied species, are short, incurved, not so secundly as in *alba*, but bent inwards towards the branchlets, and on the leading shoots they are more or less closely appressed to the leader, giving it a very elongated slender appearance. The year's shoots are of a lively chestnut-red color, and are beset with short, erect, thickish, curved, epidermal processes (trichomes), which arise especially around the edges of the flat basal plates of the leaf-bases, variously called peg-processes, sterigmata, etc. The cones are of a bright chestnut color, regularly ovate in form. The wood is softer than that of the black spruce, it is also less enduring.

under open air exposure, as we know from experience; every season the red spruce poles have to be replaced more frequently than the black in fences.

The best general description that has hitherto been published of *P. rubra* is that of my late friend William Gorrie, in the Transactions of the Botanical Society of Edinburgh, Vol. x, p. 353. Mr. Gorrie's description was taken from the tree as observed by him in the plantations and pleasure grounds in Britain, but, so far as it goes, it corresponds entirely with the tree as seen in the Nova Scotian woods:—"The red spruce fir, or Newfoundland red pine, is found in Nova Scotia, some parts of Lower Canada, and northward to Hudson Bay, but is not included in Dr. Asa Gray's Flora of the Northern United States. It is said to be a better and finer tree than either of its allies—the black and white spruces—from which it further differs in being entirely devoid of that glaucous green by which the leaves of these two are distinguished. It is in fact exactly like the common Norway spruce in the color both of its foliage and young branches, but differs from it in its thinner and more slender growth, shorter leaves, and much smaller cones. From this close resemblance in color of *rubra* and *excelsa*, Americans call the latter the red spruce of Europe. Like the *alba*, the *rubra* drops its cones in the course of the first winter and succeeding spring, while those of *nigra* are retained on the tree for two or more years. Like its two American associates, *alba* and *nigra*, *rubra* seems to delight in moist soils containing a proportion of peat, and moist upland climates. Those now growing at Tynhead were reared from seeds gathered in Newfoundland, and a portion of the plants which were planted on good, dry, heavy soil, within from two to three miles, and at half the altitude, dwindled away after the first few years, till they entirely perished. The trees at Dunmore are no doubt growing at a low altitude, but they are sheltered by a high wooded bank on the south, and are on a damp bottom. Mr. Andrew Murray, a distinguished member of the Botanical Society, and recognized authority on Conifere, has ignored the existence of *rubra*, but he has probably never seen it growing, as, although long introduced, it is still scarce in Britain." In illustration of these remarks Mr. Gorrie exhibited and presented to the

Botanical Society branches and cones of (1) *P. rubra* taken from a group of trees growing on the railway banks, near Tynehead Station, in Midlothian, at an altitude of about 800 feet. The trees had then, (13th January, 1870), been about fifteen years planted, and were from 12 to 18 feet in height; (2). *P. rubra*, from a group of trees growing in drained and improved ground, which must once have been marshy, in Dunmore Park, near Stirling, Scotland, not 50 feet above high-water mark, seemingly about the same age as the last, and from 15 to 20 feet in height; (3). *P. alba*, from near Tynehead Station; (4). *P. nigra*, from Dunmore Park.

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In addition to acknowledgements for specimens already made in this paper, my best thanks are due to Mr. John MacAloney, of Halifax, who collected for me the several forms growing on the shores of the Bay of Fundy; to Mr. W. S. Calkin, B.A., now of Cornell University, who, while an undergraduate of Dalhousie College, obtained those of the district around Truro; and to Mr. S. J. McLennan, B.A., who made similar collections around Sydney Harbour, Cape Breton.

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## AN ELOCUTIONARY DRILL CHART.

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T. B. BROWNING, M.A.

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THE BREATH AND ITS GOVERNMENT.—The breathing required in public speaking or reading is a voluntary act which calls into play two independent sets or double sets of muscles, and may therefore be considered of two kinds, thorassic and diaphragmatic. The first is more commonly used by women, the second by men. In the first, you alternately raise and lower the ribs, that is, expand them upwards, outwards, side-wise, and towards the back, separating one from the other; and, again, compress them. The muscles used in the operation act upon the backbone as a fixed line, and their action is said to be in part direct, in part indirect. Figure No. 1 shows the chest as expanded; in No. 2 it is collapsed. The extension-motions given in the chart to reach these respective positions are similar to the means employed to restore breathing in persons who have been rescued from drowning, and, in certain cases well-known to the medical faculty, to produce or increase respiration in young children. Figure No. 3 exemplifies the action of the diaphragm.

Ordinarily in public reading or speaking, we should inhale noiselessly and through the nostrils only. If you raise the tongue against the roof of the mouth at the same time that you dilate the nostrils and contract the respiratory muscles, you may fill the lungs in an instant without closing the mouth. Times occur when you must draw your breath through the mouth and with noise, as in gasping; for example, where disease is simulated or trying situations are depicted; but, except where a pronounced effect is to be produced, such labored inhalation should be avoided, as both prejudicial to health and destructive of vocal power.



The retaining of air in the lungs is an important point in the government of the breath. You hold the inspiratory muscles contracted, close the glottis as in swallowing and aid the operation by shutting as far as possible the air passages of the mouth and nose. If you ask for what time one may retain his breath without injury, the answer is: it varies with the person and his degree of skill. One may hold for a minute; for another forty-five seconds may be too long. The end to be gained is control over the muscles and, as in gymnastic exercises, that which is to be avoided most is straining.

Except for rest, the breath is to be set forth through the mouth. As in retaining, time has been divided into short, medial, long, very long. You may empty the lungs, as it were, at a blow or within a measurable time. In all cases expiration should be free, that is, without scraping, without obstruction. Whatever time you practice, a regular, even and full flow will give you more complete command than spasmodic or irregular jerks. The reader should imitate the athlete. In his private practice he will prolong his expiration to the utmost; in reading will not stretch beyond a quick recovery, but act within himself and at his best. To use up a breath as if it were one's last, necessitates, in almost every instance, an effort or gulping for the next, which is not more conducive to health, agreeable to an audience, characteristic of good delivery nor in itself more skilful, than "catching crabs" is evidence of superior oarsmanship.

Voluntary breathing is the foundation of public speaking. Under whatever defects one may labor, lisping, stammering or stuttering, if once he gain power over his respiratory muscles to use them at pleasure, he will be hindered neither by want of breath nor a surplus of it—the main stumbling-blocks of public speech—will not only avoid the throat-laceration which afflicts the clergy so deeply, but will have already overcome more than half the obstacles which lie in the way of distinct and effective delivery.

VOWELS—THEIR PRODUCTION.—How many vowels has the English language? Webster reckons 33, Ogilvie 14, Sweet 36, and other orthoepists say 40, 12, 9 or 6. There is no consensus of opinion as to the number of our vowels. How, then, may they be distinguished? Mr. Melville Bell gives a systematic answer. He subjects the mouth to minute experiment and classifies vowels mainly according to the positions which the tongue assumes in enunciation. Thus they are front,

back, mixed ; high, middle, low ; round, etc. For purposes of illustration he uses diagrams. I doubt whether any one knows better than Mr. Bell that the lips, cheeks, tongue, hard and soft palates concerned in vocalization, differ both in size and shape in different persons ; and that vowel positions which may suit one man may not, in minute particulars, be absolute for all. His directions are given generally, are easy of application and are subject to correction by the ear. "Visible speech" was a great step forwards not only in phonetics but in the understanding of our language.

But how do the sounds differ between themselves ? Helmholtz experimented fully on the question, and has been followed by Koenig. They take the common European vowels and find the number of single vibrations they contain. This is for U 448, O 896, A 1792, E 3584, I 7168 ; so that, counting on the chart from left to right, you have a series of ascending octaves. Dr. Koenig has prepared a tuning fork for each vowel and adjusted a resonator to each. If you take fork A bow and apply it to the resonating chamber, you receive the tone of the Italian A ; so with the others respectively. Here, then is a scientific basis for vowel classification, in which the personal equation is almost eliminated.

But though these sounds be used in French, Italian, German and other languages, have we them in English ? Mr. Palsgrave says they lingered in the South of England till about 1500. If it be asked, do our vowel-names correspond with these sounds, the answer, with one exception, must be, No. Our language is peculiar. It is like a stately ship built of wrecks. Scandanavian, Danish, Norman conquests are embedded in it. Our spelling is a complex form which crept upon us from the south, and was made to represent another complex form or mass of complex forms which prevailed in more northern portions of England. Mr. Oliphant throws much light on the subject and shows how our vowels waged among themselves an intricate war before 1500. Thus

i takes the place of ae, e, ea, oe, ge, iht, w, y ;

a " " " ae, e, ea, oe, ge, i, o, y ;

e " " " a, ae, ea, eo, eow, i, ia, o, w, y ;

o " " " a, aw, ae, ao, e, ea, eaw, eo, i, w, ow ;

u " " " a, ae, eo, eow, e, i, o, oi, w, we, y ;

( " Old and Middle English

There was no king in Israel in those days, no tyrant compositor, and every man spelt as seemed good in his own eyes. One vowel is written for another indifferently. "The New English," in its early stages is equally belligerent. Thus

a	takes the place of	aw, awe, e, ea, eo, ge, i, y, o ;
e	"	" ae, ea, ei, eo, ew, i, io, iw, o, oi, ow, u, ui, y ;
i	"	" a, ae, ai, e, ea, ee, eh, eye, o, ou, ow, u, y ;
o	"	" a, ae, au, aw, e, eo, ew, i, ou, ow, u, y ;
u	"	" a, e, eo, eu, ey, i, o, ew, ow, we, y, ye, v.

We have plain traces of the anarchy to-day. Dictionaries agree that a in fate is like e in they, a in fair like e in their, a in fall like o in form, a in liar like e in brier, i in ruin, o in major, and the second u in sulphur. Again, e in her is the same as i in sir, o in worm, u in fur, and y in myrrh ; the o in move cannot be distinguished from the oo in moon, or u in rule, while o in wolf is like oo in wool, and u in push. To cap the climax we are told that a has five distinct sounds, e six and o seven, as if distinct sounds do not constitute distinct vowels.

But if a has five distinct sounds why should it be named from one of them only? Not it alone but all our vowels have been so named, and, with one exception, named strangely. Shakespeare says, the whirligig of time brings in his revenges. In this case we have had ours. If invasion from the continent wrought sad havoc on English vowels, and nicknames arose from them, very likely in the manner which Mr. Earl points out, we have done our best to impose these nicknames on the languages of the continent. With respect to dead varieties, Greek and Latin, we succeeded in the attempt for several centuries, succeeded at least to our own satisfaction. These days a doubt has been ripening to a conviction that this course of action is not wise. Through the influence of philological study and under the leadership of Cambridge, English-speaking-people are beginning to raise themselves above the vulgarism, and are at once adopting a more rational mode of pronouncing the classic tongues, and are enquiring what vowel sounds their own language really has. If the question then be put thus, have we as vowels in English the five tones which are represented by the Koenig forks, call them what you will? the answer without an exception is, Yes. How could it be otherwise? They are octaves which embrace the compass of the

human voice. We shall see, I hope, that we not only have them but that they dominate our speech. It may be, as some philologers say, they are universal.

But how do you produce these vowels? He that is whole needs not a physician. He that has a model and can imitate it correctly, is well off already. Others may find the following practice of service. Take fork A, vibrate and apply it to the aperture of the resonator till you perceive the sound distinctly. Then bring the fork vibrating to your mouth. If you obtain there a resonance as full, clear and strong, as that which comes from the resonance chamber, your mouth is in the proper position for sounding vowel A; if not, not. Practice will bring A and the other vowels.

I am indebted to Professor Loudon, of Toronto University, for the opportunity of practicing upon a very fine set of the Koenig forks with resonators. The vowel which I could most quickly produce was A, next, O, E, U, I, as they stand. After considerable practice I drew the diagrams which are set opposite the vowels in the chart. They are made for the lower register and may be serviceable by way of hint. I also had the aperture of the mouth, front view, for each vowel photographed, but as the cost of transferring them to paper is considerable, I must ask the members of the Institute to be content with the following measurements in inches. I need not say that I would scarcely have subjected my own mouth to this ordeal, had I another on which to experiment.

For A,	the lips covering the teeth	extreme height	1,	width	$1 \frac{0}{16}$ ;
O,	"	"	"	"	$\frac{1}{2}$ , " $\frac{3}{4}$ ;
U,	"	"	"	"	$\frac{3}{16}$ , " $\frac{3}{8}$ ;
E,	"	"	"	"	$\frac{3}{4}$ , " $1 \frac{0}{16}$ ;
I,	"	"	"	"	$\frac{1}{4}$ , " $1 \frac{5}{16}$ .

Practice upon the forks brings into clear relief the function which the mouth plays in singing and speaking. It is a resonant chamber for the vocal cords.

The strings of a piano from which you have removed the dampers, may take the place of the forks. Sound any vowel to any note directing the voice upon the strings. If and when you form the vowel pure, you will receive a full, loud and distinct resonance. Again, take a metal tube one end of which tapers wedge-wise to a narrow slit by way of mouth-piece, insert the other end into a flexible

tube say of rubber, and its unattached end into the nozzle of a bellows which may be worked by hand or foot. Put the mouth-piece to your lips and ply the bellows gently. You will get a clear vowel sound when you place your mouth in a true vowel position. Those who cannot avail themselves of any of these methods may find it advantageous to practice on the short vowels of English words, as set out in table III., lengthening and modulating them as may be required.

In producing vowels, primary, intermediate, or compound, there should be no breathiness or wind-rush. An approved plan is to hold a lighted candle close to the mouth and shout. Sound vibrations are not likely to extinguish the flame nor to throw it outwards. Breathiness is a blemish in all speech; in vowels, it is a measure of bad production; it should not be used publicly except where blemish and bad production are required, for instance, in representation of disease.

**MODULATION.**—We say thou is a personal pronoun, if a conjunction, and up a preposition. But in, “if thou-thou’st him some thrice, it shall not be amiss;” “if me no ifs, I know not if;” “he up with his staff and smote;” what parts of speech are they? I have no quarrel with our grammarians, but admire the ease with which in former days they swept obstructions from their path. Slang and license remain potent terms, and are explanatory in the manner of the scholastic dictum, nature abhors a vacuum. If she does, what then? Within certain bounds and these very wide, any word in English may be any part of speech, not by reason of its position, but of its employment. So a word or phrase in our language may take or require any modulation or any coupling of them. How many standard interpretations of Hamlet have we? One for each great actor who has studied and acted the part. Their different renderings consist not in textual variations, but almost wholly in different modulations. For this reason it has often seemed to me misleading to set down for practice in modulation phrases which are marked for one form only. The extracts wrested from their setting, bear very little meaning, and the pupil does not perceive why this and not that modulation is given. A better plan would be to carry one or a few phrases through all modulating forms, that the purpose or effect of the vocal change might appear. I would myself like to see a set of Shakespeare’s

plays according to a standard interpretation, or a volume of Bright's speeches marked for delivery in the manner say of Mr. Bell's "Emphasized Liturgy." It would show what an intimate relation there is between the outward expression and the inward feeling, and rid elocution of the common imputation that it is a sham, a fictitious something imposed on words. In this event as well as under present circumstances, to gain the power of modulation, to produce it at will, to cultivate and control it, one must dive beneath the word and exercise the voice mechanically, as in singing, upon that which alone may be modulated, namely, the vowel.

Modulation is said to be of four kinds—force, pitch, inflection, stress; or, counting quality, five. Throughout them as an under current flows the element of time. I do not refer to the distinction between vowels as long and short. Important as that may be in words, vowel interchange, the history of language, it concerns us here very little. Any and every vowel may be appreciably uttered in the 132nd part of a second, or be lengthened for a minute. Each modulation should be produced in every time.

CLASSIFICATION.—Orthoepists at the outset of their work are met with this difficulty; they must adapt the letter to the sound, the sound to the letter or confuse both. Our spelling grew very rigid in the last century and change of the printed character, so frequent in our early history, became a thing tabooed. It would have been well had the letters adopted represented the sounds of our language with a considerable degree of fairness. One other condition would permit a particular spelling to remain for all time; if no new sounds arose, and if the vowels hit upon remained substantially as they were. We know neither of these conditions obtain. In such event we would not have seven sounds indicated by character o, five by a, six by e, and so many more by u and i. Again, the characters would not interlock each other. In the last century a distinction was not drawn between the stability of a language and its rigidity, and people thought that unless spelling were made and preserved uniform, the language itself would somehow perish. Philological science began with Grimm's discovery of the law of consonantal interchange and may be perfected with a sufficient theory of vowel interchange. The

preservation of obsolete letters, many of them inserted by way of mistake, is not so much an aid as a stumbling block to the student of language. His problem is this—what is the speech of a people, how has it developed, through what changes has it passed? The matters which he desires most to know are the changes which take place in language, that he may discover and apply the law of the change.

I make use of the vowels of the Koenig forks for many reasons. As already said, they embrace the highest and lowest tones of the human voice, are equi-distant one from another and are common to all speech. An objection such as this I have heard: they are universal and therefore not necessarily English. A universe that does not include English-speaking countries, or universal vowels that are not necessarily found in the English tongue, would be rarities indeed; round squares simply, or round squares in the shape of isosceles, rhomboidal triangles. With other scholastic lumber they should be sent to Paris for exhibition next year at the centenary of the Great Revolution. Second, these sounds may be used as aids in and tests of vowel production. Mr. Ellis, who is, I suppose, our best authority on phonetics, says that few men, probably no man, pronounces his vowels precisely the same at all times. What elaborate supports singers have by way of accompaniments and forks! Yet they do not at all times strike every note truly. What would their execution be had they no accompaniments, no fork, and but a hazy notion that a particular note were required? This is precisely the situation of the vast majority of speakers. Again, as the sounds may be made externally and the same at all times, they not only give us a test of pure production, but enable us to allot their proper position to intermediate vowels and to detect compounds. This is their chief scientific function. A subordinate reason will have influence with many; that, as they are the principal sounds of European speech, practice upon them will render the acquirement of modern languages more easy. Those who are engaged in voice-training would add, from the experience of singers, that they are a better means than our vowel name-sounds of developing the riches and power of the human voice. To me their principal recommendation is that they set forth in clear relief the dominant characteristics of English, and may be adapted to our printed forms with very great ease.

Upon this basis our vowels would stand thus :

Single vibrations per second.	Primaries and Intermediates :	
7168	I	as in pin, fin, peel ;
	é (ei)	“ her ;
3584	E	“ they ;
	á (ah)	“ man ;
1792	A	“ father, pun ;
	ó (awe)	“ form ;
896	O	“ pole, note ;
	ú (ou)	
448	U (oo)	“ pool, move, pull.

Some persons distinguish an intermediate *ú* between U and O ; “ not on thy *sole* but on thy *soul*, harsh Jew ;” but I do not find that it has established itself in our pronunciation. We have four compounds, that is, vowels formed by a quick transition from one vowel position to another.

<i>O</i> (ow)	by combination of A and U, as in how, house ;
<i>i</i> (eye)	“ “ A “ I, “ pine, Cairo (Kiro) ;
<i>oi</i>	“ “ O “ i, “ oil, join ;
<i>u</i> (you)	“ “ I “ U “ tune.

A glide from U to I (oo-ee) gives we, a sound which has been the subject of much controversy, is found in composition with g, at least in foreign names (*g-oo-ee-ze*), is often converted into *i*, and is generally represented by a consonant. It would seem that all compounds are more or less consonantal. I doubt not but the manometer would show this very clearly. The change from one position to the other would seem sufficient to produce a consonant. Compounds are, as it were, connecting links in word-systems, wherein the stepping stones, counting from the vowel side, are vowels proper, compounds, liquids, sibilants, mute consonants. The transition from a low to a high vowel gives a more or less distinct w, from a high to a low vowel a more or less distinct y sound.



Here, then, we have five primaries, three (or four) intermediates, four compounds, in all twelve (or thirteen to include *ú*) under which, I believe, all vowel sounds now received in English may properly be brought.

The primaries as they hold the extreme positions and the equidistant way-stations, the octaves, are fixed points that are easily verified, and will suffer neither increase nor diminution. Between each pair in the ascending scale there is room for many intermediates which no doubt will be formed. As language progresses finer distinctions are drawn. These find place particularly within the higher octaves. Why it should be we are not told, but the fact is that our speech has a tendency to mount higher and still higher, until, like vaulting ambition, it overleaps itself and falls into compounds. The process of multiplying intermediates and fusing compounds will no doubt continue as it has heretofore gone on, in the face of academies and all accepted orthographical modes. We may shut our eyes but must move with the stream. In these circumstances it is a part of wisdom to note a change when it is made and to accommodate one's self to that change. We need not make ourselves anxious lest future generations should not be aware how well their fathers of the nineteenth century spelt. They will desire to know chiefly how we sound our language. As for etymology, it is reasonably safe already, and is scarcely furthered by parading in words a mass of useless or misleading characters, be they never so beautiful. Nature is careful that organs which have outlived their usefulness should not be kept at full length as a clog on animals, but shall to all intents and purposes vanish. Philologists will find the rudimentary forms of words without further aid from absolute letters which have their proper place in storehouses such as dictionaries.

A word upon the forms assigned to intermediates and compounds. The acute accent shows that the number of vibrations per second has been increased from that of the octave; in other words, we have sharpened the normal sound. Accents are frequent in printed French, and are therefore familiar to the majority of persons who read. The subscript may not meet with so ready acceptance, but is used in Greek for the same purpose, is not hard to make and would, I think serve well to indicate the two-fold character of compounds.

We now come upon the question what is a vowel, and how is it distinguished from a consonant? Both are sounds and therefore consist of vibrations. In vowels they proceed without jar or interruption, are regular or periodic; in consonants they are not regular, not periodic, and proceed with more or less of jar. A manometer reflecting a gas jet which is agitated now by a vowel, and again by a consonant, will make the difference evident. The outline of the one appears uniformly curved, the other is ragged, jagged or distorted. The same instrument tells the internal difference between one consonant and another. Thus L and R have a kind of periodicity which is not so remotely separated from the contour of the vowels, at least of compounds, while G (hard) K. V. P. etc., are extravagant. The distinction is summed up thus: a vowel is a tone, a consonant is a noise. Tones are many, noises infinite.

But, it may be asked, if vowels are tones, and music consists of tones, more properly of compound tones or notes, how on this theory do you distinguish speaking from singing, speech from music set to words? Helmholtz provides the answer. He investigated the nature of music and resolved its development into three stages which for our purposes shall stand reversed. First, you have the harmonic music of our own day with its vast accompaniments, tempered tuning, subtle use of intervals once deemed dissonant and its reduction of all sounds to a key-note which governs throughout. Music of this kind has little in common with speaking. What a feeling of artifice, strainedness, unreality, one might almost say hypocrisy runs throughout our best operas! No sane man ever expressed himself so in real life, or could be conceived so to do. Galvanic grimaces are pawned on us for genuine laughter. The middle ages have another species which knows neither key-note, tempered tuning, nor accompaniment, rigidly discards dissonances, is built for many voices and called polyphonic. From this you may step back into the ancient world, say of Greece, where a monophonic or one voiced music reigns, without dissonance, key-note, tempered tuning, accompaniment or the need of any. It is a succession of unrelated or independent sounds in themselves regular which follow one another as the feeling, thought and rhythm of the verbal composition may demand. In this manner hymns and ballads were rendered at the Isthmian and other games. A partial survival of it may be detected in the intoning of religious

service ; while the improvised recitations of Italy are said to preserve it with very great fidelity. It is the noble art in a gelatine stage, yet between it and speaking there is a difference which is pointed out by Mr. Hullah when he says : " musical notes are discrete, speaking notes concrete." He refers to inflection, the chief charm of speech, and that which gives it so vast a range of expression. Now, withdraw inflections from speaking, as we have already abstracted key-notes and accompaniments with their dependencies from music, and you come upon a platform which both have in common, and from which they set out on their diverse developments, the monotone. The mayor's proclamation in Henry VI., the ghost's speech in Hamlet, the well known " oyez, oyez, oyez," of our courts are rightly said to be sung, or intoned, or spoken.

The cultivation of the speaking voice in respect of force, quality, time, stress and pitch, proceeds along the lines which singers adopt. The musical scale is used in common. Good singing demands a wider compass of compound tones than effective speaking which will be satisfied with three or four notes, at most an octave. To speak well, one should confine himself to those notes which he can best produce, and upon them practice every form of modulation, particularly the welding of notes or inflection.

In the chart exercises, A is selected, not because it only should be used, but for other reasons. A is the centre of the vowel system, is that tone which is most easily formed, which opens the mouth most widely and best develops the possibilities of the human voice. O, E, U, I, the intermediates and compounds are not to be neglected, but return should frequently be made to A.

THE CONSONANTS.—I had once thought of pursuing the subject from the compound vowels to the liquids, and thence to the more pronounced irregularities of the mute consonants. For the present I pass from that point of view, interesting as it may be or may some day become, begin at the other end, adopt as the basis of classification the formation-point of consonants in the mouth, beginning at the tip of the lips and proceeding step by step backward to the base of the tongue and soft palate. Within this space there are two regions of aspiration, the teeth and the back of the mouth, and two of light production, the tip of the lips and mid-arch of the hard palate. Accordingly, we have the mouth divided into three main and easily

recognisable sections, and obtain from it the well established grouping into labials, dentals, gutturals ; or the B. D. and G. groups. These are subdivided into classes, thin, medial and aspirate, and by a cross division into (1) mutes, stop or explosive consonants, (2) sibilants, (3) liquids, oral and nasal. The diagrams given in the chart indicate the central formation-point for each group.

It has been suggested and may be that the order of historical development of language was the reverse of that which I have indicated, namely, from the base of the mouth forwards. In support of this theory is instanced the gradual disappearance in our own and other cultivated languages of the heavy gutturals, the formation of ch (t-sh) and j (d-sh) within group D., and the interchange of aspirates of the G into those of the D and B group. Upon the other hand examples of an opposite process may be adduced. Again, it is said that as language progresses, aspirated sounds soften or differentiate themselves into medials or thin consonants of the same class, whether mutes, sibilants, or liquids. Thus T passes into P, D into Z, S, L, and many other cases may be cited. Both French and English have gone rapidly to sibilation. But the cause of this change is doubtful ; it is doubtful, also, whether the process still proceeds in France. In our own tongue a strong tide has set in the opposite direction for more than thirty years under the influence of Germany. The tendency I speak of, will appear clear to any who will compare a page of Carlyle with one from DeQuincey or Newman. Indeed, the function which is played by sibilants and liquids in the interchange of consonants within groups, or from group to group, whether in our own language at different periods, or as between ancient and modern tongues, is a matter which is by no means ascertained. Grimm's law applies to mutes and has been scarcely added to since his day. There are enormous gaps in it which await filling, and, for that purpose, use may be found both f. r liquids and sibilants. A sufficient theory of vowel interchange is also among the needs of the day. Meantime and that one may proceed on certainty, the table of consonants which is given in the chart corresponds to, accords with and may, I think, be profitably used to illustrate the discovery of the great German scholar, the basis of all philological science.

Certain consonants give rise to no small difficulty, as q, rh, w, wh, x. Q is to-day resolved into its elements k-w (or kn) and is therefore

usually discarded from the class of independent consonants. Rh may be trilled at the teeth as well as the back of the mouth, and for that reason is often classed as a dental—others argue that it is a semi-vowel. While the formation point of liquids is not so defined or pointed as that for mutes, I believe, the balance of authority regards Rh as guttural consonant. The consideration which has seemed to me conclusive is its function in our older English, where its guttural character is very pronounced. So far back as James I's reign Hume, the grammarian, held w and wh as labials, and had for testimony the evidence of his lips. The interchange of v and w in many of our dialects and as between German and English gives countenance to his view, while the argument from analogy under Grimm's law is at least not against him, for instances are found on both sides plentifully. But other men have organs of speech and find that they pronounce w and wh clearly, while their lips are held forceably apart. In this plight the historical argument is of weight. W ordinarily represents the hard g of our older tongue. As for wh it is a curious transposition. We do not pronounce it in that form but rather as it was spelled, hw; not what, but hwat; a palpable guttural. X has two forms, ks and gs; expect, exact; it is differentiated into its elements like q, and should therefore I suppose be dropped. I do not give it place in the table so much because of its necessity as to call attention to the nature of the sibilants. They belong to every group and coalesce with every class. In standard English we do not retain ps, waps, the older sibilant of the B group which is now heard only among children, but convert it into sp, wasp. Of western speech probably Greek is the only one in which it is thoroughly embedded.

Many divide consonants into whispered and voiced. K, t, p, it is said, are whispered; h (hard) th, v, are voiced. But the second set may be whispered as well as the first, and the first, though evidently thinner, may be voiced as well as the second. Again, all medials, mutes, sibilants, liquids, admit both of whispering and voicing. I wish to go further, for I deem the matter important, and say that all sounds in speech, vowels and consonants, not only should be but for clear enunciation must be both voiced and whispered. In whisper you observe the mode of sound-production more accurately, detect an error more quickly, and may remedy it with greater ease. Those who labor under defects of speech as lisping, stammering, stuttering,

find, if I may speak from my own experience and that of other persons from whom I have heard, that, next to regular breathing, the whispering of vowels and consonants is their most speedy and sure road to cure. The declaiming of whole passages in whisper will be found a most beneficial practice; all exercises in the chart are given for rendition in both forms.

THE TABLES.—The first does not call for special remark. Modulation upon one, two, three and four vowels will follow in their natural order. In the lower line of the second table the order of the letters is reversed within each group, so that in forming a syllable with any vowel you may begin with a thin and end with an aspirated consonant, pav, pov; or reversely, fib, vup. Difficulty in syllabic formation and enunciation has, generally I think, the following degrees: (1) repetition of the same consonant, pap, bab, fap; (2) a thin alternating with a medial, or a medial alternating with a thin consonant within its group, pav, bop; tod, dot; (3) composition of the aspirates with either of the other classes within the group, pev, vup; buv, vub; tuth, thut; duth, thud. The formation of syllables as between group and group, is comparatively easy, the greater interval, I presume, allowing freer play to the parts.

The third is an attempt at orthoepy. I have made use of the classification of vowels into long and short not because it is accurate, but because it is convenient. If a word such as pin be emphasized—as once in the House of Commons ‘call you that a pin?’—it will necessarily be long. I sometimes doubt that our prosody proceeds upon the order of the foot-rule. The intermediate which I call é (ei) is written indifferently, o, u, a, e, i, appears frequently in composition with r as or, ur, er, ir, but, so far as I can ascertain, scarcely admits of classification as long or short. According to its use it may be either of indefinite length. O is that vowel-name which we have in common with European peoples. Its position in English is well defined, as in note, and we might have expected it to show marked varieties of length. But not so. Its short form has shot into intermediate ó, (awe) while the short sounds of other vowels have remained comparatively stable. One must go north of the Tweed, at least north of Mr. Oliphant’s Great Sundering Line, before he reaches nōht, pōht, hōht. The Scotch have preserved the old English vowel with very great exactness. I give no examples, long or short, of the intermediate ú

(ou) for the reason already given. Its place is often supplied or usurped by the compound *o* (ow) as rout, rowt; gouge, gowge. In these instances our pronunciation is not stable, while fine distinctions are not easily drawn in the case of low vowels. When U, disinterred from the rubbish that for nearly three centuries has lain upon it, shall have claimed and received fit recognition from our authorities, the position of the intermediate will become more clearly defined and be confounded neither on the one side with U (oo) nor on the other with *o* (ow). In regard to the compounds *u*, *i*, *oi*, *o*, I find no short form of them and imagine that to be pronounced at all, which necessitates the passing from one vowel position to another, they must be sounded long.

One will see in scanning the table that the main difficulty in English orthoepy arises from the long and not from the short forms of vowels. Pin, bin, fin represent I (ee) faithfully, but to produce the same vowel long, we change the character, peel, ueat, feel, except, in foreign words. Again for E we have an accurate short sound in pet, bet, fell, but for the long we write pay, bay, fey, or fay. The á (ah) is the most pronounced intermediate in English both long and short and was a particular favourite with Sheridan. It makes distressful havoc of the continental A, though we manage to obscure by out-heroding the outrage with our name-sound for the same character. The center of the vowel system A (aa) found its advocate in Walker. As early as the days of Chaucer it is represented by the letters au, but its native garb is by no means obliterated from our tongue. It appears in many words, in father, for instance. Its short sound constitutes the most unsatisfactory part of our orthography. Many dictionaries set it down as an obscure or obtuse form of the compound *u* (you). I doubt whether any statement could be more obscure or more obtuse. If you lengthen the vowel in pun, you get the vowel in palm; shorten the first vowel sound of father and you have that of fun. The intermediate ó (awe) is well developed in both powers, and presents a striking contrast to O and U. Such has been the influence of our compound *u*, that the ancient English sound for the letter came to be written oo for the short as well as the long form, fōot, pool. It is nevertheless found in its proper dress on composition with p, b, f, l,

w and sh, pull, push. When one looks upon the printed English of to-day, he would not at first blush entertain the thought that the characters I, E, A, O, U, represented in old English the sounds which they represent in the chart, or that our fathers used them in the island of Britain for more than four hundred years, and attached to them the same powers which they now have in the best educated circles of Europe. Yet such is the incontestable fact.

In drawing up table III. I endeavoured to confine myself to monosyllables and words which are in frequent use and in its compilation have received much assistance from Mr. Hullah's work on the "Speaking Voice." I give but one example of each consonant except where there seemed strong reason to use a greater number, in the case of intermediate é and U. Had I allowed myself greater latitude I might have lengthened the table indefinitely. As it stands it falls much short of my wish. The difficulty of picking out monosyllables beginning with each consonant containing each vowel in cases where pronunciation is not open to serious question, must be my apology for its incompleteness. My endeavour has been and I hope the table on examination will be found to exemplify with a reasonable degree of fullness, the vowel and consonant sounds of English on a basis of pronunciation which is accepted by all standard authorities and is in use on both sides of the Atlantic.

I should add that the chart is copyrighted in the United States by Mr. L. W. Seely, in Canada by myself, and is submitted to the members of the Institute for their consideration, and in the hope of receiving such suggestions for its improvement as may occur to them, while the right of publication and translation is reserved.

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## CHART OF ELOCUTIONARY DRILL.

*Designed for use in Private Study and in Schools and Colleges*

T. B. BROWNING, M.A.

### VOLUNTARY BREATHING.

#### I. MODES.

THORASSIC.—From the shoulders as a fixed line alternately to elevate and depress the ribs to their full extent.

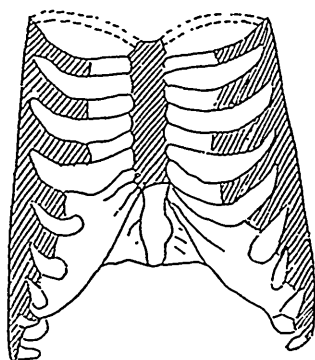


Fig. 1

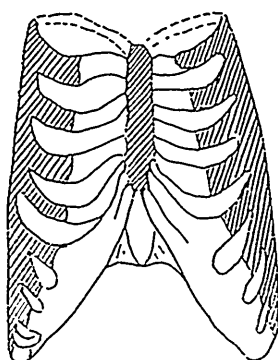


Fig. 2

Production—the body erect, shoulders square to the front, the arms hanging by the side, nostrils dilated.

- (1) *Full Inspiration*.—(a) Bend the fore-arm against the upper, placing the fingers on the shoulders; (b) raise the elbows obliquely outwards to the height of the shoulders; then (c) over the shoulders obliquely backwards, till the wrists cross at the nape of the neck.
- (2) *Full Expiration*.—(a) From the last position bring the elbows obliquely outwards and downwards to the sides; (b) cross the wrists on the hollow of the chest, and (c) compress the ribs both in front and at the sides.

Exer. 1. Inhale in thorassic breathing, repeat.

2. **DIAPHRAGMATIC**.—From the ribs as fixed points to contract and relax, that is, depress and elevate the diaphragm alternately.

Production—the body erect, nostrils dilated.

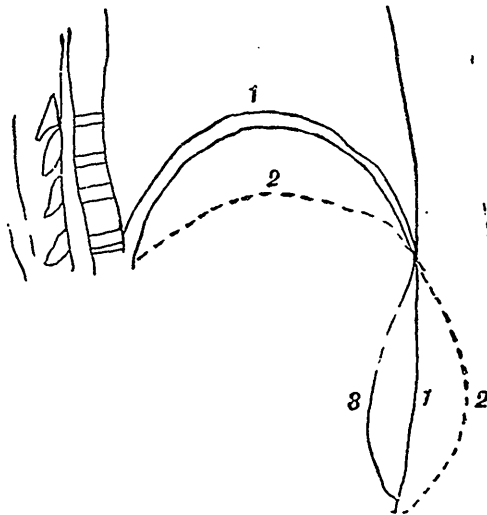


Fig. 3.

- (1) *Full Inspiration*.—(a) Relax the front abdominal muscles; (b) depress the diaphragm. The dotted lines (2) indicate the position to be assumed.

- (2) *Full Expiration*.—Contract the front abdominal muscles, pressing inwards (3) and upwards—diaphragm is driven to its normal position which is indicated in Fig. 3 by the continuous dark line (1).

Exer. 2.—Inhale in diaphragmatic breathing, repeat.

## II. GOVERNMENT.

1. *INHALING—Ordinary*.—Receive the air through the nostrils and without noise. Place the tongue against the roof of the mouth, expand the nostrils and bring the organs to the position of full inspiration.

*Impassioned*.—Receive the air through the mouth and with sound, as in gasping.

Exer. 3.—Inhale in each kind alternately and in each mode.

2. *RETAINING*.—Maintain the position of full inspiration, close the glottis as in the act of swallowing, and keep it closed, shutting the air passage of the mouth and of the nose as far as possible.

*Times*.—(1) from  $\frac{1}{10}$ " to 1";  
 (2) " 1 " 5, short;  
 (3) " 5 " 15, medial;  
 (4) " 15 " 45, long;  
 (5) " 45 " 60, very long.

Exer. 4.—Retain for each time inhaling as above, repeat.

3. *EXHALING*.—Assume the position of full expiration, emptying the lungs without noise;  
 (a) At a blow,  
 (b) Gradually, pouring forth the breath in an even stream for the times given under head of retaining.

Exer. 5.—Exhale for each time, repeat.

## VOWEL SOUNDS.

## I. PRIMARY.

<sup>448.</sup> U (oo)      <sup>896.</sup> O      <sup>1792.</sup> A (aa)      <sup>3584.</sup> E (ey)      <sup>7168.</sup> I (ee).

*Note.*—The Primary vowels are a series of ascending octaves; the figures are the numbers of single vibrations which produce them; the diagrams are drawn for the lower register. Project all sounds to an object.

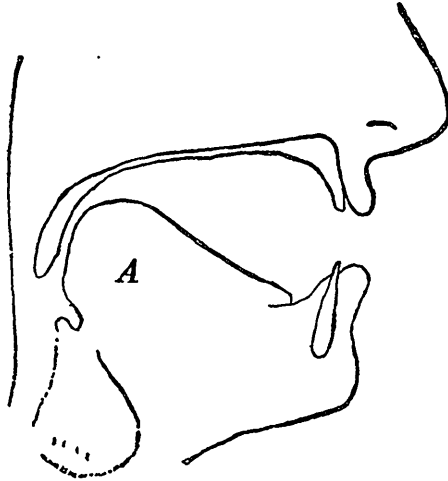


Fig. 4.

1. **FORMATION.**—Arch the back of the tongue against the uvula, its point resting on the floor of the mouth between the lower jaws, open the mouth fully and cover the teeth lightly with the lips.
- Exer. 6.**—Sound A exhaling in each time, repeat.
  - (2) **CHARACTER.**—(a) A tonic—non-vocal or whisper.
  - (b) Tonic—vocal or voice.
- Exer. 7.**—Sound A in each character for each time, repeat.
  - (3) **REGISTER.**—(a) Lower or orotund—depress the larynx and base of tongue raising the palate.
  - (b) Higher or conversational—larynx, tongue and palate in ordinary positions.
- Exer. 8.**—Sound A with each register and in each character for each time, repeat.

- (4) DESCRIPTION. — (a) *Full*—convert all breathing force into sound, as in yawning.  
 (b) *Mixed*—convert part breathing force into sound as in panting.

Exer. 9.—Sound A in each description with each register in each character for each time, repeat.

## 2. MODULATION :

- (1) PITCH.—Scale for pitch and inflection.

Low voices.      Common to all voices.      High voices.

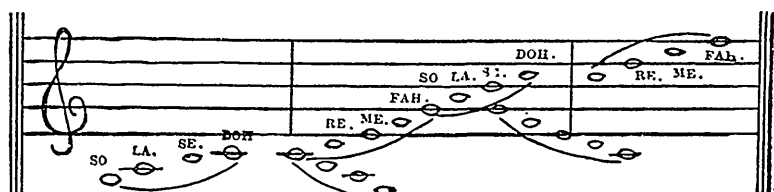


Fig. 5.

Each note is a pitch—principal pitches, doh, so, me (key c.).

Exer. 10.—Sound A in each pitch or principal pitch in each description, etc.

- (2) INFLECTION.—Inflection is an union, coalescing or welding of notes.  
 (a) *Monotone*.—Notes repeated; doh, doh.  
 (b) *Rising*.—Sound continued from lower to higher pitch without break or distinction of notes; me-so.  
 (c) *Falling*.—Sound continued from higher to lower pitch without break or distinction of notes; so-me.  
 (d) *Circumflex*.—The combining of rising and falling inflections without break or distinction of notes; marks



Fig. 6.

Exer. 11.—Sound A in each inflection at each principal pitch in each description, etc.

- (3) FORCE.—(a) Very soft.      (c) Moderate.      (e) Very Loud.  
 (b) Soft.      (d) Loud.

Exer. 12.—Sound A in each force with each inflection at each pitch in each description, etc.

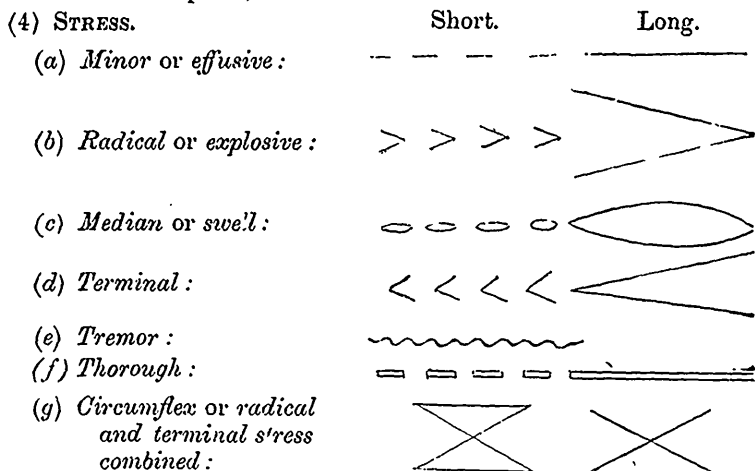


Fig. 7.

Exer. 13.—Sound A in each stress in each force at each pitch in each description, etc.

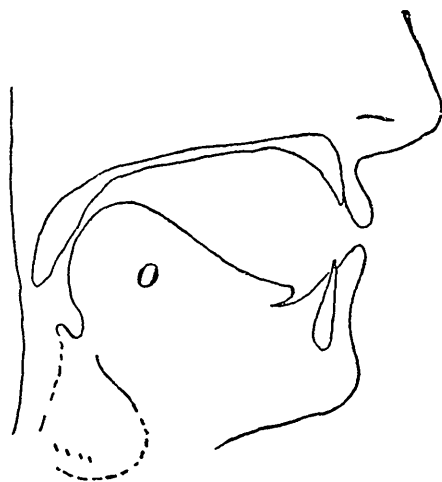


Fig. 8.

FORMATION.—Tongue and teeth in the A position, cheeks hollowed, lips drawn in, oral aperture almost circular, its diameters half those for A.

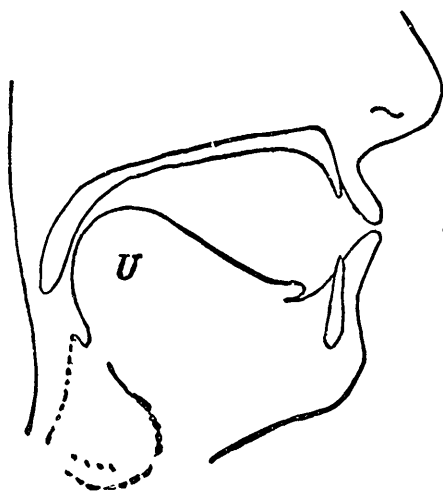


Fig. 9.

Tongue, teeth and cheeks in the O form, lips protruded, oral aperture reduced to half the size for O.

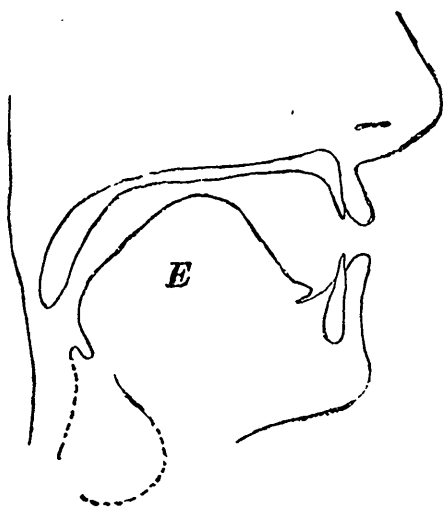


Fig. 10.

Place the tongue against the roof of the mouth, sink its fore-part near the mid-arch of the hard palate, so that its tip rests

upon the floor; drop the lower jaw about  $\frac{2}{3}$  the distance for A and cover the teeth lightly with the lips.

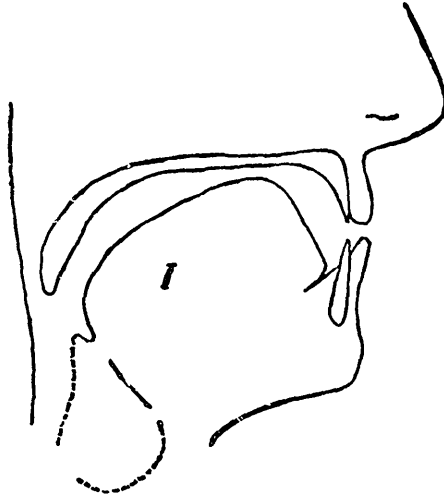


Fig. 11.

From the position for E move the tongue close to the front wall of the mouth, bring the teeth to about  $\frac{1}{2}$  the distance for E and draw the lips sharply over them.

Exer. 14.—Repeat exercises 6 to 13 for each primary.

INTERMEDIATES.—(1) é (ei) is intermediate between I and E, as in her.

(2) á (ah) is intermediate between E and A, as in man.

(3) ó (awe) is intermediate between A and O, as in form.

(4) ú (ou) is intermediate between O and U.

Exer. 15.—Repeat exercises 6 to 13 for each intermediate.

COMPOUNDS.—(1) o (ow) is formed by coalescing A and U, as in how, house.

(2) i (eye) is formed by coalescing A and I, as in pine.

(3) oi is formed by coalescing O and i, as in oil.

(4) u (you) is formed by coalescing I and U as in tune.



Exer. 16.—Repeat exercises 6 to 13 for each compound.

TABLE I.—ARTICULATION OF VOWELS.

	<i>U</i> <small>(ou)</small>	<i>O</i> <small>(ave)</small>	<i>A</i> <small>(ah)</small>	<i>E</i> <small>(ei)</small>	<i>I</i>	<i>o</i>	<i>i</i>	<i>oi</i>	<i>u</i>				
<i>I</i>													
<i>e</i>													
<i>E</i>		⊕											
<i>a</i>													
<i>A</i>													
<i>o</i>													
<i>O</i>													
<i>u</i>													
<i>U</i>													
<i>u</i>													
<i>oi</i>													
<i>i</i>													
<i>o</i>													
	<i>O</i>	<i>o</i>	<i>A</i>	<i>a</i>	<i>U</i>	<i>u</i>	<i>I</i>	<i>e</i>	<i>E</i>	<i>u</i>	<i>i</i>	<i>o</i>	<i>oi</i>

Note.—The primary vowels are placed on the leads, the compounds on the hair, and the intermediates on the dotted lines. Hyphen is used between syllables.

(1) Groups of two vowels :

- (a) Proceed on the lines from left to right and reversely, vowel on the left leading : I-U, I-O.
- (b) Proceed from top to bottom and reversely, upper vowel leading : U-I, U-E.

Exer. 17.—Repeat exercises 6 to 13 for each group of two.

- (2) Groups of three: Take the right angles : I-O-U, U-O-A, A-U-O, O-U-I.

Exer. 18.—Repeat exercises 6 to 13 for each group of three.

(3) Groups of four. Proceed on the perpendiculars each in turn leading: E-O-O-A, O-O-A-E, O-A-E-O, A-E-O-O.

Exer. 19.—Repeat exercises 6 to 13 for each group of four.

### CONSONANT SOUNDS.

1. FORMATION.—Beginning at tip of lips for P., the consonant formation point moves backward to the base of the tongue and soft palate for the gutturals H and Y (old English). The vertical lines indicate that the lower letters have approximately the same formation points as the upper. The word sibilant shows the distinctive character of the letters so named. Of the liquids, m, n, ng, are nasal, the rest oral. L is formed by holding the point of the tongue on the D position, and driving the vocal current round it, that is between the upper and the lower jaws: drop the point of the tongue to form R. The regions of aspiration are the teeth and back of the mouth, in both of which places the R can be trilled. The figures show the medial positions for each group.

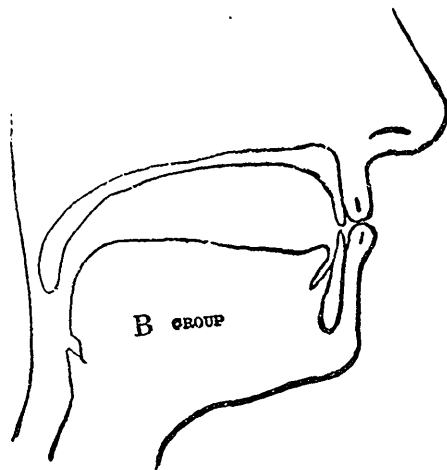


Fig. 12.

Labials or B Group.

	Thin.	Medial.	Aspirate	
Mutes.	P.	B.	F.	V.
Sibilants.	Ψ (ps)			
Liquids.	oral			
	Nasal.		m.	

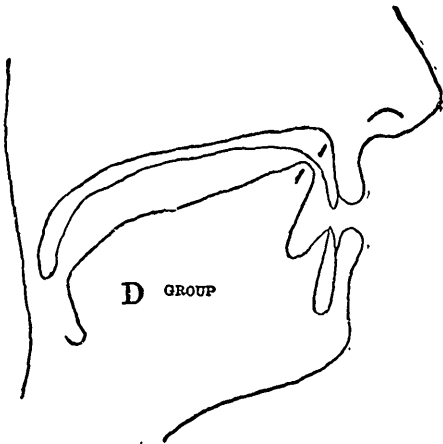


Fig. 13.  
Dental or D Group.

Aspirate.		Medial.	Thin.
Th.	Th.	D.	T.
Zh.	Sh.	Z	S
J-(Dsh)ch-(Tsh)		L	R.(final)
		n.	

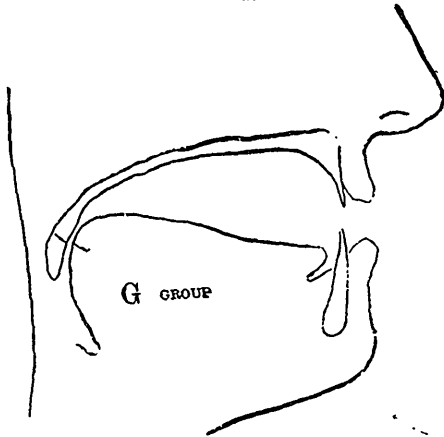


Fig. 14.  
Guttural or G Group.

Thin.	Medial.	Aspirate.		
K.	G.	Y.	H.	12
X.	X.	9		8
W.	N G.			4
		Wh.	Rh.	3
				<hr/> 27

TABLE II.—VOWELS AND CONSONANTS.

*Note.*—The liquids are in italics, the sibilants in small capitals, the mutes capitals; in the upper line the mutes are on the leaded, the sibilants on the hair, and the liquids on the dotted lines.

	P	B	<i>m</i>	F	V	TH	ZH	TH	SH	J	CH	D	Z	l	n	T	s	r	K	x	w	G	x	ng	Y	wh	rh	H	
U																													
ü																													
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(1) FORMATION.—(1) Groups of two.—Proceed with each vowel on the lines (a) from left to right and (b) reversely, the letters on the left leading: (a) U P.

Exer. 20.—Repeat exercises 6 to 13 for each group of two.

(2) Groups of three.—(a) Proceed from right to left, consonant leading and repeated, P U P.

(b) Proceed from right to left taking consonants in the following order, top and bottom, then reversely, bottom and top.

Exer. 21.—Repeat exercises 6 to 13 for each group of three.

2. Two Syllables:

(1) FORMATION.—(a) Duplicate exercise 20, first the vowel leading, next the consonant: UF, -PU.

(b) Repeat groups of three in exercise 21 (a);

(c) Combine two groups in exercise 21 (b).

Exer. 21.—Repeat exercises 6 to 13 for each group of two syllables.



K.	Kill.	key.	kern.	ken.	kate.	cat.	come.	coo.	cost.	core.	could cook.	cooper.	curate.	kite.	coil.	cow.	
X.	links. flgs.	weeks. lengues.	xerxes.	vex. legs.	plagues. bags.	backs. bags.	cash. example	hogs.	hawks.	hrogues	goorka, good.	rebutkes fugues.	rebukes fugues.	likes.			
G. Final. Ng.	fig. sing.	gear.	guess.	get.	gate.	gammon glass.	gun. guards.	got. long.	gauze.	goat.	goorka, good.	groups.	gewgaw guile.			gout.	
Wh.	whit.	wheel.		whot.	whey.		sung.	what.		whon.	whoop.		whine.				
Rh.	rick.	reck.	reck.	red.	rate.	raft.	run.	rock.	row.	yeoman whole.	rook.	rood. rude. who.	rhyme.	royal.		house how.	
Y and H		yield. he.	her.	yet. hen.	yen. hny.	yarn. hat.	yard. half.	yon. hot.	yawn. haw.				rule. hue.	high.	hoist.		

FIRST SERIES—Begun August, 1852; concluded December, 1885; 41 numbers, 3 vols. 4to.

SECOND SERIES—Begun January, 1856; concluded January, 1878; 92 numbers, 15 vols. 8vo.

THIRD SERIES—Begun 1879:

#### NOTES :

1.—The First Series has for title, "The Canadian Journal; a Repertory of Industry, Science and Art; and a Record of the Proceedings of the Canadian Institute." The Second Series has for title, "The Canadian Journal of Science, Literature, and History." The title of the Third Series is, "Proceedings of the Canadian Institute." Parts 1 & 2, Third Series, are entitled "The Canadian Journal: Proceedings of the Canadian Institute."

2.—By inadvertence, No. 85 (November 1873) of the "Canadian Journal," 2nd Series (Vol. XIV.) immediately follows No. 79. There is, however, no *lacuna* between these two numbers, as is shown by the fact that the paging is consecutive.

3.—Societies wishing to exchange back numbers of their Proceedings can be supplied with complete sets of the Publications of the Canadian Institute, except Vol. XV., No. 5, Second Series, and Vol. I., Part I, Third Series.

4.—Members having either of the above, Vol. XV., No. 5, Second Series, April, 1877, or Vol. I., Parts 1, 3 & 5; Vol. II., Parts 1 & 2; Vol. III., Part 1, Third Series, and being willing to part with them, will please communicate with the Assistant Secretary.

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#### ERRATA IN "THE DEVELOPMENT OF LANGUAGE."

Page 96, line 18; insert "and" before "issuing."

" 113, line 3 from foot; for "or" read "and."

" 113, line 6; for "*witsaia*" read "*witsaiu*."

" 119, line 23; for "word" read "words."

