

JOURNAL AND PROCEEDINGS

—OF THE—

Hamilton Association

FOR SESSION 1890-91.

PART VII.

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AUTHORS OF PAPERS ARE ALONE RESPONSIBLE FOR STATEMENTS MADE
AND OPINIONS EXPRESSED THEREIN.

PRINTED FOR THE HAMILTON ASSOCIATION BY THE
TIMES PRINTING COMPANY.

1891.

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JOURNAL AND PROCEEDINGS

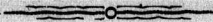
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Hamilton Association

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AND OPINIONS EXPRESSED THEREIN.



PRINTED FOR THE HAMILTON ASSOCIATION BY THE
TIMES PRINTING COMPANY.

1891.

J.

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COLONE

OFFICERS FOR 1890-91.

President.

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A. T. NEILL.

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1859	Rev. W. Ormiston, D. D.	J. B. Hurlburt, M.A., LL. D.	Chas. Robb.....
1860	Rev. W. Inglis, D. D.	T. McIlwraith.....	Rev. W. Ormiston, D. D.
1861	Rev. W. Ormiston, D. D.	J. B. Hurlburt, M.A., LL. D.	Rev. W. Inglis, D. D.
1871	W. Proudfoot....	Judge Logie.....	R. Bull.....
1872	Judge Logie.....	H. B. Witton, M.P..	R. Bull.....
1873	H. B. Witton, M.P.	J. M. Buchan, M. A.	A. T. Freed.....
1874	H. B. Witton, M.P.	J. M. Buchan, M. A.	A. T. Freed.....
1875	H. B. Witton.....	J. M. Buchan, M. A.	W. H. Mills.....
1880	T. McIlwraith....	Rev. W. P. Wright, M. A.	H. B. Witton.....
1881	J. D. Macdonald, M. D.	R. B. Hare, Ph. D..	B. E. Charlton.....
1882	J. D. Macdonald, M. D.	B. E. Charlton.....	J. A. Mullin, M. D..
1883	J. D. Macdonald, M. D.	B. E. Charlton.....	H. B. Witton.....
1884	J. D. Macdonald, M. D.	H. B. Witton.....	Rev. C. H. Mock- ridge, M.A., D.D.
1885	Rev. C. H. Mock- ridge, M.A., D.D.	Rev. S. Lyle.....	W. Kennedy.....
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1887	Rev. S. Lyle, B. D.	B. E. Charlton.....	W. A. Child, M. A..
1888	Rev. S. Lyle, B. D.	T. J. W. Burgess, M.B., F. R. S. C.	W. A. Child, M. A..
1889	B. E. Charlton....	T. J. W. Burgess, M.B., F. R. S. C.	J. Alston Moffat....
1890	B. E. Charlton....	J. Alston Moffat....	A. T. Neill.....
1891	B. E. Charlton....	A. T. Neill.....	S. Briggs.....

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	T. C. Keefer,	Dr. Craigie	W. H. Park	A. Harvey.
	C. E.			
niston,	T. C. Keefer,	Dr. Craigie	W. H. Park	A. Harvey.
	C. E.			
D. D.	Dr. Craigie	Wm. Craigie	W. H. Park	Chas. Robb.
	Dr. Craigie	Wm. Craigie	W. H. Park	T. McIlwraith.
	J. M. Buchan,	I. B. McQuesten,	W. G. Crawford	T. McIlwraith.
	M. A.	M. A.		
	J. M. Buchan,	I. B. McQuesten,	W. G. Crawford	T. McIlwraith.
	M. A.	M. A.		
	Geo. Dickson,	Geo. Dickson,	R. Bull	T. McIlwraith.
	M. A.	M. A.		
	Geo. Dickson,	Geo. Dickson,	R. Bull	T. McIlwraith.
	M. A.	M. A.		
	Geo. Dickson,	Geo. Dickson,	A. Macallum,	T. McIlwraith.
	M. A.	M. A.	M. A.	
	R. B. Hare, Ph.	Geo. Dickson,	R. Bull	A. T. Freed.
	D.	M. A.		
	Geo. Dickson,	A. Robinson,	R. Bull	W. H. Ballard,
	M. A.	M. D.		M. A.
D.	Geo. Dickson,	Wm. Kennedy .	R. Bull	W. H. Ballard,
	M. A.			M. A.
	Geo. Dickson,	Wm. Kennedy .	R. Bull	W. H. Ballard,
	M. A.			M. A.
Mock-	Geo. Dickson,	A. Alexander . .	R. Bull	Wm. Turnbull.
D.	M. A.			
	Geo. Dickson,	A. Alexander . .	R. Bull	A. Gaviller.
	M. A.			
	Geo. Dickson,	A. Alexander . .	R. Bull	A. Gaviller.
	M. A.	F. S. Sc.		
A..	H. B. Witton,	A. Alexander . .	R. Bull	A. Gaviller.
	B. A.	F. S. Sc.		
A..	H. B. Witton,	A. Alexander . .	R. Bull	A. Gaviller.
	B. A.	F. S. Sc.		
	H. B. Witton,	A. Alexander . .	R. Bull	A. Gaviller.
	B. A.	F. S. Sc.		
	H. B. Witton,	A. Alexander . .	R. Bull	A. Gaviller.
	B. A.	F. S. Sc.		
	Thos. Morris, Jr.	A. W. Stratton,	R. Bull	A. Gaviller and
		B. A.		G. M. Leslie.

MEMBERS OF COUNCIL.

- 1857—Judge Logie; Geo. Lowe Reid, C. E.; A. Baird; C. Freeland.
- 1858—Judge Logie; C. Freeland; Rev. W. Inglis, D. D.; Adam Brown; C. Robb.
- 1859—Rev. W. Inglis, D. D.; Adam Brown; Judge Logie; C. Freeland; R. Bull.
- 1860—J. B. Hurlburt, M. A., LL. D.; C. Freeland; Judge Logie; R. Bull; Wm. Boultee; Dr. Laing.
- 1871—Geo. Lowe Reid, C. E.; Rev. W. P. Wright, M. A.; A. Macallum, M. A.; A. Strange, M. D.; Rev. A. B. Simpson.
- 1872—Judge Proudfoot; Rev. W. P. Wright, M. A.; John Seath, M. A.; H. D. Cameron; A. T. Freed.
- 1873—Judge Logie; T. McIlwraith; Rev. W. P. Wright, M. A.; A. Alexander; I. B. McQuesten, M. A.
- 1874—Judge Logie; T. McIlwraith; Rev. W. P. Wright, M. A.; A. Alexander; I. B. McQuesten, M. A.
- 1875—Judge Logie; T. McIlwraith; Rev. W. P. Wright, M. A.; A. Alexander; I. B. McQuesten, M. A.
- 1880—M. Leggat; I. B. McQuesten, M. A.; A. Alexander; Rev. A. Burns, M. A., LL. D., D. D.
- 1881—T. McIlwraith; H. B. Witton; A. T. Freed; Rev. W. P. Wright, M. A.; A. F. Forbes.
- 1882—T. McIlwraith; H. B. Witton; A. T. Freed; A. F. Forbes; Rev. C. H. Mockridge, M. A., D. D.
- 1883—A. Alexander; A. Gaviller; A. F. Forbes; T. McIlwraith; R. Hinchcliffe.
- 1884—A. Gaviller; A. F. Forbes; T. McIlwraith; R. Hinchcliffe; W. A. Robinson.
- 1885—W. A. Robinson; S. Briggs; G. M. Barton; J. Alston Moffat; A. F. Forbes.
- 1886—J. Alston Moffat; Samuel Slater; Wm. Milne; James Leslie, M. D.; C. S. Chittenden.
- 1887—J. Alston Moffat; James Leslie, M. D.; P. L. Scriven; Wm. Milne; C. S. Chittenden.
- 1888—J. Alston Moffat; B. E. Charlton; T. W. Reynolds, M. D.; S. J. Ireland; Wm. Kennedy.
- 1889—T. W. Reynolds, M. D.; S. J. Ireland; William Turnbull; A. W. Hanham; Col. Grant.
- 1890—Col. Grant; A. W. Hanham; W. A. Robinson; A. E. Walker; Thomas Morris, Jr.
- 1891—Col. Grant; W. A. Robinson; Prof. McLaughlin; Dr. Reynolds; W. Turnbull.

ABSTRACT OF MINUTES

OF PROCEEDINGS OF THE

HAMILTON ASSOCIATION

FOR SESSION 1890-91.

THURSDAY, NOVEMBER 13th, 1890.

The President, Mr. Charlton, in the chair.

The minutes of the previous meeting were read and confirmed.

Several additions were reported to the Library and Museum from Mr. Whiteaves, of Ottawa; Mr. John A. Barr and others. On motion the thanks of the Association were voted to the donors.

The Secretary gave an abstract of what had been done during the recess.

Some of the members having expressed a desire to have a Section, or Sub-section organized for the study of Philology, it was resolved to form such a Section, to be known as a Sub-section of Section G.

The following names were then proposed for membership, viz : William Marshall, C. W. Mulligan, Sidney Saunders, J. A. Locheed, F. H. Yapp, Robert L. Edgar, J. S. Fielding, C. S. Mason, George Lynch-Staunton, F. H. Lynch-Staunton, P. L. S.; Geo. M. Leslie, A. W. Stratton, B. A.; H. P. Bonny, W. H. Schofield, B. A.; Henry S. Moore, J. F. McLaughlin, B. A.; D. Clarke, L. D. S.; Walter H. Elliott, Ph. B.; Hon. Donald McInnes, George Roach, J. G. Cloke, C. S. Finch, Thomas Lees, R. T. Lancefield, Charles Moore and J. J. Morrison.

The President then delivered the opening address of the session. The address was a very interesting one, and dealt with the early history of Hamilton and its neighborhood. At the close of the Paper a very interesting discussion took place, in which the Rev. Dean Geddes, Sheriff McKellar, Senator McInnes, Geo. S. Mills, Mr. Gaviller, F. W. Fearman, Mr. Witton, Jr., and others took part.

The meeting then adjourned, to meet on the second Thursday of December.

THURSDAY, DECEMBER 11th, 1890.

The President, Mr. Charlton, in the chair.

The minutes of the previous meeting were read and confirmed.

The following contributions were reported to the Museum and Library, viz. :—Three fine specimens of fossil ferns from the Nova Scotia Coal Measures, presented by Adam Brown, Esq., M. P.; poisonous insects and reptiles from Central America, presented by W. A. Robinson; and a case of parrots from Mr. A. E. Walker; first annual report of the geological survey of Texas, with several pamphlets relating to the same survey, presented by Mr. Wm. Kennedy, now assistant geologist of Texas.

The thanks of the Association were voted to the donors.

Dr. Burgess, Superintendent of the Protestant Hospital for the Insane, Montreal, was elected an honorary member of the Association.

The following were elected ordinary members of the Association, viz. :—

Wm. Marshall, C. W. Mulligan, Sidney Saunders, J. A. Locheed, F. H. Yapp, Robert L. Edgar, J. S. Fielding, C. S. Mason, George Lynch-Staunton, F. H. Lynch-Staunton, Geo. M. Leslie, Thomas Lees, Charles Moore, A. W. Stratton, B. A.; H. P. Bonny, W. H. Schofield, B. A.; Henry S. Moore, J. F. McLaughlin, B. A.; D. Clarke, L. D. S.; Walter H. Elliott, Ph. B.; Hon. Donald McInnes, George Roach, R. T. Lancefield, J. G. Cloke, C. S. Finch and J. J. Morrison.

The following names were proposed, viz. :—J. M. Burns, E. L. Rastrick, J. T. Crawford, B. A.; J. B. Turner, B. A.; Frederick Jas. Rastrick, A. H. Hemming, Commander Cheyne, R. N.; J. G. Witton, B. A.

Mr. Charlton then quoted several authorities to verify his statements respecting the existence of Slavery in Canada in the early part of the present century, some of these references showing that there were slaves held in Ontario as late as the year 1811 at least.

In the absence of Mr. Wilkins, of Beamsville, the Secretary read a paper on the Surface Geology of the County of Lincoln and

the neighboring Counties. The paper contained a great amount of original matter, the result of the author's personal observations.

Prof. McLaughlin, W. A. Robinson, Colonel Grant, Mr. Walker and others took part in the after discussion.

The meeting then adjourned.

THURSDAY, JANUARY 8th, 1891.

The President, B. E. Charlton, in the chair.

The minutes of the previous meeting were read and confirmed.

The Curator reported several donations to the Library and Museum.

The following were elected members of the Association, viz:—
J. M. Burns, E. L. Rastrick, J. T. Crawford, B. A.; J. B. Turner, B. A.; Frederick James Rastrick, A. H. Hemming, Commander Cheyne, R. N.; J. G. Witton, B. A., and the following were proposed for membership, viz:—O. J. Brown, M. A.; S. A. Morgan, B. A.; L. T. Locheed, B. A.; J. R. Chapman, J. E. P. Aldous, B. A.; Thomas C. Mewburn, Inspector of Customs.

Mr. Witton then read his paper on "Egypt," with an account of the "Book of the Dead," beautifully illustrated by the British Museum facsimile of the papyrus seventy feet long, written at the end of the fourteenth century B. C.

Several members took part in the after discussion, all speaking highly of the interesting character of the paper.

Mr. Witton kindly consented to allow the illustrations to remain on view for another two days.

Many of the members and their friends availed themselves of the opportunity to examine these very interesting papyri.

The meeting then adjourned.

THURSDAY, FEBRUARY 12th, 1891.

Regular monthly meeting of the members.

The President in the chair.

The minutes of the previous meeting were read and confirmed.

Donations to the Library and Museum were reported by the Curator, Mr. Gaviller.

The following new members were then elected, viz:—Oliver J.

Brown, M. A. ; L. T. Locheed, B. A. ; J. R. Chapman, S. A. Morgan, B. A. ; J. E. P. Aldous, B. A. ; Thomas C. Mewburn, Customs Inspector ; and the following were proposed for membership, viz. :— F. G. Foster, Florist, and Rev. H. Birkenthal.

Some very interesting notes were read by the Secretary, from Mr. Wm. Yates, of Hatchley, on his observations among the birds and flowers, which gave great pleasure to the members present.

A lengthy but able paper, entitled "Connecting Links," by H. B. Small, of the Department of Agriculture, Ottawa, was read by the Secretary.

There was not time after the reading of the paper to enter upon a discussion of the various subjects touched upon ; it was therefore suggested that the paper be dealt with by the Sections.

It was announced that the next paper would be by Mr. Aldous, on "Flutes of the time of Moses," recently found in Egypt.

The meeting then adjourned.

THURSDAY, MARCH 12th, 1891.

The President, Mr. B. E. Charlton, in the chair.

Owing to the illness of Mr. Alexander, Mr. H. P. Bonny acted as Secretary. Minutes of former meeting read and confirmed.

Mr. F. G. Foster, Florist, and Rev. H. Birkenthal, were elected members of the Association.

Mr. Gaviller reported the receipt of Transactions of the Royal Society of England ; the Bulletin of Harvard University ; Psyche and the Entomological Magazine for March. He also announced the following donations to the Museum, viz. :—A quantity of wampum, presented by Mr. Allison, of Waterdown ; specimens of copper ore, iron and manganese ores from Western Virginia, presented by Mr. G. Meakins ; asbestos from the Eastern Townships of Quebec, given by Mr. E. Furlong ; and lead ore from Missouri, presented by Mr. W. D. Long.

A vote of thanks to the donors was proposed by Mr. H. B. Witton, seconded by Mr. Bull, and carried.

A very interesting paper on the "Flutes of the time of Moses," was read by J. E. P. Aldous, B. A., elucidated by diagrams. The subsequent discussion was joined in by Messrs. Briggs, Witton, the President and others.

Mr. Briggs then read some instructive notes on domestic animals, by Mr Wm. Yates, of Hatchley.

The President announced that the next paper would be read by Mr. J. T. Crawford, B. A., and be entitled "Applications of Electricity," illustrated by experiments.

The meeting then adjourned.

THURSDAY, 9th APRIL, 1891.

The President, Mr. B. E. Charlton, in the chair.

The minutes of the previous meeting read and confirmed.

Mr. Charlton called attention to the transit of Mercury on the 9th May next, and that through the kindness of Chief Aitchison, of the Fire Brigade, the use of the fire tower had been secured as an observatory for the occasion. He also intimated that some of the best telescopes would be in position on top of the tower, and that there was ample room for sixty people.

The Curator reported several additions to the Library.

William M. McClemon, law student, and S. B. Sinclair, B. A., were proposed for membership.

J. T. Crawford then gave his lecture on "Electricity as a source of Light and Heat." The subject was very clearly treated and made interesting by numerous experiments. He also explained, by means of experiment, the various contrivances for lighting and extinguishing gas lights.

At the conclusion many expressed the pleasure they had received in listening to the subject as it had been treated.

It was resolved to organize a Section for Physics.

At the close it was announced that A. Alexander would read a paper on some botanical subject at the next meeting, and that the meeting would be the annual one for the election of officers for the ensuing session and other necessary business.

THURSDAY, MAY 14th, 1891.

The President in the chair.

The minutes of the previous meeting were read and confirmed.

S. B. Sinclair, B. A. and W. M. McClemon were elected members of the Association.

Mr. Alexander read a paper which he called "Botanical Jottings."

After remarks on the paper the annual meeting of the Association was held, at which the following reports were read:—

Report of the Council, by A. Alexander.

Biological Report " Dr. Reynolds.

Geological " " A. T. Neill.

Philological " " A. W. Stratton.

Conchological " " G. M. Leslie.

Financial " " R. Bull.

Votes of thanks to the retiring President, Secretary and other officers followed, when the election of officers for the ensuing session took place, resulting as follows:—

President, - - - - - A. Alexander, F. S. Sc.

1st Vice-President, - - - - - A. T. Neill.

2nd Vice-President, - - - - - Samuel Briggs.

Corresponding Secretary, - - - - - Thomas Morris, Jr.

Recording Secretary, - - - - - A. W. Stratton, B. A.

Treasurer, - - - - - Richard Bull.

Curator and Librarian, - - - - - Alexander Gaviller.

Assistant do. - - - - - G. M. Leslie.

COUNCIL.—W. A. Robinson, Colonel C. C. Grant, Prof. McLaughlin, Dr. Reynolds and William Turnbull.

AUDITORS.—J. M. Burns and George Black.

The meeting then adjourned to meet on the second Thursday of November.

HAMILTON ASSOCIATION.

SESSION 1890-91.

INAUGURAL ADDRESS

DELIVERED BY B. E. CHARLTON, ESQ., (PRESIDENT),
ON NOVEMBER 13th, 1890.

After welcoming the members to the Association's new quarters, he said that he had chosen as the subject of his address, "Notes and Incidents in the Early History of Hamilton and Vicinity":

Perhaps the earliest recorded visit of any white man to this part of the Province of Ontario was that of the Jesuit fathers, Brébeuf and Chaumonot, in 1640. In 1634 these two missionaries, with others, attached themselves to a party of Huron Indians, whose home was near Lake Simcoe, then visiting the present location of Three Rivers, in the Province of Quebec, on a trading expedition, and returned with them by the way of the Ottawa and French Rivers and Lake Nipissing. After that long and toilsome voyage in bark canoes, the intrepid fathers found themselves floating on the broad bosom of a mighty inland ocean, which the Indians called Attiguan-tan, but which they named La Mer Douce, or the fresh water sea. This is now known as Georgian Bay. On the southern shore of this bay, and between that and Lake Simcoe, they found populous Indian towns, the homes of the Hurons. There they labored with that zeal and courage for which their Order has always been noted, but apparently with very indifferent success. After residing in this place six years, the two fathers named above were selected to penetrate the country of the Kahguas or Neuters, a numerous tribe inhabiting the country lying between the Niagara and Detroit Rivers, and between Lakes Erie and Simcoe, lying chiefly around the head

of Lake Ontario, while a wing of their territory extended across the Niagara river into Western New York. After five days' march from the most southerly Huron town, situated near the present village of Oro, ten miles north-east of Barrie, they reached the first village of the Kahquas, and afterwards visited in turn eighteen others. The Kahquas were a fierce people. In athletic proportions, ferocity of manners and extravagance of superstitions, they were never exceeded by any other North American tribe. They, like their neighbors the Iroquois, and Hurons too, on some occasions tortured and roasted their captives alive for hours, and, when life could no longer be prolonged, ate them. The mission was barren of any other fruit than extreme hardship and danger; but from the distance travelled, and the number of towns visited, it is quite probable that these two Jesuits visited the head of Lake Ontario.

Whether they did so or not, it is certain that La Salle, that most intrepid explorer, in company with other Jesuit missionaries, namely, de Casson and de Galinée, encamped several days on the north shore of Burlington Bay, and on Sept. 24th, 1669, visited the Iroquois town near Lake Medad, the particulars of which visit are recorded in the Journal of this Association for 1882-1883. La Salle's expedition was the first to leave any written record of Burlington Bay, and he has therefore been appropriately designated as its discoverer.

Between these two missionary visits the small-pox—that disease so deadly to the Indian—had swept with decimating effect over the land, and was followed by one incursion after another of the ferocious Iroquois, till not a trace, save the ash heaps, was left of the 30,000 Kahquas and 20,000 Hurons in all the country bounded by the Niagara River, Lakes Erie and Huron and Georgian Bay, a few only of their towns, such as that at Lake Medad (previously referred to), being, according to the Iroquois custom, occupied as outposts by the conquerors.

For another hundred years after La Salle's visit, the only white faces reflected from Burlington Bay were those of a few traders and trappers.

A few stirring events occurred meanwhile about the borders of the Niagara River, as along it ends the grand portage or carrying place, which formed the thoroughfare between Lakes Ontario and Erie. This, indeed, has been the chief Canadian battle-ground of

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this country since history began—first, between the Kahquas and Iroquois; next, between the Iroquois and French; next, French and English; next, English and Americans in the two wars of 1776 and 1812; and lastly between Canadians and Fenians.

The old fort at the mouth of the Niagara River, which had been built by La Salle in 1678, was captured from the French in 1759 by Sir William Johnson, commanding a little army of 2,000 English and 1,000 Indians. The youthful warrior Brant, or Thayendinaga, first figured in Canadian history at this battle. Five years later, on the close of the Pontiac war, one of the largest Indian councils ever held upon this continent took place at Niagara. In the spring of 1764 Sir William Johnson, who was married to the sister of Brant and who attained a commanding influence in Indian affairs, from his place called Johnson Castle, near the mouth of the Mohawk, sent out runners all over the north and west, summoning the Indians to meet him in council at the mouth of the Niagara River, and when he, with an escort of 500 Indians, stepped from the canoes by which they had travelled by way of Oswego River and Lake Ontario, he found there assembled an immense concourse of Indians, embracing delegates from all the nations dwelling in that vast region between the pine forests of Nova Scotia and the head springs of the Mississippi, the margin of Hudson's Bay and the shores of Lake Superior. The Sioux and Pottawattamies alone were absent, conscious of their own misconduct and afraid to trust the English, whom they had greatly injured. The task before Sir William was a delicate one—that of threatening some, conciliating others and moulding these various tribes, many of whose delegates were red-handed from the massacres of Michillimackinac and Bloody Run, into friends and allies. The council lasted for over a month, and proved of great benefit to the British and to the cause of peace.

Twelve years later the American revolution broke out, lasting from 1776 to 1783, resulting in the Mohawks under Brant fleeing to Canada and settling upon a grant of land upon the Grand River, formerly called the Ouse. Brant established his headquarters at what is now the small village called Mohawk, one and a-quarter miles from Brantford, where is at present the small church which Brant established, which was the first church ever erected in Ontario. In it is still preserved a massive silver communion service, presented to the tribe by Queen Anne in 1710, while they

resided upon the Ohio River. Here Brant lived in a style which, for an Indian, might be called regal magnificence—the idol of his nation and its greatest living warrior, attended by numerous slaves, both of African and of Indian blood. What an elevation for an Indian to attain! The locality had been selected with that skill and sagacity for which the Indian is noted. No place in Canada could have answered the wants of his people so well. The flats of the Grand River were and are proverbial for their rich soil—the best in the Dominion for the cultivation of Indian corn. Game, wild fowl and fish were abundant, and white settlers had yet scarcely disturbed nature's own handiwork. It was virtually an Indian's paradise.

One Capt. Campbell, of the Forty-second Regiment, stationed at Niagara in the winter of 1791-2, relates how himself and others, in two sleighs, made a trip from Niagara to Mohawk and return for the purpose of visiting the great chief. The account which he gives throws considerable light upon the condition of the country at that time, and the style in which Brant lived.

The first night they put up at Squire McNab's, which was more than fifteen miles from the Niagara River; the second, at Smith's, near the North-west corner of the present King and Wellington streets in this city; the third, at Paisley's, and next day at Mohawk. He speaks of Burlington Bay as Lake Geneva, and says the Indians called it Ouilqueton. Other writers say it was once called Macassa, possibly by the former occupants of the country, the Kahquas. Himself and party were most hospitably received by Col. Brant, whom he found living in the grand style mentioned before—the table loaded with excellent china and attended by two slaves in silver buckles and ruffles and scarlet dress. The house was supplied with good furniture. Brandy, port and Madeira wines and other European delicacies in considerable variety were freely dispensed. Mrs. Brant was dressed in the Indian style, but her costume was made of satin and broadcloth, with blanket of silk. On Sunday all attended church, at which an Indian conducted the service, and Capt. Campbell was charmed with the singing of a choir of Indian women. The same evening a great war and serpent dance took place, Chief Brant himself beating a drum. The dance ended with Scotch reels, in which all, the Europeans included, took a hand. He speaks of the excellence of the land and the comfortable habitations of the Indians scattered pretty thickly along both sides of the Grand River; of the

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abundance of fish—sturgeon, pike, pickerel and maskinonge—in the river, and game in the woods.

Returning down the river through several Indian villages, he stopped the first night at the house of W. Young, a half-pay officer married to a squaw; next day crossed a forest of twenty miles without a settler, stopped at Mr. Andrew Patton's, called at Major Tinbrook's and dined at Squire McNab's. This Mr. McNab (not a relative of Sir Allan's), he says, "is a gentleman of genteel and independent property—is a justice of the peace, which gives him the title of squire, and a member of the land board." He further describes their arrival at the Fort of Niagara, and going on to Chippawa for a dance the same night.

Burlington Bay was a favorite fishing ground of Brant's tribe at the seasons of the year when wild duck and fish were most abundant, and the chief having obtained a grant of 600 acres bordering the north-east angle of the bay, established his next and final residence there, where he died in 1807.

Besides the Indians who came to Canada at the close of the American revolution, numbers of loyalists who, through the war, had espoused the side of the British and preferred still to be sheltered by the old flag, also came over and commenced settling along the frontier and gradually extending into the interior. Governor Simcoe, first governor of Ontario (or Upper Canada), arrived at Niagara, then called Newark, in 1791, and established his government, afterwards in 1796 removing to Toronto, then Little York, described at the time as a miserable collection of shanties. It bore the title of Little York till 1817, when a change to Toronto was made, lest it might be confounded with New York. One of Governor Simcoe's first acts was to send out surveyors, who laid out districts and counties, liberally distributing among them names of places in Yorkshire, such as Barton, Flamboro', Ancaster, etc.

It is not pleasant to remember that human slavery once cast its dark shadow on this beautiful province; and as I have mentioned that Chief Brant held slaves, a fact which some may be unwilling to believe, it may be necessary for me to state that a mild patriarchal form of slavery existed in Canada at this period—was permitted, indeed, from the date of the proclamation of King Louis in 1689 to that of the Imperial act of 1833, which freed the slaves of the British West Indies and embraced those of Canada likewise.

J. C. Hamilton, LL. B., in a paper which he recently read before the Canadian Institute, stated that in the year 1791 there were some three hundred negroes and a few Pawnee Indian slaves in Upper Canada, mostly in and around Niagara, and that Sir Adam Wilson informed him of having met, about 1830, two young slaves, "Hank" and "Sukey," at the residence of a lady in the County of Halton, mother of a distinguished resident of this city, who died a few months ago. These took their freedom under the Act of 1833, and were perhaps the last slaves in the Province. Since that date, however, for half a century, Canada afforded such a refuge and a home to the fleeing sons of Africa as to have effectually wiped out the dark stain.

In the old burying-ground attached to the Christ Church Cathedral stands a tombstone bearing the following inscription: "In memory of Richard Beasley, who departed this life on the 16th day of February, 1842, aged eighty years and seven months. The first settler at the head of the lake." The honor of being the first settler here is claimed also by Col. Robert Land.

It is quite probable that a few settlers might be located here before the arrival of Governor Simcoe's surveyors, by whom the site of Hamilton was divided into farm lots east and west by Main street—King street being established upon an Indian trail and not sufficiently straight for a dividing line. At a very early date, south of Main street, James Mills, father of the late Hon. Samuel Mills, owned all lying west of Queen street; Peter Hamilton, between Queen and James; George Hamilton, between James and the line of Mary street; Richard Springer, from Mary to Wellington; and Ephraim Land, from Wellington to Wentworth. On the north of Main street, Peter Hess owned all west of Bay street; Samuel Kirkendall, from Bay to James; Nathaniel Hughson, from James to Mary; Archibald Ferguson, from Mary to Wellington; Robert Land, from Wellington to Emerald; and Abel Land, from Emerald to Wentworth.

Previous to 1832, Hamilton extended no further west than Queen, nor east than Wellington street. The latter was known as Lover's lane, at the foot of which stood the only wharf.

The site of Hamilton was very broken, being traversed by numerous creeks, which took their rise at the foot of the mountain, thence winding their way to the bay. There are those now living who remember speckled trout being caught in a creek at the rear of

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the Boys' Home, near the corner of Stinson street and Erie Avenue, and in another at the corner of King and Jarvis streets; others who have seen canoes and skiffs in a third creek near the Royal Hotel, corner of James and Merrick streets, which creek was navigable for that kind of craft from thence to the bay. The only son of Sir Allan Macnab lost his life by the accidental discharge of his gun while leaping across the same stream near the corner of Hughson and Augusta streets.

It is worthy of note that we have in the city one organization, and one only, still in active operation which was established in this place in 1795, eighteen years before its name was Hamilton—twenty-nine years before it had a regular church building. Older than any structure in the city to-day, The Barton Lodge of Freemasons stands unchanged, amid a scene of change, except that its meetings and festivities are held in a palatial hall, or temple, instead of a lodge-room of logs. Its records tell of the first meeting for organization at Smith's tavern, which stood, as before mentioned, at the north-west corner of King and Wellington streets, and that after the meeting the brethren marched in procession to the house of Bro. Beasley, (Dundas), where Bro. D. Philips preached a sermon, and that Bro. Brant, the great chief, was in the procession. The records show also that at that early date the nearest store was at Niagara, whither the brethren usually went on horseback to purchase the necessary articles, as writing paper and ink-powder.

The Road from Toronto to the head of Burlington Bay was cut out in 1811, and Hamilton laid out as a village in 1813. In 1833 it was incorporated as a town, but the population in 1830 was only 653. In the same year the population of Toronto was 2,860 or about four and a-half times greater.

It is worthy of note that the corner of King and Wellington streets is the location of Hamilton's first tavern, first Masonic lodge, first school and first church. The first regular church building was erected on the site of the present First Methodist Church, on land donated by Col. Robt. Land in 1822. It was dedicated in 1824. The first interment was that of Samuel Price, tavern-keeper, in 1822. One of the oldest marble slabs in the burying-ground attached thereto reads as follows: "Sacred to the memory of Capt. John McKeen, who was a partner with James G. Stobridge for the construction of Burlington Bay Canal, who died Sept., 1824. This monument was

erected by J. G. S., 1831." Mr. Strobridge was interred in the same place two years later.

Burlington Bay Canal was commenced in 1823 and completed in 1826, the width being only thirty feet. Prior to the building of this canal Ancaster was the county-seat, having in 1818 twenty prosperous stores; but many of her most enterprising business people, such as Edward Jackson, Richard and Samuel Hatt, etc., removed to Hamilton on the opening of the said canal. Afterwards, in 1846, the canal was greatly widened. The contractor for the job, in order to bring stone for the piers from the north mountain, near Waterdown, built a tramway. This tramway equipment was afterwards sold to Andrew Miller, who had a project to build a canal from the bay up the ravine in rear of the Spring Brewery to the intersection of Bay and York streets. It is said that he obtained from Messrs. Hess and Kirkendall thirteen acres of land in the said ravine at a very small price, the chief consideration being that he should build the said canal. When people became impatient at his slow progress with the canal, he finally said he would complete the job at the date fixed by his deed, but upon examination of the deed it was found that no date had been mentioned.

For a long time "Mountain Road," now John street, was the only road leading from Hamilton to the brow of the mountain. On it were built some of Hamilton's first stores, notably one at the northeast corner of Jackson street, kept by Rolston, and one at the southeast corner of King street, kept by Sheldon. Later on some enterprising property owners opened up James street to the top of the mountain and celebrated the event with great éclat, proclaiming that it would draw the Ancaster and surrounding country trade through it at the expense of John Street, and that in consequence the latter would soon be abandoned as a business street. To emphasize their statements they hired a farmer to sow John street with grass seed. Commencing at the corner of King street, the agriculturist went southward scattering his seed until reaching the log jail, from the rear of which he met a shower of odorous eggs, which caused him to beat a quick retreat.

The old log jail, erected in 1861, stood on a slight elevation on the east side of John street, directly opposite the eastern entrance to the present Court House. It faced the west, but stood a little back from the street, leaving room for the pillory and stocks in front. In it impe-

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curious debtors, and others more criminal, were often incarcerated. A prisoner on one occasion sent word to the sheriff that if he did not make better fires and keep the place warmer he would leave. Another prisoner, named David Springstead, burrowed under the logs and escaped temporarily, and was thenceforth named "the Fox." Here an incident worth relating occurred at an early day. Three brothers named Young were accused by a prisoner confined in the jail of having killed a man, whose body, he said, he saw them deposit in the interior of a burning charcoal pit. The brothers were arrested, but after an exciting trial were acquitted. Upon gaining their liberty one of the number named John, proceeded to the United States and succeeded in finding the party whom they were accused of murdering. Both returned together, and the wretch who had endeavored to have three innocent men executed was sentenced to three months' imprisonment, during which he was to stand three times in the pillory, two hours each time, on which occasions he was pelted unmercifully with stale eggs. The log jail gave place in 1828 to a stone jail and court house combined, on the site of the present court house, to which it also gave place in 1877.

The venerable bell which now rings out the alarms of fire from the high tower at the Central fire station with such promptness, making the faithful firemen and horses spring to the call of duty, has quite a history. It was purchased from a manufacturer in Troy, N. Y., in 1836, for £100, and one of the first four debentures ever issued by the corporation of the town of Hamilton was given in its payment. Therefore, it would seem appropriate to designate the old bell as the father of the city debt. It first swung from the belfry of a wooden church on John street, a little south of Rebecca street, where the Gurney company's foundry now stands. In 1840 it was removed to a tower on the roof of a building on King William street, which forms part of the present central fire station, which building has been in turn town hall, lock-up, police court, and lastly fire station. About 1874 the bell was removed to the clock-tower on the old market house and city hall, and finally in 1888 it was removed to the present fire-tower at the Central station.

We have seen from what small beginnings and within a single lifetime, Hamilton has risen from a few scattered log shanties, where industrious and hardy settlers were heroically shouldering back the crowding forest, to this beautiful city, filled with so many

happy homes—the home not so much of colossal fortunes as some neighboring cities under another flag, but where genuine comfort is more uniformly distributed and less abject poverty prevails. There are those living who have seen corn and potatoes growing where now stands our stately court-house, and an orchard on the site of our superb city hall.

Hamilton is now a city of clean streets, good schools and comfortable and elegant churches, of swelling factories, whose busy wheels give out the hum of healthy industry—a city in whose beautiful setting and surroundings nature has been lavish. Her head pillowed on the breast of the mountain, her bosom on the plain, and her feet touching the waters of the bay, who would not love her, Hamilton the ambitious, the delightful?

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NOTES UPON THE SURFACE GEOLOGY OF LINCOLN COUNTY, ONTARIO.

Read before the Hamilton Association, December 12th, 1890.

BY D. F. H. WILKINS, B. A., BAC. APP. SCI., HEAD MASTER HIGH SCHOOL, BEAMSVILLE.

The present paper must be understood to be a mere outline, a connecting link between the writer's previous description of the River Valleys of the Niagara Escarpment and a subsequent essay which will describe more fully the features now merely hinted at. In excuse for the somewhat deceptive title of the present effort, the writer must plead engagements which have of necessity confined his observations to a somewhat limited district. Moreover, in order to connect fully the present paper with the former, the attention of the Association is asked to some features lying beyond the limits of the County of Lincoln, which, nevertheless, the writer thinks necessary for the proper development of his subject. The importance, therefore, of the surface geology of the region extending from Hamilton to Niagara, together with that of the district sloping southward to Lake Erie, requires far more development than that contained in the few scattered notes here laid before you.

Now, since it is advisable to deal with those phenomena nearest the region in question, your attention is asked to a section exposed on Lot 13, Con. 1, Clinton Township, this being as near a typical series as can be found, with perhaps one exception to be noted. Again, it must be remembered that the Medina shale, unaltered, forms the surface soil in many localities, overlaid here and there by a layer of vegetable mould of a few inches in thickness. The section referred to shows in descending order:—

1. Surface soil, yellow loam—1 foot.
2. Stratified brown clay, full of boulders, stones and small pebbles—1½ feet.
3. Brown-red clay, stratified, full of Medina pebbles, red and green, Hudson River fragments, all strongly impregnated with calcium chloride—6 feet.

4. The Medina Shale.

In a direction N. 20° E. from this exposure, eleven feet in vertical height lower and six hundred feet in horizontal distance, we have:—

1. Red and green sandy clays with a few Hudson River boulders—3 feet 11 inches.
2. Reddish-brown clay impregnated with sodium sulphate—1 foot.

Following the strike of this bed for forty feet six inches in a direction N. 60° W. we reach a stretch of sixty-two feet, measures concealed, then an outcrop of reddish clay, averaging from three to four feet, in a direction N. 40° E., then, at a distance of one-sixteenth of a mile north of the second outcrop, on a section striking N. 40° E. for seventy-two feet, we have in descending order:—

1. Red-brown sandy clay—3 feet 2 inches.
2. Red-brown clay with pebbles—4 feet.
3. Red-brown clay, strongly impregnated with calcium chloride, intersected by joints N. 60° E. and N. 41° W.—4 feet.

This last outcrop lies about twenty-three feet below the first, showing thus a small dip towards the lake.

Except for the presence of sodium sulphate and of calcium chloride, the foregoing may be taken as a fairly typical section, as has been already stated, and from the point last mentioned about a quarter of a mile of lacustrine sand overlies the clay as far as the lake shore. On the lake shore the banks are composed of brown clay, stratified yet unfossiliferous, capped with sand. It may be here added, too, that about a quarter of a mile of sand and clay beds has been, within the last fifty years, washed into the lake—that the lake margin then was nearly a quarter of a mile seaward from the present position. But this account is merely traditional, and must be received as such; and a far more interesting fact awaits us on turning our looks towards the land. For about fifty feet above the lake and about a mile and a-quarter south of the present margin, there extends a true boulder pavement—a ridge of boulders or "field stones," rising about three to six feet above the general level, parallel to the present lake margin. Its material has evidently been derived from a lake terrace, to be noted immediately. It is distinctly stratified and corresponds to Burlington Beach of to-day. It is worthy of note that the deposits to the south of the boulder

pavement are more clayey than sandy, while to the north the sand predominates over the clay. The percentage of boulders is in many localities greatly Laurentian, Huronian and Montalban; in others the Hudson River calcareous sandstones predominate, and few, if any, Medina pebbles and boulders are found. It may be added that the boulders are well rounded and as a rule free from ice-marks.

About half a mile to the south lies the famous Second Terrace, the ancient lake margin, of which Burlington Heights is the continuation. This beach, as has been shewn by other observers, enters the Province at Queenston Heights, follows the escarpment to Hamilton, forms there the Burlington Heights, and runs on across the Counties of Wentworth, Halton, Peel, York, Ontario, Northumberland and West Hastings. While in the last locality the ridge rises to the height of over four hundred feet, at Beamsville the average elevation is about sixty feet, or about a hundred and ten feet above the present lake level. It is composed of stratified brown clay full of boulders in many places, the boulders being of the same character as those of the boulder pavement. Strange to say, however, here and there, especially on the Thirty Mile Creek, the terrace is composed of unaltered Medina deposits, the conditions for excavation having been favorable and those for deposition the reverse.

But this second terrace slopes gradually southward and upward to a third beach, which abuts against the lower Niagara escarpment; here and there it rises suddenly, but in general its slope is gradual, with billowy, sweeping outlines. While here and there in the valleys of the creeks which cut into the deposits, the Medina series, grey band at the top and all, may be seen, the material of this beach seems to be in general a lighter brown clay, here and there containing boulders and pebbles, principally Archæan or Hudson River in age.

The fourth beach is, as has been said, the lower escarpment, the Pentamerous limestone, at the base of the Niagara series. Very often the beach is semi-circular in form, as may be seen near Beamsville, near Grimsby, and near Stony Creek. It may show upon unexposed surfaces deposits of clay and sand, but as a rule these are absent, for a reason suggested above. On exposed surfaces, however, ice-marks and grooves are plentiful, and seem to be due to coast-ice

exclusively. The writer trusts that he may here digress sufficiently to note the importance of coast-ice as a denuding and polishing agent. On the Labrador coast may be seen hard gneissic rock, polished, grooved and scooped, *not by glaciers*, but by coast ice, raised and lowered by the tide. While it has been distinctly shown that a glacier *cannot erode*, or can erode but slightly, coast ice certainly can accomplish a heavy task in denudation, as it was the writer's privilege to verify in 1875. Amongst other phenomena he then noticed that the polishing and grooving were not conspicuous towards the summits of the hills of that forbidding rocky coast, but that between and above the tide-marks they were a conspicuous feature.

From the fourth beach the land rises to the upper Niagara escarpment in a series of billowy clay loam fields, the escarpment itself constituting a well-marked terrace. As on the lower escarpment, ice-marks are plainly visible, scratching, polishing and rounding being as usual very conspicuous. The general direction of these marks, it may be added, is plainly about S. 68° E., though it may appear that a second series of striæ crosses here and there at right angles to this. The action of coast ice is to the writer as plainly demonstrated here as on the Labrador coast, and he regrets greatly that other engagements have prevented a close study of the phenomena.

But most important of all, perhaps, upon the summit of the escarpment, at distances from the edge varying from one-eighth to a quarter of a mile, lies a ridge of brown stratified clay, much heavier in texture, more strongly calcareous and lighter in color than that below the escarpment. The ridge rises to the height of from seventy to ninety feet above the escarpment, and presents a bold, bluff face to the north-east, while it rolls away in gentle slopes to the south-west. This ridge—roughly parallel with the edge of the escarpment—is traceable westward through the County, on through Wentworth to Ancaster Township. Here it constitutes the height of land referred to by Mr. William Kennedy on page 3 of a valuable paper read before this Association in March, 1882. It crosses the H. and N. W. R track near Rymal station at a height of four hundred and ninety-three feet above Lake Ontario. The present writer independently examined this ridge west of Hamilton many years ago, and traced it into Beverley Township. As Mr. Kennedy has stated, it is the water-parting between the streams flowing into Lake Onta-

rio and those flowing into Lake Erie; and yet it is penetrated by all, or by nearly all the creeks which have a north-eastward direction. Thus, near Beamsville, the Twenty and the Thirty Mile Creeks have cut their way through the ridge long after this ridge had been deposited. It is, moreover, the last sea-margin of the former Lake Erie at a time when the highlands of Western Ontario stood far above the water level of that day; and it has been as this sea-margin referred to on page 6 of "River Valleys of the Niagara Escarpment." To the south of the ridge the soil is nearly uniformly brown clay intersected by swamps, and this character is maintained as far south as Lake Erie.

It is worthy of notice that the clay area covers not only great parts of Lincoln and Welland Counties, but also the Townships of Barton, Glanford, Saltfleet and Binbrook of Wentworth, a small part also of Ancaster, and nearly the whole of Haldimand County, together with portions of East and South Norfolk. A line drawn from Concession 2, Lot 3, Ancaster Township, at the mountain edge, south-west to Concession 5, Ancaster Township, thence south-westerly to Onondaga, roughly represents the line between the clay and the overlying sand. The line is next met with about two or three miles east of Oakland, Brant County, about three miles east of Waterford and four to five miles east of Simcoe, near Renton station on the Air Line, reaching Lake Erie west of Port Dover. A subordinate clay area occupies the southern part of Walsingham and Houghton Townships, Norfolk County, evidently a former extension of Long Point Bay. It is worthy of note that by comparison of the levels on the Canada Southern Division of the Michigan Central Railway, those along the Air Line Division of the Grand Trunk, and those along the Buffalo and Goderich Division of the same, the sand stands at a much higher level than the clay area of South Lincoln, Welland and Haldimand. Thus, the sandy deposits along the Air Line near St. Thomas east to Simcoe, have an elevation greater than five hundred feet above Lake Ontario, while from Simcoe east they fall much below this, and from Jarvis east to the Niagara River the clay beds do not exceed three hundred and seventy-five feet. Along the Canada Southern, except at Villa Nova, East Norfolk, the clay never exceeds four hundred and seventy feet, while the sand and gravel beds near Waterford maintain a pretty uniform level of over five hundred and eighty feet. Along the

Brantford, Norfolk and Port Burwell Line the sandy deposits of Oxford County show an average elevation of over five hundred feet, as also do the Oak Plains near Brantford. In 1886, moreover, the writer measured a section exposed in the sandy beds near Lake Erie, in Charlotteville Township, and found it to consist of sand 40 feet, followed by yellow and brown clay, 10 feet, stratified; sand, stratified, 80 feet; blue clay 30 feet, to the edge of Lake Erie; thus giving a total height of one hundred and sixty feet above Lake Erie, or of four hundred and eighty-five feet above Lake Ontario.

The use of these apparent digressions from our subject will be seen when we shew how these bear, or seem to bear, upon the present distribution of clay in the region under consideration—South Lincoln. The clay area having the escarpment for its margin, was evidently cut off to the west by a sand-bar derived from the higher lands of Ontario, and this sand-bar so shaped the currents of the then existing lake as to preserve an expanse of quiet, somewhat shallow water, greatly resembling the present Long Point Bay, this water covering Haldimand, South Wentworth in part, South Lincoln and Welland Counties, a few sandy spots showing yet shallower water. At that time the drainage of Lake Erie was either to the west, along the Wabash Valley reversed, or towards the east as some have supposed, beyond Buffalo to Central New York and to the Susquehanna. Be that as it may, Niagara River then had no existence, the clay and the gravel and sand beds containing recent shells, and now seen at Goat Island and elsewhere, far above the river level, pointing rather to the eastward margin of the former lake. Not until the barrier at Queenston Heights was broken could the drainage of Lake Erie take place as at present; and the cause of the fracture seems to have been mere warping of the earth's crust, even though very small. A more careful examination of the superficial deposits at Queenston Heights may reveal some other cause, and until that time the warping spoken of must be held as provisionally true. Whatever was the cause, it seems to have operated almost simultaneously upon all the streams of the Niagara district, compelling them to break through the barrier, thus draining to a large extent the area of quiet water previously mentioned, and leaving lagoons separated by clay and gravel ridges, from which lagoons by silting up have been derived the present swamp areas of the district in question.

Meanwhile, what was going on at the lower level, Lake Ontario? The deposits were being laid down in a series of terraces, and from the fact that the Medina red rock weathered forms the surface soil in many places, we may infer that powerful currents were carrying eastward much of the clay and sand of that day. The formation of the terraces could easily go on contemporaneously with the deposition of clay and sand in the upper area, and, as the water was drained away, the terraces remained high and dry. Indeed, so far as the writer's observations have gone, all but the second terrace were exposed somewhat suddenly, since there is no boulder pavement a little below their level, as there would be if the water had broken against their faces for a considerable time. Again, as has been said before, in some cases we rise imperceptibly from terrace to terrace over a succession of billowy meadows and fields, which are often intersected by little streams; precisely what we should expect to find in a suddenly drained area. The cause of this sudden drainage has been shewn by Dr. Spencer to be the removal of a barrier of some kind at the Thousand Islands, thus allowing a vast increase in the volume of water pouring seaward down the Saint Lawrence. Meantime the creeks of the district had commenced to cut their way down the escarpment and to form valleys of their own. Probably the second terrace, the most conspicuous feature, occupied more time than the others in its formation, especially since it has been traced so far and so successfully, and since it is fronted by such a well-marked boulder pavement. Finally, the latest deposits were laid down, and the present levels of land and water defined.

To sum up, the writer's observations seem to point to the following phenomena :—

1. A northward extension of Lake Erie, as has been said, the topography of which consisted of a large southward extending sandy island, occupying Oxford, Norfolk, Brant and West Wentworth Counties, as also parts of Middlesex and Elgin. East and west of this were areas of sheltered water, that on the east embracing Lincoln, Haldimand, East Wentworth, northern part, and Welland, having the Niagara escarpment as its northern margin.

2. From some reason or other, a breaking of the barrier at Queenston Heights, a development of Niagara River, and a vast diminution in the volume of water in Lake Erie; simultaneously, a break-

ing of the barrier in various parts and a commencement of many north-eastward flowing streams.

3. At the same time as 1, the formation of a series of terraces in the area of Lake Ontario at a lower level than in the above.

4. The somewhat sudden stoppage of the growth of these terraces due to removal of a barrier of rock at the Thousand Islands.

5. Establishment of the present levels of land and water.

6. It may be noticed that since recent shells have been found in the beds of Goat Island, and in those along the Niagara River—and also, since in the brown clays of Walsingham Township, Norfolk County, underlying the sand, the writer has found leaves of the red maple, the birch, the poplar and several willows—therefore, geologically speaking, the time occupied in the development of the above must have been very recent.

Lastly, the above must be taken to be a first crude summary rather than a finished detail—a suggestive or would-be suggestive outline, rather than an exhaustive picture.

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EGYPT, AND SOME ACCOUNT OF THE BOOK
OF THE DEAD.

Read before the Hamilton Association, January 8th, 1891.

BY H. B. WITTON, ESQ.

For ages the land of Egypt has commanded the attention of antiquarians, historians, warriors, statesmen and travellers. To this day, thoughtful men of many countries turn towards Egypt a longing lingering look, for since the dawn of civilization shed a glimmering light upon the earth, in the far background of the picture of man's doings, where all is hazy, indistinct, and almost lost in the aerial perspective of the past, Egypt shows a distinct if faint outline. Who but has felt some interest in that land? In youth we eagerly read of Joseph, and his brethren who sold him as a slave into Egypt; of his eventful life; his interpretation of Pharaoh's dreams; his exaltation; his provision against famine, and relief of his family who for fear of hunger had gone down into Egypt to seek food. And with what zest we read on how Joseph made himself known to his brethren; and how the Israelites settled in Egypt and increased in numbers, so that they threatened to overrun the land; and how Pharaoh, having recourse to sterner measures than modern Malthusians have ventured to suggest, commanded that the male children of the Israelites should be put to death; and further on we read how the mother of Moses, to screen her child from that cruel edict, hid him in an ark of bulrushes, which she floated on the Nile, where he was found by the King's daughter, who adopted him as her son; of his sympathy for the wretched, his gifts as a leader and lawgiver, and of the Israelitish oppression and exodus. These narratives are indelibly impressed on the memory. We never forget them, and they whet the desire to learn something of the researches of Champollion, Lepsius, Petrie and the other Egyptologists of the nineteenth century.

Hardly less interesting than Egypt itself is the river by which it has been formed; for the saying of Herodotus, more than two thousand years ago, that Egypt is the gift of the Nile, is literally

true. We marvel at the Thames and Mersey, as thronged highways of modern commerce ; at the beauty of the Rhine ; at the stretches of the Amazon or St. Lawrence ; and at the Ganges, held in veneration as a sacred stream by millions ; but the Nile has characteristics which are unique and which surpass them all. Through that immense region of desert which stretches from the Atlantic Ocean across Africa and far into Asia, the Nile is the only river powerful enough to force its way northwards from the equator to the sea. Starting from the mountains which skirt the great central basin of Africa, the Nile traverses in all a distance of four thousand miles. From the confluence of the Blue and White Nile at Khartoum to the embouchure of the river into the Mediterranean, it extends over fifteen degrees of latitude, and, taking into account its numerous bends, runs in that course about 1800 miles. A short distance below Khartoum it receives one tributary, but after that, for more than a thousand miles, it is fed by neither stream nor brooklet, as there is nothing on either hand but an arid desert. As Leigh Hunt pictures it in his beautiful sonnet :

"It flows through old hushed Egypt and its sands,
Like some grave mighty thought threading a dream.
And times and things, as in that vision, seem
Keeping along it their eternal stands, —
Caves, pillars, pyramids, the shepherd bands
That roamed through the young world, the glory extreme
Of high Sesostris, and that southern beam,
The laughing queen that caught the world's great hands.
Then comes a mightier silence stern and strong,
As of a world left empty of its throng,
And the void weighs on us ; and then we wake,
And hear the fruitful stream lapsing along
Twixt villages, and think how we shall take
Our own calm journey on for human sake."

From Khartoum to the sea the Nile falls more than twelve hundred feet, and as the geological strata dip from south to north the higher up the river the older are the rocks. A thousand miles up stream, the cataracts rush through Nubian granite and syenite, while at the lower part of the river, from Cairo to Edfu, the rocks are of nummulitic limestone, so called from the myriads of coin-like shells they contain. The pyramids were built of that limestone. Further up the river than the limestone, but before the granite region is reached, is the Nubian sandstone, which extends into the desert for

thousands of miles. It was from that sandstone the Temples of Upper Egypt were built. Through these rocks the Nile flows at an average rate of three miles an hour. The valley through which it runs varies in width from four to thirty-two miles. Rawlinson estimates the average width of the Nile to be a mile; of the Nile Valley to be seven miles; and the cultivated breadth of the Valley, in consequence of its being flanked with sand from the desert, he thinks does not exceed an average of five miles. In places, the banks are 1,000 feet high, and resemble huge canal embankments.

From the Cataracts to the point just north of Cairo, where its bifurcation begins, the Nile from its earliest history has undergone but little change. Below that point there has been great change. Seven channels are mentioned by ancient writers; and although there are still numerous small streams, there are but two navigable channels, which empty into the sea at Rosetta and Damietta. The old courses have long been dry. From Cairo to the Mediterranean the low flat land through which these channels flow, from its similarity in outline to the fourth letter of the Greek alphabet, is called the Delta of the Nile. Its base is not a straight line, as the shore bulges out into the sea. The extreme points, east and west of the Delta, are about three hundred miles apart, and from the southern apex of the Delta to the sea is about one hundred miles. The point where the river forks is said to have formerly been six miles higher up the stream. The course of the mouths of the great river is continually changing. A fourth part of the Delta is covered with shallow lakes, and the water encroaches towards the west.

The almost unexampled fruitfulness of the Nile Valley is due to the Egyptian climate and to the fertilizing mud left on the fields after the yearly inundations of the river. The tropical rains of Central Africa fall from the middle of May till the middle of September. The Nile, swollen by these rains, continues to rise from June till September, when it remains stationary about a fortnight. In early October, fed by melted snow from the mountains, it rises again for a few days and reaches its highest level, after which it subsides, at first steadily, and then more rapidly, till in January, February and March the fields dry up, and at the beginning of June the river is at its lowest level. At Cairo the average rise of the Nile is 23 or 24 feet, some years it rises 26 feet, and occasionally but 22 feet. In Upper Egypt where the river is narrower the water rises

to a greater height. At Thebes it reaches 36 feet, and at Syene 40 feet. In the Delta, near the sea, the average rise of the water is only about 4 feet. The night of the 17th of June is called "the night of the drop," as according to an old Egyptian myth, a tear of Isis falls into the Nile on that night and causes the river to rise. Astrologers profess to calculate with precision the hour of the fall of the sacred tear. At Cairo, on that night, a multitude throng the bank of the Nile, and numerous old and curious practices are indulged in. From inscriptions found on ancient Nile columns, similar festivals, it appears, were celebrated as early as the 14th century before Christ.

Besides the fertile lands along the river there are five Oases in the desert beyond the Nile Valley that are fruitful. Brugsch says these spots derive their name from the old Egyptian word Wäh, "an inhabited station." Some of these are small, and most of them are thought to owe their fertility to subterranean communication with the Nile. The Fayum is the largest Oasis. It, however, has surface connection with the Nile. It is an oval district comprising 840 square miles, is very fertile, and was the seat of the great temple called the Labyrinth, which Strabo describes, and which Herodotus calls one of the wonders of the world.

The ancient people of this wonderful valley of the Delta, and of the Oases, are said to have numbered eight millions; a greater population than they boast to-day, if the large foreign element in Egypt be included. Modern historians, anthropologists and philologists have worked hard to trace back the history of man beyond the old landmarks, and in some directions their efforts have been crowned with success. Latin authors tell us something concerning the early condition of Britain, France and Germany; and the literature showing what contributed to the making of these countries daily increases. Schrader, and a score of others, following with untiring patience the clew of language, have plodded their way back to the prehistoric past, and give an interesting picture of early Aryan civilization. We know but little of the aboriginal tribes of this Western world; but Champlain, Charlevoix and the English Voyagers, will set at rest the future enquirer who attempts to follow the wave of civilization, which, in the last two centuries, has resistlessly overspread this continent. But hitherto, attempts to discover the origin and descent of the ancient Egyptians have been futile. The sphinx still refuses to

give up her secret. Ethnologists and philologists do not agree as to the affinities in race and speech of the ancient Egyptians. The linguists maintain that no African race oppressed by tropical heat, has ever developed a civilization like that of Egypt; and that the structure of the Egyptian language is Asiatic, and close akin to the Semitic languages. One philologist points out its analogies to the Aryan tongues. The word *Chami*, 'black,' used by the Egyptians to designate their country in contradistinction to the white sands of the desert, resembles, it is said, the old Indian *syâma*, having the same meaning; and *gupta* or *kopte*, the chief element in the word Egypt, is akin to *gupta*, used as a suffix to *vaisya*, the designation of the Indian agricultural caste. Ethnologists perhaps incline to the views of the Egyptians themselves, who believed they were the offspring of the Gods, and indigenous to the soil. However that may be, it is certain that in the XVIII dynasty Thothmes the third sculptured types of races tributary to his arms; and defined several types of the Asiatic and African races as sharply as they could be portrayed to-day. When the structural affinities of the Egyptian language are thoroughly compared with those of other tongues, clearer light will be thrown on the subject; for if language be not an infallible racial test, it generally decides a nation's ancestry, as fairly as the Ephraimite was detected by his sibboleth, and as Peter the Galilean was betrayed by his speech.

It is remarkable that Egypt bursts on our view at once as a highly civilized country. Like the fabled goddess who sprang perfect from the brain of Jupiter at her birth, Egyptian civilization first manifests itself at almost its highest pitch of perfection. The reign of Menes, the founder of the 1st dynasty, is placed at about 4000 years before the Christian Era, and only a few hundred years before the building of the great pyramid. But behind him there must be a background of ages of unrecorded growth to bring Egypt to that stage of national life. For our oldest history of Egypt, apart from the monuments and papyri, we are indebted to Alexandria Ptolemy Philadelphus, the second of the Græco-Egyptian Kings, who was a liberal patron of art and literature. He gathered at his court the most famous men of his time. Amongst them was at least one—Euclid the Geometrician—who is better known in the world to-day than he was then. Ptolemy filled the famous Alexandrine Library with the treasures of antiquity, and caused to be

translated into Greek the Septuagint version of the Jewish Scriptures, and a work on the religion and chronicles of Egypt. For that work he secured the services of an Egyptian priest named Manetho, the beloved of Thoth. It was this Chronicle of the Egyptian Kings which the priests of Memphis had permitted Herodotus to see. His works have been lost, one poem perhaps excepted, and the list of the kings as imperfectly transmitted by Josephus, Eusebius, and Julius Africanus. No country has such ancient records as those of Egypt. The monuments were built to defy time, and the papyri and embalmed dead, by the dry climate and desert sands, are hermetically sealed against decay. As Prof. Whitney says: "The oldest writings by man are held by dead hands in the valley of the Nile." But with these advantages there remains a wide gulf between Egyptologists regarding Egyptian chronology. From 1842 till his death in 1884, Lepsius devoted himself to the study of Egyptology, and made a methodical comparison of the lists of Manetho with the ancient monuments and papyri, especially with a papyrus at Turin, which is in fragments from age, and is held in high repute. The chronology adopted by Lepsius has not escaped criticism, although with minor modifications it has been widely adopted. He places the age of Menes, of the First Dynasty, at 3892 B. C., and the end of the XXX Dynasty, the closing reign of the Persian kings, at 345 B. C. The Greek, Roman, Byzantine and Mohammedan periods of Egyptian rule which followed are not in dispute.

Difference of opinion regarding Egyptian chronology has mainly arisen in this way. Some scholars regard the kings given in the list of Manetho as reigning in succession, and take the sum of their collective reigns to be the true time elapsed from the first to the last on the list. Others contend that several of the kings mentioned reigned in different parts of Egypt at the same time, and must be reckoned as contemporaries to rightly compute the time covered by all the dynasties. It is not strange that knowledge concerning Egypt is incomplete, as it was only to the last generation of scholars that Egyptian records ceased to be sealed books. The burning of the Alexandrine libraries and the extinction of the priesthood destroyed the old learning. The written speech of the Egyptians was changed and carried on in Greek characters, with half-a-dozen of the old letters for sounds the Greek alphabet could not express, and, known

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as the Coptic, that language survived as a living language amongst a small school of priests until last century.

Egyptian writing is of three kinds, called Hieroglyphic, Hieratic and Demotic. The Hieroglyphics were cut in stone, or, for sacred purposes, depicted in outline on vestments and papyri. They were called by the Greeks *grammata hieroglyphica*—letters sacred sculptured. The two other forms of writing are cursive and quicker methods of conventionally representing the older characters. The Demotic, the younger of the two systems, does not appear in use till the ninth century B. C. From cursory inspection, the monuments and writings were found to shew a variety of Hieroglyphic characters, and closer scrutiny proves that they are even more than was suspected. A Leipzig publishing firm keep in stock for Egyptian printing a font of 1479 different Hieroglyphic signs. They include representations of divinities, men, women, birds, beasts, fishes, insects, and forms of the chief objects before the eyes in Egyptian life.

With such a bewildering variety of signs, it is little wonder that Egyptian writing for centuries was thought to be a form of picture-writing only; and that its characters were supposed to be ideographic and not phonetic. Prof. Mahaffy, in one of his essays, shews, with his usual ability and force of illustration, how transition from the lower form of picture-writing may advance to the suggestion of abstract ideas, by depicted objects of sense; and may further become a conventional alphabet to symbolize sounds, and set in train those faculties of our intellectual and emotional nature, which a clever writer by his pen has the power to excite. It was after a time learned that figurative, ideographic and phonetic signs are all found in hieroglyphic writing. How this discovery was made is an interesting story.

In 1799 a French officer of artillery, when digging a trench in Fort St. Julien, at Rosetta, found a block of black basaltic granite, on which was a trilingual inscription. He was not heedless of his treasure trove, for his General had brought with the army the best artists and *savants* of France, expressly to describe the antiquities of Egypt. Their description filled twenty-two immense folio volumes sold at \$1,000. It was the grandest work of its day, and, though in part superseded, remains one of the great books of the world. Nelson rudely awoke Napoleon from his dream of Eastern empire, and after

the army on whom "forty centuries looked down" had retreated, the Rosetta stone was sent in 1802 by Hamilton to England, where it remains in the British Museum. On the face of the stone is inscribed in Greek, in Demotic, and in Hieroglyphic characters, the decree of the priests of Memphis after their coronation of Ptolemy the Illustrious, with the double crown of Upper and Lower Egypt at Memphis, in the temple of Ptah, 200 years B. C. Porson and Heyne made out the Greek text of the inscription, and in 1802 DeSacy, the French Orientalist, and Ackerblade, a Swede, who understood Coptic, analyzed some of the names in the Demotic text. Young, the physicist, best known by his theories concerning light, published in the Transactions of the Antiquarian Society, in 1815, a supposed translation of the Hieroglyphic text. He and Champollion worked simultaneously, though by different methods, but the brilliant Frenchman carried his system beyond the point at which Young rested. Young, however, independently discovered that the cartouches or lines surrounding some of the signs, contained the proper names of Kings. The truth of that had been suspected by Zoega, a Dane. Young's greater discovery was that the figures within those lines represented, not ideas, but sounds. That was the hinge on which the secret turned. Champollion hoped this might some day be found true, yet was not sure but such hope might turn out to be an illusion. In 1814, only a year before, he wrote:—"My studies day by day strengthen the flattering, though perhaps illusive hope, that from those tablets on which Egypt represented only material objects, will yet be recovered the sounds of the language and the expression of Egyptian thought." Champollion was on the threshold of discovery, but Young was the first to cross into the vestibule of the temple. The credit given to him by Sharpe, the Egyptologist, can hardly be gainsayed:—"It is to this stone, with its three kinds of letters, and to the skill and industry of Dr. Young, that we now owe our knowledge of hieroglyphics. The Greeks and Romans, who might have learned how to read this kind of writing if they had wished, seem never to have taken the trouble and it was left for an Englishman to unravel the hidden meaning after it had been forgotten for thirteen centuries." It was not till December, 17th, 1822, that Champollion read to the Academy his celebrated paper, published under the title of "A letter to M. Dacier." He was an excellent Coptic scholar, and in his later years

was so familiar with the demotic characters that notes for his own use were often written with that alphabet. It is said that some of these notes fell into the hands of a French Academician, who published them as an original Egyptian text of the Antonine period. In his paper at the Academy, he gave readings of many names, and of some other words, and shewed the hieroglyphic alphabet to be phonetic, and in some cases syllabic. On the same night of his reading at the Academy, the discoveries announced in his paper were communicated to Louis XVIII, who, as a mark of esteem, sent Champollion a snuff-box on which was the royal monogram set in diamonds. That was a princely gift; though one he more highly prized came in the words of Chateaubriand: "His discoveries will have the durability of the immortal monuments he has made known to us."

All the signs used in Hieroglyphic writing are pictures good or bad of actual objects. A sign may stand alone as a picture to represent the object meant, or it may be placed at the end of a word, which is the phonetic name of an object. Signs are also used figuratively. A circle means the sun; and figuratively it means a day; a vase tilted so that liquid is pouring from it signifies a priest; the ostrich feather means justice, and the leg of a man in a trap means deceit. Another use for signs is as "determinatives." That use is common mostly after proper names. Thus the names of birds are followed by the picture of a bird; of fur bearing animals by a figure shewing a bit of the pelt of an animal and its tail. But in all inscriptions, most of the signs are phonetic, and the sign for each sound is some familiar object. Thus *moulag* is the Egyptian word for owl, and an owl is the sign for the *m* sound, the first sound in the name of that bird. Some signs represent syllables, as the *crux ansata*, the handled cross, in *ankh*, life. Rawlinson says there are at least a hundred signs of this kind. Numbers from one to nine are written with a short vertical stroke for each digit, those from four to nine being written in two rows, one over the other. Occasionally Hieroglyphic writing is found in vertical columns, but it is generally in horizontal lines, to be read from left to right if the signs face to the left, and from right to left if they face to the right; addition of a pointed ellipse, an open mouth means the sign is used phonetically.

The grammatical structure of the language has been partly

unravell'd. The article is declined, and substantives and adjectives form their plural by adding an additional letter. Pronouns are used independently, or as suffixes to the verb. The first person of the verb is distinguished by a sign representing the figure of a man speaking. Heine said it was fortunate that the Romans learned Latin in their cradles, for had they learned that language as he did, they could never have found time to conquer the world. Taking into account the number of signs with which this language is written, and that they may be used in a representative, symbolic, determinative, or phonetic sense, and that sounds of the phonetic alphabet have more than one sign, may we not paraphrase Heine's words, and say, had the Egyptians not learned their language in their cradles, they could never have found time to build the pyramids and make their valley the garden of the earth.

The efforts of Young, Champollion and their coadjutors have been followed by success. Starting as they did, and within the lifetime of living men, to examine a dozen signs, which they conjectured might be phonetic symbols of an ancient alphabet, these earnest men were pathfinders who broke the way to a knowledge of the language of one of the oldest and most important of ancient nations. How long Hieroglyphic writing was in use none can say. One of the Oxford museums has a monument, thought to date from the second dynasty. That may admit of doubt, but monuments of the fourth dynasty incontestably shew that this form of writing has existed, at least, for 3000 years before the Christian era. The literature to which that language is the key remains in great part on the walls of Egyptian Temples, Pyramids and Tombs, and on the cerements and papyri buried with the dead. The large number of Egyptian books stored in the museums and libraries of Alexandria, when the Ptolemies made that city the most renowned seat of learning in the ancient world, in successive tumults, were destroyed by Roman, Mohammedan, and, I fear it must be added, by Christian hands.

During the last half century men of ability and learning have devoted their lives to the study of Egyptian history. They have worked assiduously, and have garnered their treasures where they will be safely kept and can be freely studied. Even the Nile mud has had to yield up monuments and cities buried so many ages that their names were forgotten. Some of the shadowy, half mythical,

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personages of the older historians, their later brethren by the force of their genius and persistency of their industry, have made as real to us as Julius Caesar or William the Conqueror. We can follow their actions, call up a mental picture of the world they lived in and pass our judgment on their motives. Their most sacred haunts, the interiors of their temples and mausoleums, shrouded for ages in silence and darkness, have re-echoed to the footstep of the intrusive unhallowed stranger, and have revealed their beauty to the flash of the magnesium wire and the lightning rapidity of modern photography. But it is hard to make the events of a score of centuries march before the mental vision in consecutive course, and harder to describe the development through long ages of the inner and spiritual life of a gifted people. The night of Egyptian darkness was long, and the darkness was a thick darkness, to be felt. The dawn has indeed broken, and we have glimpses of a civilization whose very magnificence almost staggers our belief. But the most skilful historian can give only a faint sketch, with many a broken line, of these long ages, and we can never hope to enjoy as complete a picture of Egypt as Gibbon gives us of declining Imperial Rome.

One striking trait in the character of the Egyptians was their care of their dead. To understand whence that care arose, we must know their views of the constitution of man. Dr. Maspero, an authority on these questions, says the Egyptians regarded every human being as consisting of the body; the *Ka*, or double of the body; the Soul, *Bi*, represented as a hawk with a human head; and the *Khoo*, the "Luminous," a spark from the fire divine. The Dr. further says that the Egyptians also believed, that if left to themselves after death any or all of these component parts of a human being might pass into dissolution, when the man would die a second time, be annihilated. Their piety to their ancestors averted that. Embalming preserved the body, and prayers and offerings saved the other constituent elements of the human being from second death.

In Egypt embalming of the dead was a profession, and the fraternity were so jealous of their rights that the services of the proper functionary of the district had to be secured in each case of death. During the long periods of Egyptian history, new drugs and processes were discovered, but the end aimed at—the preservation of the body from decay—remained the same. The late Dr.

Birch, of the British Museum, says the early embalmers in their practice depended on salt, wax and wine. In the middle empire naphtha and bitumen were used, and later, as the art declined, cheaper substances were relied on. The time of embalming occupied about 70 days, which were spent by the family as days of fasting and mourning. After the antiseptic preparations were finished, a plate on which was engraved the mystical eye was placed on the body; amulets were strung upon the neck; and, as the heart was the seat of life, the sacred scarabæus, with special signs and ceremonies, was placed over the heart. The body was then enwrapped in six or seven hundred yards of linen, on the outer bandage of which a scribe wrote the name of the deceased, sometimes adding his age at death, and the year of the King's reign when death happened, and the mummy was then ready to be encased. The cost of embalming, according to Herodotus, was from \$100 to \$1,200.

Not the least singular of the charms for adornment of the dead was the sacred beetle, the scarabæus, placed over the region of the heart. In Egyptian its name was *kheper*, a word supposed to be derived from *khepra*, "to become," and it was made the emblem of earthly life and of the changes of man in the life to come. The original of these singular adornments, the common black beetle of Egypt, lays its eggs on the brink of the Nile, surrounds them with dirt, rolls the ball up the steep river bank beyond reach of the inundation, to the edge of the desert, and, leaving them to mature in the heat of the sun to perpetuate its race, dies in peace at its appointed time. This industrious little creature the Egyptian priests choose as their emblem of creative power and of immortality. It was made a hieroglyphic sign, meaning "to be" and "to transform." Miss Edwards says:—"His portrait was multiplied a millionfold, sculptured over the portals of temples, engraved on gems, moulded in pottery, painted on sarcophagi and the walls of tombs, worn by the living, buried with the dead."

The scarab is the symbol of duration, and to wear one was a preservative from death. Around this primary idea a thousand conceits clustered, and as charms they were used without limit. Scarabs or conventional representations of them, scaraboids, were cut out of schists and many other materials, and of all sizes. They were glazed and colored in a variety of ways, according to the fashion,

of the times. Their study has become a fascinating and instructive branch of Egyptian Archæology. Mr. Petrie, in a volume published a few months ago, gave exquisite drawings of more than 2,300 specimens. He has given only such as bear the names of Kings and private persons; but the best specimens of the great Egyptian Museums are in his book. All the dynasties, and most of the Monarchs of the dynasties, are represented and classified in chronological order. It behooves us not to be altogether heedless of scarabs, for has not Miss Edwards, with great mock gravity, in an appreciative review of Mr. Petrie's book given warning that "Civilized mankind is divided into those who care for scarabs and those who do not. "The former are a select minority; the latter are dwellers in outer "darkness, and so ignorant that they are even ignorant of their "ignorance."

The same solicitude devoted to the preservation of the dead body was given to its place of sepulture. To the Egyptians the homes of the dead were more important than the homes of the living. A dwelling house for the living was but a resting place which was unimportant, and its structure might be inexpensive and mean. The place of sepulture for the dead was an eternal abode, of superlative importance, and, like the temples of the gods, could not be made too costly or too elegant. Crushed by the tooth of time, and showered over by the sands of the desert, Memphis, the glory of ancient Egypt and seat of her early Kings, so utterly perished that its very place of existence was in dispute, till the shovel of the modern explorer revealed its site beyond doubt. But the tombs of its adjacent necropolis exist in hundreds, and amongst them stands the great pyramid, a marvel of what Egyptian art produced 5,000 years ago, and which in our days of colossal structures, Ferguson, the historian of architecture, says, remains the first building in the world. According to the best Egyptologists, an Egyptian tomb, besides being a resting place for the body, had to include rooms for the soul, which were closed on the day of burial, and which it was sacrilege to afterwards enter; a reception room of the Double, where friends of the deceased and the priest brought their offerings; and a passage connecting the two. The reception room accessible by friends was sometimes above ground. Much variety in tombs, according to the place of burial and station of the deceased, was permissible, but the general features of construction carried out

were the same in all, and every Egyptian, according to the national beliefs, was theoretically entitled to such an eternal dwelling. But theory and practice, like faith and works, often differ, and the typical Egyptian tomb was virtually for only the wealthier dead. Maspero gives a pathetic picture of the lot of the poor. The funeral rites once over they were disposed of in ransacked tombs, or huddled *en masse* in shallow pits in the sand, and covered only with their bandages or a few palm branches. A pair of sandals of painted card-board or plaited reeds, a staff and a simple ring, the toy image of some favorite god, a mystic eye or scarab, and a cord twisted round one of the limbs to protect from necromancy—such were the funerary trappings of the pauper dead.

The greatest of the Egyptian tombs, the pyramids, have called into existence a literature of their own. More than thirty volumes aim to shew the purpose for which these massive structures were built; and in addition to books, there are magazine articles and pamphlets without number, written to accomplish the same end. The conjectures of these writers are numerous and some of them fanciful. It is contended that the pyramid of Cheops, *Khufu*, the great pyramid, 454 ft. high and 750 ft. wide, divinely reveals a system of weights and measures for the human race, and for all time. Another thinks that they were granaries to provide against famine, and another that they were astronomical observatories. The best Egyptologists, however, stand aloof from such theories. They agree that the 66 pyramids found in Egypt were tombs and were built for no other purpose. The nature of Kings, their souls, bodies, and whole constituent parts, were not supposed to differ from those of other men, and their royal tombs, the pyramids, like other tombs, contain a chapel, passage, and sacred vault. They differ greatly in size, as the smallest is only 30 ft. high, and it is difficult to conceive why the Pharaohs, during the thirteen centuries in which these tombs were built, should have chosen sepulchres of such different proportions.

In constructing their tombs, when space permitted, the chapel was built over the vault, and a shaft connecting the two was sunk, sometimes in front of the tomb door, and sometimes into a corner of one of its chambers. In instances the chapel was built apart from the tomb, and occasionally at a considerable distance from it. It was into the chapel that on feast days relatives, friends and priests

brought offerings, and placed a repast on the offering table, of which, after the living had departed, the double was supposed to partake. But those recently dead were found to engross most of the attention of the living, and when action was taken, similar to that our forefathers used to take in our own Christian times by establishing foundations to have such ceremonies performed by the priesthood, it only put off a little further the day of forgetfulness and consequent annoyance to the dead, whose double might, it was thought, through such neglect, be reduced to seek food from the garbage of the town. To obviate such a calamity recourse was had to painted and sculptured representations of offerings in lieu of the offerings themselves. At first decorations were confined to the chapel of the tomb, but afterwards on the vaults pictures were painted and passages were inscribed from the Book of the Dead and from other works, intended to strengthen the soul during its probation in the other world. This practice goes back to the time of the early dynasties. The inner walls of some of the pyramids are covered with inscriptions. At a later date such texts were written upon sarcophagi, and on some of the early tombs whole chapters from the Book of the Dead are inscribed. Later on still, in the fifteenth and sixteenth centuries B. C., these books of the dead were written on papyri attached to the person of the mummy, placed between the folds of the bandages, or laid near the coffin.

A fair general view of ancient Egyptian literature may be obtained from the "Records of the Past," a series of volumes published in London and edited by Birch, Renouf, Sayce and other scholars of reputation. The Book of the Dead is, however, the most interesting volume of Egyptian literature as yet discovered. As early as 1805 M. Cadet published "A figured copy of a roll of paper found at Thebes in the tomb of a King," and made some curious speculations concerning its contents. Other copies followed, the chief of which was "*Das Tottenbuch der Aegypter nach dem hieroglyphischen papyrus in Turin, 1842.*" The edition by Lepsius contained 165 chapters, and he was likely the first modern editor who understood the text. Every museum of note in Europe has now a copy of the Book of the Dead, and numerous *fac similes* have been published. But no single papyrus hitherto found contains all the chapters of the book, and the Congress of Orientalists, held at London in 1874, commissioned M. Naville, a distinguished scholar, to prepare a com-

plete text of the whole book. M. Naville confined his attention to MSS. of the time of the XVIII-XX dynasties, and published according to the canons of modern criticism, a text from papyri of that period. After carefully studying 26 papyri of the British Museum, 17 in Paris, 5 in Leyden, 5 in Berlin, and many kept in other museums, as well as the inscriptions at Thebes, his work was published in 1886. It contains 186 chapters, and costs about £12.0.0.

A few months ago the trustees of the British Musuem published in *fac simile* a papyrus of the Book of the Dead. I have pleasure to submit it for the inspection of the Hamilton Association. It was executed for an Egyptian named Ani, a scribe, and director of the granaries of the Lords of Abydos. Like other copies, it does not contain all the chapters, but is illustrated in a finer manner than most other copies are, and the 175th chapter, it is said, has not before been issued in so complete a form. Mr. le Page Renouf has written an able introduction, and gives a full translation of many of the more interesting passages. For reasons assigned at length by Mr. Renouf, the date of the papyrus is referred to about the end of the fourteenth century before Christ. No copy of the Book of the Dead is found on any papyrus before the XVIII. dynasty, although, as has been stated, sculptured passages are found at much earlier date. In the vignettes Ani is accompanied by his wife Tutu. She is called a *kemait*, a musician, or one who belongs to some chapter of a Temple. In her right hand she carries the sistrum, or Egyptian lute, and in her left hand she holds flowers with a symbol to propitiate the Gods.

The aim of the Book of the Dead was to give might to the departed and to aid him in the life after death, but it is hard to trace whatever unity there may be between the chapters, and some of them might be detached from the rest with as little detriment as a hymn can be taken from the Vaidic books, or as one of the Psalms can be read alone without impairment of its beauty. That it records the belief of the Egyptians concerning the common lot after death, reflecting a faith that with little change obtained for centuries, there can be no doubt. The first scene shews Ani and his wife before a table of offerings, and after an invocation to the sun comes the great scene of the psychostasia, or weighing of the heart. There is nothing in the papyrus grander and more impressive than this scene. The heart is weighed against an ostrich feather, which symbolizes law, by

the jackal headed Anubis. Thoth records on his tablet, the result of the trial; and the soul of the deceased, destiny, fortune and the cradle, are on one side of the balance as witnesses. To the right is Amemit, the devourer. He has the head of a crocodile, the body of a lion, and the hind quarters of a hippopotamus. After the trial Thoth declares: "The heart of the deceased is weighed and his soul standeth in evidence for it. His case is straight upon the "great balance." Then the gods proclaim: "Unalterably established is that which proceeds from thy mouth. Righteous and just is he, and without rebuke before us." Other scenes shew Ani before Osiris; and the artist gives a running picture of an Egyptian funeral, with the attending Priests and mourners, till with last adieus the mummy is handed over to Anubis, the god of the tomb.

The deceased then goes forth into the first stages of life in the other world. The Greeks are said to have been taught the doctrine of transmigration by the Egyptians, who believed that when freed from sin by successive transmigrations, a course that might run on for ages, the soul would have the option of returning to its former body, or of being absorbed into the infinite: hence their care to preserve the body. In this papyrus there is depicted the strange conceit of the soul fluttering over a mummy case on its return to the body. It is said of Ani that he may transform himself "into all the forms he pleases;" and many of the chapters refer to such transmigrations and many mystical teachings only imperfectly understood. In the thirty-first scene a second weighing of the heart is described. Whether that is intended to represent a second trial after a stage of further probation in the other world, I cannot say. Plates 31 and 32, in which the second weighing scene is depicted, are remarkable for what is called the Negative Confession. As it is a most interesting exposition of the ethics of ancient Egypt I transcribe it in full. Pleading before his judges, the deceased says:—"I am not a doer of what is wrong, I am not a plunderer, I am not a robber, I am not a slayer of men, I do not stint the quantity of corn, I am not a niggard, I do not seize the property of the gods, I am not a teller of lies, I am not a monopolizer of food, I am no extortioner, I am not unchaste, I am not the cause of others' tears, I am not a dissembler, I am not a doer of violence, I am not of domineering character, I do not pillage cultivated land, I am not an eavesdropper, I am not a chatterer, I do not dismiss a case through self-interest, I am not

"obscene, I am not an exciter of alarms, I am not hot in speech,
 "I do not turn a deaf ear to the words of righteousness, I am not,
 "foul-mouthed, I am not a striker, I am not a quarreler, I do not
 "revoke my purpose, I do not multiply clamour in reply to words,
 "I am not evil-minded or a doer of evil, I am not a reviler of the
 "King, I put no obstructions upon the water, I am not a bawler,
 "I am not a reviler of the god, I am not fraudulent, I am not
 "sparing in offerings to the gods, I do not deprive the dead of the
 "funeral cakes, I do not take away the cakes of the child or pro-
 "fane the god of my locality, I do not kill sacred animals."

Amongst trials which our traveller in the other world under-
 goes, he has to pass through a veritable valley of the shadow of
 death, "for it is all abyss, utter darkness, sheer perplexity." He is
 also tried by fire, which the artist represents pictorially, but has
 compensation by a sojourn in the Egyptian Elysian fields, where he
 ploughs and sows and reaps, and through which runs a canal, "the
 limit of which cannot be stated," and in which are fish and no
 serpents. The papyrus ends with a picture of Hathor, a personifica-
 tion of the sky, in the form of a hippopotamus. On her head she
 holds the solar disk, and in her left hand she holds the symbol of life.

The time has not yet come for a satisfactory expo-
 sition of the Egyptian religion; but as some of the
 acutest intellects in Europe are engaged in its study,
 we may hope that light will yet shine into the dark
 places. Their more important gods received homage in different
 localities under different names. Each canton, or *nome*, had its own
 college of priests and tutelary divinities, so that we come to regard
 their religious system, at first sight, as a heterogeneous polytheistic
 mass. They personified sun, moon and stars, the earth and sky,
 light and darkness, and, according to Renouf, recognized a divinity
 wherever they discerned a fixed law either of permanence or change.
 But behind and above these adored personifications of natural
 objects and forces there was the recognition of one great power.
 That admits of no doubt. It is true some incline to believe the
esoteric doctrine of the Egyptian priests was materialistic; that they
 held matter to be endowed with intelligent, inherent creative force,
 and to be eternal. On the other hand many passages from their
 writings are monotheistic. Referring to the powers higher than the
 popular divinities, a power to whom no temple was raised, one of

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their papyri reads: "He was never graven in stone; his shrine was never formed with painted figures; he has neither ministrants nor offerings." And if it be asked what was their name for the great uncreated Creator of all things, Brugsch replies it was inscribed on a scroll which the initiated took to the grave, and which reads "NUK PU NUK," "*I am that I am.*"



CONNECTING LINKS.

Read before the Hamilton Association, February 12th, 1891.

BY H. B. SMALL.

The term "Connecting Links," might perhaps, with more propriety, be expressed under the wider term development, or the state of progression from one phase or class to another.

As an example of this, take the infant and the man. There is little in common between these two stages, save form and existence. But trace the various intermediate stages to see the links of development. The first movements of an infant are automatic and directed solely to the supply of its physical wants. New sensations are constantly excited by surrounding objects, which call into exercise all the dormant powers of mind; notions are acquired of the character and position of external objects. An attachment to persons and places begins to manifest itself. As the child advances in age the power of observation is strengthened, the perceptions become more distinct, the powers of reflection are called out which prompt him to reason upon the causes of what he observes, and his growing intelligence enables him to direct his actions to the attainment of objects he desires.

Then comes a development of moral feeling, and the *intuitive perceptions* of the lower stage of infancy become, through the connecting links recorded, the *acquired perceptions* of the man.

"Man," says Humboldt, "ever connects on from what lies at hand." Progress, degradation, survival, revival and modification, are all modes of the connection that binds together the complex network of civilization. A glance into the trivial details of daily life shows how we are but transmitters and modifiers of the result of long past ages. In the history of firearms, the clumsy wheel-lock, in which a notched steel wheel was turned by a handle against the flint till a spark caught the priming, led to the invention of the flint lock; that in time passed by an obvious modification into the percussion lock, the gun itself now changing again from muzzle-loading to breech-

loading. The mediæval astrolabe passed into the quadrant, discarded in its turn by sailors for the sextant; and so on through the history of one art and instrument after another.

Books of costume, showing how one garment grew or shrank by gradual stages and passed into another, illustrate the nature of the change and growth, revival and decay, which go on from year to year in more important matters of life. It is only when we fail to see the line of connection that we form the idea of something having been originated.

There is nothing more evident than the fact that man is in every respect of the same nature as the world in which he dwells, that in fact he is a part of it—a part of the *universal whole*; and, descending from man—the highest known state of organized life down to the animate object of the lowest order—all creation is found to be composed of individual members, which collectively form the infinite whole. The line of demarcation here and there may be rugged; seeming chasms exist, to be bridged over by future revelations of science and investigation—but the conclusive result of all research shows everything to be so gradually and yet so intimately connected that it is in some cases a matter of difficulty to discriminate where one terminates and another begins. All nature may be said to be bound together by a series of connecting links, which conjointly form the chain of unity and point to the grand idea of harmony which pervaded creation at its birth.

Our subject might be extended to all the sciences; to the various branches of learning, including that highest branch of all, mathematics; to music and harmony, or the sweet blending of sounds; to geology; to chemistry; in fact, to everything whose collective parts form unity: but I must to-night limit it to two branches—links of mind, individual and ethnological, and links of matter.

Of the individual links of mind memory stands the foremost; the remembrance of the past, vividly brought before us by some connecting chain of thought, over the links of which the mind bounds at once, till one string so recalls another that the original train of thought is lost, and some past object so prominently recalled that it occupies the attention to the exclusion of all else. Who amongst us to-night, from some chance meeting, from the passage of some well-known author, from the sight of a trifling object, has not recalled scenes and phases of early life and days of childhood long since for-

gotten, and only evoked by some chord of memory being touched. The accidents of life, places, flowers and names, all act as mind links, mementos of the past. A recent writer on "mental physiology," styles memory the "organic registration of the effects of impressions." The character in which organic changes are written may be said to be indelible, and in a brain not disordered, the records of memory are stereotyped. To recall them to consciousness may be beyond our power; we may think they are lost to us forever, till something occurs to alter to an appreciable degree the minute nerve cells of the brain, and thus to tear off the veil which hid from us the thoughts and events of the past.

Dreams are another connecting link, recalling at times long forgotten scenes and faces, memories of bygone times which the storehouse of memory unearths without any apparent reason. If it were possible to trace a dream to its origin, some chance remark, some word or act, not noticed at the time, has touched a chord of memory which continues to vibrate in the nervous state after sleep has sealed the body in repose, till all at once it flashes on the mind, sometimes dimly, like objects in a fog, and forgotten directly, or else so lifelike that it seems to be the cause of the sleeper awaking.

There is another connecting mind link, undefinable, yet plainly manifesting itself, which, for want of a proper term, may be styled sympathetic attraction. I do not mean, by this, biology or mesmeric influence, which themselves seem connecting links, but the mutual reciprocation of mind existing between different individuals, whose unity of thought and intellect run side by side, and whose ideas seem to have been fashioned in the same mould.

Psychology, in itself, would form a subject for a lecture, and I have only introduced the above branches of it as a prelude to the ethnological division of mind links, on which we will dwell at greater length. Foremost amongst these stands Mythology.

There is a striking similarity in the early records or legends of all nations that plainly shows the connecting link that binds together all the races of the human family. Oral tradition, doubtless, had much to do with this. The classic legend of the Golden Age evidently had the same origin as the history of Paradise. The Fall of Man may be traced in the story of Pandora, the first woman, who is represented as having, through curiosity, opened a forbidden box in the house of her husband, Epimetheus. When she raised the lid,

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all the evils incidental to man flew out, and only by quickly shutting down the lid did she manage to retain and prevent the escape of Hope. The promise of recovery, through the destruction of the serpent, may be traced in various legends, classical and eastern, where the serpent or dragon is introduced. Hercules slaying the dragon in the garden of the Hesperides, and Apollo killing the python, may have derived their origin from this source. The Persian sacred books, the Zendavesta, contain so similar an account to our own, of the Fall of Man, that it is generally conceded that Zoroaster, the compiler of them, must have derived it from Moses. Connected doubtless with the Biblical legend of the Fall of Man, serpent worship took its rise, and it seems to have been one of the most universal as well as mysterious superstitions among the primeval religions of the world. The Phœnicians adored this reptile as the genius of beneficent knowledge, the Chinese use it to this hour as a symbol of wisdom, and paint their Kings of Heaven—the Tien Hoangs—with snake bodies. As the sign of the sun, of eternity, and of the art of healing, we encounter the serpent in Arabic, Chaldean and Roman lore. The woman at Endor is called in Scripture, "Ob," that is the serpent; and the name Endor itself, means "the oracle of Ador," who was identical with the Canaanite snake-god Addir. Evoc, again the classic cry of the Moenad priestesses, whose heads were wreathed with snakes, is thought to be derived from Ophis, the Greek word for the creature. At Colchis, at Thebes, at Delphi, we have stories of sacred serpents; the Greeks called Apollo himself "Python," and before the days of the Greeks, the Egyptians carved the asp upon their temples, embalmed it and ornamented the tiara of Isis with it. The priests also wore the reptiles upon their officiating hats; and indeed, Thermuthis, the snake-god of the Nile, amid the sacred figures of the hieroglyphics is everywhere great and revered. The Chaldeans built the snake city of Ophis or Oubis upon the river Tigris. The Æthiopians are thought to derive their name from "Ath-opes," *i. e.*, worshippers of the serpent. Eubœa means "snake island," and one of the earliest heresies of the Christian Church was that of the Ophites. In a word, look where we will, historical vestiges occur of this intense and venerating worship of what we regard as the most base and maligning thing in nature.

Among the Hindoos, the king of evil demons is called the King

of Serpents. Krishna, one of the incarnations of the Deity, attacked the serpent and destroyed it, and Hindoo sculpture represents him with his feet on the serpent's head. Dr. Deane says, in his treatise on serpent worship: "The progress of the sacred serpent from Paradise to Peru is one of the most remarkable phenomena in mythological history, and to be accounted for only on the supposition that a tradition of the serpent in Paradise has been handed down from generation to generation."

Serpent worship existed amongst the mysteries of the ancient Mexicans. There is in the Vatican, I believe, a remarkable painting originally brought from Mexico, representing a woman in conversation with a serpent erect, to which was attached the Mexican legend that the woman was the mother of mankind, and the serpent the genius of evil. The originality of the painting is further borne out by the existence of a colossal sculpture in that country of a serpent swallowing a woman, to which the same legend is attached.

Serpent worship can be distinctly traced throughout all Asia. Living serpents were kept at Babylon as objects of adoration, and to this the apocryphal story of "Bel and the Dragon" points. All through the east is found in the Temples a mystic representation of a circle with wings and a serpent passing through it. This circle, when filled in with a human face, became the "Medusa" of the Greeks. In Hindoostan to the present day, a custom prevails similar to that spoken of in "Bel and the Dragon," when at the "Festival of Serpents," "Kartik Purnima" night, every man sets by a portion of his rice and saucer of milk, which he offers to the snakes around his quarters as a propitiation to them.

Amongst the Scandinavians and Norsemen of old, their deity "Thor," is represented casting down to the bottom of the sea the great serpent Midgard.

Amongst the ancient Druids the serpent was not omitted, as is shown by the serpentine stone Temple of Abury still remaining, and the Saurian mound at Loch Nell, near Oban in Scotland, identical with similar remains discovered in Ohio and Wisconsin. In Ireland its worship was not without its votaries. Ogmios; the chief object of Celtic worship, was depicted with a huge club with serpents twined round it and surmounted with wings like the *caduceus* of Mercury. Dr. Christmas speaking of the serpent worship in Ireland, says: "There is perhaps more truth in the legend of St. Patrick

than is generally allowed. His banishing by prayer all snakes and venomous reptiles from Ireland, may imply that by disseminating the doctrines of Christianity, he overthrew the worship of the serpent and drove its priests from the island."

This form of worship, I believe, is now confined to the inaccessible tribes of Central Africa and an Abyssinian tribe called the Shangallas, and traces of it are said to be met with amongst the lowest class of Negroes in the Southern States, who hold Obi worship once a year in the densest part of the forest and the swamp.

The Hindoos have a tradition evidently connected with the creation of man and the subsequent death of Abel at the hands of Cain. Brahma becoming incarnate, produced the first man out of one half of his body, and the first woman out of the other half. From this pair were born three sons, two of whom quarrelling, one wished the other might be a wanderer on the face of the earth, whereupon, his brother incensed at this slew him with a club whilst performing a sacrifice.

A remarkable legend exists amongst the Iroquois Indians, that the first woman was seduced from her allegiance to God, and on this account banished from Heaven. Afterwards she bore two sons, one of whom, in consequence of a quarrel, took a club and slew the other. But from the same woman sprang many men and women, who were the progenitors of the whole human race.

The fable of Uranus, the first civilizer of men, and his eldest son, Hyperion, being slain by his brethren out of envy, is thought by mythologists to show a connection with the Scriptural account of Abel, whilst some again include under this connection the fable of the Corybantes, three brothers, one of whom was murdered by the other two. Doubtless each legend had its basis in the same origin and from one source.

Take again, as another connecting link of mythology, the deluge. Everywhere the tradition exists, amongst all the Nations of antiquity, amongst the Indians of our own land, the Mexicans, the South Sea Islanders, the Asiatics, and in fact everywhere, and each race has modified or diversified it according to its own ideas. Plato, in his *Timæus*, gives an Egyptian account of the deluge, on which occasion certain herdsmen and shepherds were saved on the tops of the mountains, but they who dwelt in the plains were swept into the sea by the rising of the waters. In the Hindoo

mythology, the incarnation of Vishnu into a fish, is supposed by Sir Wm. Jones, to bear reference to the deluge. The world having become corrupt and a flood sent to destroy man, the reigning Prince and his family were deemed worthy of preservation, and by command of Vishnu, entered an ark prepared for the occasion called Cahitra. Vishnu took on himself the form of a huge fish, to which the ark was moored by a vast serpent, which being again fastened to the horn of Vishnu, rode securely through the flood.

The Greek and Roman traditions of the deluge are known to every school-boy and do not require mention. The ancient Druidical tradition is handed down through their Bards, as follows: "The profligacy of mankind had provoked the great Supreme to send a pestilential wind upon the earth; a fierce poison descended, every blast was death. At this time the patriarch distinguished for his integrity was shut up, together with his select company, in the enclosure with a strong door. Presently a tempest of fire arose, it split the earth asunder to a great depth. The waves of the sea lifted themselves up around the borders of Britain. The rain poured down, the waters covered the earth and the flood which swept away from the surface of the earth the expiring remains of the patriarch's contemporaries, raised his vessel on high from the ground and bore it safe on the summit of the waves."

The Peruvians had the following account: They believed, by tradition, that it once rained so heavily as to deluge their country. A universal destruction of the human species took place, a few only excepted, who took refuge on the top of a mountain. When the rain ceased they sent out two dogs, which returned covered with mud. After a certain interval they sent out two more dogs, which coming back dry, they concluded the earth was again inhabitable, and leaving the mountains they became the progenitors of the present race of men. The Brazilians have a somewhat similar legend of a man and a woman escaping on a raft. In the Sandwich Islands, all the earth was said to have been covered with water, except one of their mountain peaks, on which one pair of mortals saved themselves from destruction, and from them sprang all the present races.

The Mexican tradition is that a mighty inundation swept from the earth all the generations of man. One man and a woman with their children embarked in a spacious bark, with a great store of provisions, a variety of animals and every sort of grain. In this vast

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receptacle they sailed over the deep. At length, when the deities ordered the waters to withdraw, the man sent out a vulture to ascertain the condition of things. This bird, however, feeding on dead flesh, did not return. The man then sent out another messenger, and after dismissing several, the humming-bird alone returned, bearing with it a branch covered with leaves. Perceiving by this that the waters had subsided, the inmates of the bark went forth on Mount Colhuaca. This story is told by Humboldt in his Researches.

In a speech at Birmingham quite recently, Professor Fawcett remarked: "Children who have been taught to read the Bible in an intelligent fashion frequently receive a tacit impression that Jewish history has no point of contact with profane history." But it is very easy to trace, on examination, the connection between many of the heathen gods of the ancients and prominent characters of the Old Testament. For instance, we find Vulcan corresponding with Tubal Cain, Nimrod with Orion, Noah with Deucalion, Moses and the Brazen Serpent with Aesculapius, represented with a stick entwined with snakes, Hercules with Samson, especially in the relation of the former to Omphale, and the latter to Delilah.

The building of the tower of Babel corresponds with the fable of the giants attempting to pile Ossa upon Pelion, and the subsequent confusion and scattering of tongues with the dispersion of the giants. There is a Grecian legend strangely resembling the visit of the two angels to Lot and the subsequent destruction of Sodom. Hermes and Zeus, having visited *incognito* a city on earth, were inhospitably repulsed by the rich and powerful, but were treated with great kindness by an aged couple named Baucis and Philemon, who had retained their virtue when all around were sunk in profligacy. Discovering the divine nature of their visitants from the undiminished quantity and improved quality of the wine in the pitcher out of which they drank, they were about to pay them homage, but were prevented from so doing by the vengeance the deities took on the depraved and inhospitable city. When the old couple, recovering somewhat from their amazement, looked for it, they saw only a stagnant lake, beneath the waters of which the city was plunged. Their cottage was left and changed into a Temple, of which they were appointed Priest and Priestess, and after a long life they were changed into trees overshadowing the structure. Here we see Zeus and Hermes representing the angels, Philemon and Baucis Lot and

his wife, and the change into the trees may be but another version of the change Lot's wife underwent.

A mythological connection has been traced by a French writer, M. Huot, in his *Demonstration Evangelique*, between Bacchus and Moses. Both, he says, were born in Egypt; both were cast into the river; both were educated in Arabia, or resided a considerable time there; both were exiled; Bacchus was ever accompanied by a dog, and the companion of Moses was Caleb, the Hebrew word for dog; therefore, says Dr. Huot, the identity is sufficiently proved.

Many other coinciding characters could be adduced if it were necessary to show the connecting links of mythology with Scriptural traditions.

It is interesting to trace in the various forms of religion, or modes of worship, the connecting link which pervades all, from the rudest form up to enlightened Christianity. The rites of sacrifice, purification and a future life pervade all. The Red Indian believes in his Happy Hunting-grounds; the South Sea Islander in his shadowy Island of Bolotu; for the Greeks of old were the Elysian Fields and Hades; and to the Christian of to-day, the heights of Heaven and the depths of Hell hold forth an expectation of a life to come. A child naturally wonders why the Israelites formed and worshipped a golden calf, when they thought Moses had forsaken them, but it was simply the remembrance of the god form they had seen worshipped in Egypt that suggested it to them. The rites attendant on the Obi worship of the Negroes of the present day, and those attendant on the worship of Astarte and Mylitta, and the later Eleusinian mysteries, are closely allied. Success would never attend a new religion about to be thrust upon the world, without adapting it to the forms of something preceding it, and thus we find each successive form of worship gradually adopting certain practices of the one it was intended to supplant, but showing by these the connecting link pervading all.

Sabaism, or the adoration of the sun, moon and stars, branching off into fire worship, is easily accounted for as a degraded form of that homage to visible Divinity, with which men worshipped the glorious god of day, and bowed down before the heavenly host. It was alluded to by Moses when he said: "Take heed to yourselves, for ye saw no manner of similitude on the day that the Lord spake unto you in Horeb, out of the midst of the fire * * * lest thou

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lift up thine eyes unto Heaven, and when thou seest the sun and the moon and the stars, even all the host of Heaven, then shouldst thou be driven to worship them."

Amongst the Medes and Persians of old, fire was worshipped as the element containing and diffusing light, and in special places a perpetual fire was kept up, with certain purifications and ceremonies. The material worship of light and fire was raised in the religion of Ormuzd, their divine being, to a spiritual character, the symbol of higher spiritual purity. For a long period worship was paid simply to the light and fire, as they appeared in nature; the imaginations of the Persians do not seem to have conceived the objects of their worship in definite forms, nor did they invent any mythological stories about them. Sacrifices were offered in the open air and on hills or high places, and Herodotus expressly states that the Persians, in his time, had neither statues nor temples. Idolatry was afterwards introduced but soon disappeared, and its place again supplied by the material worship of fire, and at this stage the religion of Ormuzd has continued to the present day, for the few surviving remnants of the ancient Iranians, called Parsees, still cling to the worship of their ancestors, notwithstanding the furious persecution of the Mohammedans. They are found in some of the eastern parts of Iran, especially in Surate, in Western India, and amongst the Afghans, but their religion has become a coarse mechanical and superstitious fire worship.

Used more or less by all the nations of antiquity, especially of Asia, it was likewise the religious form of worship amongst the Aztecs and Peruvians of this continent, and traces of it yet linger in some of the Indian festivals of the west. Amongst the Aztecs, at the end of every 52nd year, their cycle, a high religious festival in honor of the sun was held, on the eve of which every fire was extinguished, and after an interval of fasting, the ceremony of the new fire was celebrated, the Priests going at midnight to a neighboring mountain, where by means of friction the sacred flame was rekindled, which was to light up the national fires for another cycle. As the sacred flame again blazed on the high altar and was distributed to other shrines, shouts of triumph resounded and a festival lasting 13 days was held, attended with human sacrifices—a sort of jubilee for the recovered flame, type of a regenerated world. Dr. Wilson, in his description of this Aztec ceremony compares it to the Annual

Miracle of the Greek Church in the crypt of the Holy Sepulchre.

Amongst the Peruvians a feast was held at the Summer Solstice, for three days previous to which a solemn fast was held, the fire on the great Altar of the Sun was allowed to go out and no private fire was kindled. On the fourth day, after various rites of adoration, the sun's rays were collected by a priest into a focus by means of a concave mirror, by which a heap of dried cotton was ignited and the Sacred Fire again rekindled direct from the sun. Only when the sky was overcast was friction resorted to by them, but such an event was looked upon to be almost as calamitous as the extinction of the Sacred Fire, which it was the duty of the Virgins of the Sun to guard. Here again can be traced a link connecting with the Vestal Virgins of early Rome.

Amongst some of the Indian tribes traces of the Annual Festival of Fire are discernible in their New Year's Dog Feast, extending over six days, during which two "Keepers of the Faith" visit each Lodge and perform the ceremony of stirring the ashes on the hearth, accompanied with thanksgiving to the Great Spirit. On the fifth day a fire is solemnly kindled by friction, and on it at sunrise is sacrificed a white dog as a propitiation to Manitou. Traces of Fire and Sun worship still linger in Europe, in the Beltan fires of Ireland and the Channel Islands on St. John's Eve, the Summer Solstice, in the Easter Bonfires of Germany, the Yule Log of Xmas, the Winter Solstice, and in the peasant of Saxony and Brandenburg climbing the hill-tops on Easter morning to see the sun rise, whilst it is also thought that the hymn or carol sung by chorister boys in the tower of Magdalen College, Oxford, at sunrise on May-day, is but a remnant of the adoration of the sun handed down by the Druids.

The monumental records of antiquity, in the form of cromlechs, pillars of stone, obelisks and sculptured stones, are a link that enables the Archæologist to trace the connection of early nations and point to Asia as the cradle of the human race.

Dr. Wise, in a paper read before the Royal Society of Edinburgh, in 1855, ably demonstrates the general identity of the ancient monuments of S. and W. Europe with those of Hindostan, proving it, by the physical conformation of the races who inhabit those widely distant countries, by the similarity of many of their manners, customs and observances, and by the decided and extensive affinities

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of the Celtic and other languages of W. Europe with the Sanscrit, which afford as strong an evidence as we can be expected to obtain of a connection so remote between races so widely separated. Dr. Wise says that the names of mountains, rivers and other great natural features of the south and west of Europe, bear evidences of its having been in the possession of a Celtic race anterior to the earliest date of authentic history, and this early connection indicates a line of enquiry by which much of the obscurity resting over the earliest monuments and history of Europe may be cleared away. May not the same test be applied to the monumental records of the race long passed away on this continent, prior to the Indian, known to us as the "Mound Builders," and whose cyclopean works have survived in the ruined cities of Central America, and are regarded by even the native tribes there, with such superstitious awe that they avoid frequenting them in any way? Some of these mounds and stone records, along their line of advance southward, bear a striking resemblance to the Druidical circles, and would thus point to one common origin.

Dr. Wise says the general identity in idea and design of the European monuments with those of Hindostan, is so marked as to justify the inference that races of Asiatics proceeded westward at different ages, and established themselves along the shores of the Baltic and Mediterranean, and part of the Atlantic coast, along which they have left characteristic monuments, which resemble those of their original country. These races appear to have proceeded westward by Scythia and Scandinavia on the one hand, and by the shores of the Mediterranean on the other. We find the same cromlechs and pillar stones in Circassia, Tartary, Asia Minor, Sardinia, the Atlantic shores of Spain, Gaul and the British Isles. May not another exodus have taken place eastward from Asia across the Behring Straits to the American Continent, and proceeded southwards along the line of mounds which remain as landmarks of their route, and which may become, in the hands of Archæologists, connecting links to prove the identity of their builders with a Hindoo ancestry, just as the sun worship of Peru and Mexico, which I have described, is a remnant and the connecting link with the fire worship of Assyria, Chaldea and Persia, and of the rites of Moloch and Baal? In connection with this, Dr. Wilson says in his "Prehistoric Man," the worship of the Sun, though associated with ancient rites of

Asiatic nations, is not necessarily an evidence of the eastern origin of the nations of the New World. But in the services to which it gave rise, we have at least suggestive hints of the links that bind together its ancient and modern tribes; perhaps, also, they may supply a clue to the interpretation of some of the obscure sculptures, with their mysterious hieroglyphics, still remaining on sites of the extinct native civilization of America, and of rites once practised amid the sacred enclosures, and on the altar mounds which give such peculiar interest to the river terraces of the Mississippi Valley.

In tracing the personification of the deities of old, the link that connected such personification with the ideas of the instituters of Heathen worship is easily distinguishable. In the early days of Greece, for instance, the division of the deities contained only those emblematic of the forms, properties and powers of nature, and next the impersonation of the qualities of the mind. The first were the natural result of the awe that filled the mind when it observed the mysterious changes perpetually going on in the world around, the apparent agency of something giving fertility to the earth and motion to the wind and sea. The dogma of that was "*Jupiter est quocumque videt.*" And of this deification of the all, the deification of the parts was a natural consequence. Pantheism led to Polytheism. So the powers of nature were worshipped under various forms and with various rites, consonant to their supposed attributes, and the idea of the *existence* of such beings was so brought to the minds of the people that at length representations of these unseen agents, fashioned as the mind would naturally personify them, were made.

As years rolled on and man passed from the contemplation of material forms to that of spiritual phenomena, and when the principles of social existence began to be understood, then it became necessary to typify the qualities of the mind. To this we may trace Apollo, the patron of learning; Minerva, the legend of whose birth typified a blending together of the characteristic influence of the sexes, masculine strength and female beauty. And so could we trace one by one the attributes that connected each deity with the form assigned to it, the connecting link in the mind of that cultured race that coupled the ideal with the character and propensities of the time.

Language is another of the connecting links of nations.

I think it was Dante who makes Adam enunciate the notion that there is no primitive language of man to be found existing upon earth, but the connecting links of language which can be traced in the words of all nations are so palpable that they plainly point to one common origin. To trace these affinities, however, would of itself fill a volume, and I shall only allude to one or two peculiar ones.

Philologists trace a remarkable connection as subsisting between the modern languages of Europe and the ancient dead languages of the Indian Vedas, thereby tracing the origin of the human race to some probably Asiatic centre.

Throughout the Polynesian Archipelago there are connecting links of language in each Island, showing all the different islanders to be the descendants of one common race. Even in Madagascar are recognized certain Malay and Polynesian words. Important elements of relationship are stated by linguists to be traceable between the native languages of South America and those of the Polynesian family, which suggest a peopling of that part of the continent from Asia through the Islands of the Pacific, and Garnett goes even so far as to show an analogy between them and the languages of Southern India. This subject is largely entered into in the proceedings of the Philological Society, and is too extended except for passing allusion here. The study of the affinity of languages is now leading philologists to anticipate important revelations as to the links connecting the tribes and nations of mankind till they are traced to one original centre, and a determination of the probable lapse of time requisite for the formation of the various sub-divisions now existing.

Writing has also its connecting links. Picture-writing, or the literal figuring of the objects designed to be expressed, merged into the Egyptian hieroglyphics, which, through a natural series of progressive stages, were developed into a phonetic alphabet, the symbols of sounds of the voice. The Indian of to-day, on the far off prairies of the west, chronicles his deeds on the skin side of his buffalo robe and on his birch bark, precisely as his ancestors, centuries ago, painted on the rocks, and this picture-writing, when understood, is remarkably figurative.

In the history of the Indian tribes of the United States, mention is made of a census roll of a band of Chippawas, in Minnesota,

numbering 108 souls, each depicted by a different object, with a series of units simple as those on the Rosetta stone, denoting the numbers of each family, and as intelligible, it is said, to the Indian Agent, as our figures and writing. The object chosen to distinguish a family bears a strange similarity to the crests and heraldic devices of civilized nations.

Humboldt assigns one of the traces of the Asiatic origin of the early races of America, to the connecting link in the symbolic character of their numerals. The four symbols of the seasons among the Aztecs, corresponded precisely with those of the Chinese, Japanese and other Asiatic nations. The Peruvians transmitted to future generations a record of events on a cord of different colored strings, to which others were attached of various colors; yellow, denoting gold and all its allied ideas; white, silver or peace; red, war or soldiers; green, agriculture, and so on. These strings were called a *Quipu*, and a corresponding link to this is to-day to be found among the Indians, in the form of the Wampum belt, used by them for registering their events, and given and received at their treaties as the seal of friendship.

Time will not permit us to dwell longer on ethnological connecting links, and we will now pass on to those of matter, or to speak more plainly, natural history.

It was a remark of Linnæus, that nature takes no leaps, she proceeds by insensible transitions. Mr. Bennett, a rising naturalist, in England, in an article in the Popular Science Review, says: "Classification is now but a human contrivance for tabulating the links in the endless chain which connects all living things." The lines on the chessboard have disappeared and have given place to the imperceptible gradations of the colors of the rainbow. While we can still define red and yellow and distinguish one from the other, we must admit a wide debatable borderland of orange. Even the division of animate nature into the two kingdoms of animal and vegetable life is no longer unchallenged. The last refuge of those who still maintained the essential distinction of the two kingdoms, viz: that the food of animals is organic, whilst that of plants is inorganic, must now be abandoned, and carnivorous or insect-devouring plants hold the position of the connecting link which has hitherto been considered wanting. These plants alluded to in Dr. Hooker's inaugural address before the British Association

in 1874 have been experimented upon in various ways, and the result shows that they absorb through the tissue of the leaf by special organs the material required for their food, and the actual agent in the digestion of insects is a ferment of nature similar to pepsin, which is secreted only during the absorption of some digestible substance. Insects steeped in lithium have been placed on these carnivorous plants, and the roots, when boiled some 30 hours afterwards, afford the colouring matter of the lithium, showing that it has been absorbed and distributed throughout the whole plant tissue.

Up to the year 1837, the efforts of naturalists were chiefly directed towards the perception of differences and the creation of species. But in that year Schleiden told the world, after long research, that as the lowliest members of the vegetable kingdom are each in themselves an individual cell having life and activity, so the highest orders of plants were only congeries of such individuals moulded into a thousand shapes and adapted to different purposes. He enunciated the principle that the story of a plant is to be studied through the vital history of its composing cell elements, and proclaiming the microscopic vegetable cell as the unit of vegetable creation, he exalted it to a place of honor—the key to the cabinet of Vegetable Physiology.

His researches induced Schwaun to apply to the animal world, the same method of enquiry which Schleiden had inaugurated among plants, and he in his turn made known the sublime truth that the law of formation and reproduction which prevails in the vegetable, rules also over the animal creation—the scheme is the same, the cell the element of being. Bones, cartilages, muscles, nerves and every tissue were traced to their origin in cell growth, the universality of which binds all created beings in one sublime connection and proclaims a common law of growth. The vital processes of the body are carried on by cell action; secretion, absorption, exhalation, nutrition, chemical change and vital change, all indicate only phases in the history of cell life—that epitome of all organic life. But while Schleiden and Schwaun were working amidst the mysteries of structure, Professor Owen took up the question, and what the former had done for structural anatomy, Owen did for the anatomy of form. The man, the bird, the reptile, the fish, the saurian and the monsters of pre-adamite earth seemed to be sepa-

rated by as wide an interval as the lichen from the palm tree. But the secret once fathomed and the type established, their visible connection is read off plain. Owen has satisfactorily demonstrated that by changes of one form alone, the archetypal vertebra, all varieties have been effected, yet all are connected. Some idea of the infinity of life may be formed by a comparison between the microscopic animal, which, when magnified 5,000 times, only appears the size of a visible point, and the huge form of the whale, measuring something like 100 feet; yet all the intermediate space is filled up with animated beings of every form and order, more or less connected; or in the vegetable kingdom by comparing the microscopic mildew with the giant trees of California, and yet knowing that the immense interval is filled with plants, shrubs and trees of every form and size.

One mark of the connecting link of animal life exists in what are known amongst naturalists as rudimentary structures. There is discoverable in all vertebrate animals a general type amidst the diversity of form; there are undeveloped limbs or members which are of no use to the particular animals in which they are found. Apparently functionless and useless where they occur, but representing similar parts of large size and functional importance in other animals, they seem to serve no other purpose than to prevent the gaps in the scale of nature being too large. As examples of these rudimentary structures, I will mention a few: The Rorqual, a species of whale has rounded horny filaments in its jaws, united by a common membrane, in addition to the balaena or whalebone, these filaments apparently corresponding to the teeth of the spermaceti whale. The foetal teeth of the common whale, and of the front part of the jaw of ruminating animals, are minute in size and never cut the gum, but are absorbed without ever coming into use, and no other teeth succeed them or represent them in the adult condition of those animals. The Ornithorhynchus of Australia possessing no teeth, has a horny appendage on each side of either mandible, but without roots, evidently corresponding to teeth in other animals. The Apteryx, a New Zealand bird, utterly incapable of flight, has an almost imperceptible wing in quite a rudimentary condition, yet it contains bones which are miniature representatives of the ordinary wingbones of birds of flight. In the Emu the wings are discernible, and in the Ostrich they become largely developed, although useless as wings proper. The Anacondas and Boas, the largest known

species of serpents, have beneath their scaly coats two elementary extremities, rudiments of the organs of locomotion, just anterior to the base of the tail, and in which are found a series of bones representing those of the hind limbs of Mammals. These rudiments, though imperfectly developed, are yet acted upon by powerful muscles, and thus become a strong fulcrum in the animals' movements or in seizing their prey. We may pass from lizards to serpents through a continuous series of forms in which the limbs become more and more feeble, until all external traces of them are lost. Such, for instance, are the family of Chalcidae, one of which, the *Pseudopus*, found in Northern Africa and Greece, has only the rudiments of hind limbs; whilst another, the *Chirotes*, a native of Mexico, has only the fore limbs, placed a short distance behind the head, yet so developed in its case as to be used. In the family of Scincidae, the *Evesia*, a native of India, has the limbs reduced to footless appendages. In the common slow worm or blind worm, rudimentary limbs are found beneath the skin on dissection.

In a species of Turtle, the *Matamata*, found in Guiana, rudimentary ears or ear-like membranous prolongations of skin on the head exist. Again, at the inner corner of the human eye is a third eyelid, known, I have no doubt, to very few persons, and an object of attention only to anatomists. In other animals, birds especially, it is of full size and of great utility, enabling them to turn their eyes upwards to the sun, a feat they could never accomplish were not the visual organ thus protected.

A curious animal has been discovered in the Amazon, called the *Lepidosiren*, with the scales and mucous covering of a fish, but with rudimentary limbs, represented by four tentacular appendages, not jointed. Another species is met with in South Africa, with the tentaculae jointed.

Professor Owen, speaking of rudimentary forms, thinks that we have not in this globe all the diversities of which a general pattern or archetype is susceptible, and that limbs which are found only in an undeveloped state in this world, may be fully developed in the other planetary bodies. Arguing on this principle, Dr. Leitch, in his work, "God's Glory in the Heavens," says there are undeveloped volcanic structures on the face of the earth, similar ones to which have long ago been fully developed in the moon, and by analogy he

shows a connection between the geological formation of the earth and that of its Satellite.

Although in the more recent geological formations, there are numerous fossils met with corresponding to similar living species, few, very few, are the existing types or links connecting the present with the earlier geological periods. The few that occur to me I will allude to. The "Gar-pike," or Bill-fish of our Canadian waters, comparatively rare here, but abundant in the West, helmeted and mailed in almost impenetrable scale armor, with its jaws hinged similar to the Alligator, and its vertebrae of the regular ball and socket formation, points to a close affinity with the Saurians and the fossil Ganoids of Agassiz. The Trilobites have long since ceased to exist, but in the Antarctic Ocean science has brought to light a curious crustacean, (*Glyptonotus Antarcticus*), which strongly recalls the extinct form of the Trilobite. The Crinoids and Encrinites of the Palaeozoic world, have a link remaining extant in the pentacrinus of the Caribbean Sea, with its delicate strong stem, bearing on its summit a symmetrical cup or body, around the margin of which are supported five strong arms, which ramify into scores of fingers. The whole structure is composed of thousands of little stony pieces, fitted together with mathematical precision. The fossil plants of our coal measures have their existing links in the arborescent ferns of Australia, the lowly club moss of our own woods and the diminutive equisetum of our swamps, and the tangled thickets of tropical morasses; but the majority of the early forms of creation, having fulfilled their work have passed away, leaving no existing type or link to be associated with their story record in the rocks.

There are many apparent connections between animal and vegetable life, or between different orders of *animals* which are apt to mislead a novice from their similarity to a transition state. Such, for instance, is the Sea Anemone, presenting all the colors, hues and appearance of the flower of that name, though belonging in reality to the animal kingdom. The same remark applies to the Sponge, which, though apparently growing at the bottom of the sea like a plant, is now acknowledged to be of animal growth and allied to the coral builder. The *Ornithorhynchus* of Australia, an animal possessed of the bill of the duck, and with webbed feet, is not a connecting link as once was thought between beasts and birds, although possessing certain properties of both. That the Armadillo is a link

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between animals and reptiles, viz: the Tortoise which it somewhat resembles, is another popular error, for the Armadillo has a coat of mail, implanted as it were on the skin, whilst the shell of the Tortoise is part of the skeleton extended, and as it were thrown outside the body for the protection of the internal organs. The Bat, ignorantly asserted by many to be a connecting link between birds and mammals, belongs exclusively to the latter as much as the so-called flying squirrel, and the flying fish has acquired that name only from the impetus it gains by its fins in leaping out of the water when pursued by larger fish, the fins not being used as wings at all.

Errors like these have to be guarded against by the student of Natural History, and, where possible, nothing should be taken for granted without examination.

Turning to the vegetable kingdom we find the mutual relations of the parts of the flower and their homology with the leaves indicated by those cases in which there is a gradational passage from the leaf to the bract, from the bract to the sepal, from that to the petal, and from the petal to the stamen. The non-development of some organ possessed by neighboring groups is manifested by the presence of that organ in a rudimentary or undeveloped condition. When the whorl, or part of it, in a flower is suppressed, the deficiency is manifested either by the presence of the undeveloped organs in rudimentary form, or by leaving a space for them in the arrangements of the parts which are present. Thus, in the Primrose tribe, there is a single row of stamens opposite to the petals, instead of alternately with them, according to the regular plan of floral development, from which the botanist concludes that a whorl has been suppressed, which ought to intervene between the petals and stamens. The rudiments of an intermediate row are found in the *Samolus* in the form of a whorl of little scales, not developed into stamens. In the common Sage, only two stamens are found where the plan of the flower would lead us to expect five; but on looking at the interior of the corolla attentively, two little scales may be seen where the two deficient stamens should have been. These scales are frequently developed as perfect stamens in flowers, which otherwise are constructed precisely like the Sage.

In botany, however, the term transition might more appropriately be used than connecting links. The Algae, or water weeds, vegetate exclusively in water or damp situations. Their nearest representa-

tive on land is the lichen, growing on rocks, trunks of trees and other hard substances, and deriving its nourishment from the atmosphere. Some of these approximate to the Algae, some to the Fungi, and whilst some botanists rank them with one, and some with the other, it seems reasonable to regard them as an intermediate section—a connecting link. Next come the Liverworts, Mosses and Ferns, passing so gradually from one to the other that the connection is apparent to all when closely examined. For instance, the Liverwort begins to assume the structure and aspect of a leaf, and has an indication of a central midrib; Moss has a distinct axis of growth more or less erect, in which the elongated cells seem to prefigure the wood of plants. There is no actual root, but radical appendages are put forth from every portion of the lower part of the axis, and even from the under surface of the leaves. The Mosses, known as Stag's Horn, Club Moss and Tree Moss, closely assimilate to the lower forms of the Ferns from which they are hardly distinguishable. The Tree Fern possesses a stem round which leaves are symmetrically arranged, and has a proper descending root; in the case of some of the Fern tribe, particular fronds manifest themselves from the rest of the leaves as fertile or spore-producing. In this department is seen the tendency towards a flowering plant, which the next class in succession, the Equisetum, fairly merges into. From that upwards there is no difficulty in tracing the gradation which connects in the end the mightiest monarch of the forest with the tiny growth of vegetable mould, discernible only under the microscope.

In the early part of this lecture I spoke of man as the highest known state of organized life. Whether he is a connecting link with a higher race of beings is not known, but this much we do know, that though in structure and functions he ranks as belonging to this sphere, yet by his intellect and reasoning powers he approaches those chosen creatures who are represented as shining near the Throne of the Eternal and form a bond of union between heaven and earth. By the exercise of his genius man elevates himself towards that Supreme Being in whose likeness he was fashioned; by giving scope to his passions, he debases himself to the lower orders of life to which he is akin.

Having now cursorily traced connecting links as they may be seen in our daily intercourse with nature and in our study of history, it remains for me only to allude to the great final connecting link,

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which, if I may so use the term, is miscalled death—the connecting link between this and a future state of existence. A recent writer in a scientific journal says: “On earth we have no veritable death, we have only change of form and condition.” What we call a dead body is not dead—an Egyptian mummy even tries hard to attain a real death in vain, but it corrupts, it decays. Corruption is a force—a potent agent, the harbinger of life to come. Assimilated with the elements of which it was composed, the organic matter of a dead body is absorbed and reproduced, we cannot tell when or where, for one form of matter is continually taking the place of another in everything. Animal and vegetable remains are changed, and again become part of the earth of which they were composed. During life the body is continually changing; death is only a loss of consciousness and a cessation of action in the intellectual and sentient being; it is not a loss of existence, for not a particle of matter ever ceases to exist, but it is the change—the transition state—which the body must undergo previous to its being created anew into other forms of existence. I speak here simply from a scientific view apart from a doctrinal one; the future of the soul is a subject for other hands and another place than this, but even of that future, death is still a connecting link between the sphere we now inhabit and some other region far away, of which the mind of man can form no conception.

The idea of looking on death as only a change, is thus beautifully expressed by Lord Lytton:

“ There is no death ; the dust we tread
 Shall change beneath the summer showers
 To golden grain or mellow fruit
 Or rainbow tinted flowers.
 There is no death ; an Angel form
 Walks o'er the earth with silent tread,
 He bears our best loved things away,
 And then we call them dead.
 He leaves our hearts all desolate,
 He plucks our fairest, sweetest flowers ;
 Transplanted into bliss, they now
 Adorn immortal bowers.
 Born to that undying life,
 They leave us but to come again,
 With joy we welcome them the same,
 Except their sin and pain ;

And ever near us, though unseen,
The dear immortal spirits tread,
For all the boundless universe is life—
There are no dead."



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FLUTES OF THE TIME OF MOSES, RECENTLY
DISCOVERED IN EGYPT.

Read before the Hamilton Association, March 12th, 1891.

BY J. E. P. ALDOUS, B. A.

The importance from an historical point of view of the recent discoveries in Egypt must be my excuse for bringing this musical topic before an audience that is not composed entirely of musicians. Within the last few months discoveries have been made that carry back our authentic information one thousand years earlier than it went at the beginning of last year, and I think I can make this clear to any one who has the reasoning faculty, musical or otherwise.

Let me commence with a short and very condensed statement of some scientific musical facts, which it is necessary to understand in order to appreciate the value of the discoveries.

Tone, or musical sound, is the effect on the brain of pulsations of the air at regular intervals striking the drum of the ear. The pulsations of the air are started in various ways. If a stretched string is plucked it will give a certain note; if it is stopped or held at the half of its length each half will give vibrations twice as quick, or in other words will sound an octave higher. You can easily understand that between the end of the string and the halfway point there are an infinity of points where you could "stop" it, each stop making the pitch a shade higher till the octave is reached.

These "stops" (or steps we might call them) are of the utmost importance, for music is dependent on the number of steps in the octave. Modern music, by which I mean music as we find it in Europe, America and all parts of the world, colonized from these sources (the only music worth calling music), is built on a system of steps of such size that there are twelve of them in each octave. These twelve are called half-steps, or semitones, which latter term would imply another arrangement of the steps that I must allude to. If you sound these twelve half-steps in the octave, one after another, you get no idea whatever of *intonality*, which means a relationship of

the various steps to one particular step as their starting point, or "key note," as we call it. But if we take a selection from these steps, in what may seem at first sight an arbitrary manner, we get what is called a scale.

If, starting from the first tone or open string, we skip the first small step and take the next, we shall get the interval known as a whole step or whole tone. Let us do the same again. Let us next take a small step: we have now a group of four notes at unequal intervals, two whole steps and one half. Let us now take a large step from the top one of these four, and from that, as a starting point, make a succession similar to the first four, which will bring us to the octave. I am stating all this to make clear to you that music as we know it is based on a succession of tones and semitones (steps and half steps) in a certain order, the half steps being of such a size as that it takes twelve to complete the octave.

Some Asiatic tribes to-day, and some semicultivated races elsewhere, make music from stringed instruments in which they use steps smaller than ours, in some cases making eighteen and more steps in the octave. This may be music to their ears but it is not such to ours.

Concerning the history of our modern scale, it is a development of the Greek system. The first Greek lyres had only four strings, which were tuned in certain successions of steps and half steps according to the mode in which the music was to be played. We learn from Greek records that the philosopher, Pythagoras, visited Egypt about 600 B. C. and got from that place the complete octave scale; but that was the utmost we knew about Egyptian music. What their theories were, how long they had been known, was all mystery and speculation. We saw their harps of many strings, their flutes and double flutes all portrayed in painting and sculpture. A few shreds of reed-pipes and rickety remains that could scarcely be looked at without falling to pieces, tantalized us with the "what might have been" or "used to be." But guess work is now ended.

Near an imposing pyramid, built by Useresen II, a monarch of the twelfth dynasty, who reigned some 4,500 years ago, at the entrance of the Nile into the Fayum province, and about 60 miles south of Cairo, stood the town of Kahun, which was built for the habitation of the architects and workmen employed in the construction of the pyramid. It would seem that when the building of

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the Usertesen pyramid was completed, the workmen's colony was naturally dispersed, and so Kahun became gradually deserted. Some few inhabitants lingered on till the eighteenth dynasty, when the town was finally abandoned. But previous to this the rock cellar tomb where our wonders were discovered had been used as a sepulchre.

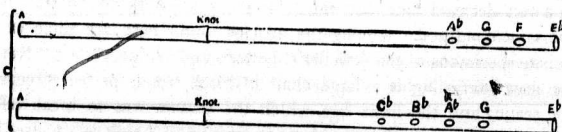
Mr. Petrie, the Egyptian discoverer, is of the opinion that at the end of the nineteenth or early in the twentieth dynasty, (about 1100 B. C.,) the tomb was rifled and again used as a place of burial by some new comers in search of a sepulchre for their family. As was common, the later people plundered the early mummies, decorating their own dead with the spoils. From that period until Mr. Petrie broke into the cellar the place had been undisturbed. The light of day had not entered since the time of Moses, some 3000 years.

Several coffins were deposited in the vault, the mummies being in a very decayed state, and much of the wood-work found was in the same condition. Among the articles found here are some exquisite specimens of the jeweller's, potter's and lapidary's art. Not the least interesting is a large chair of black wood, perfect except the seating and the front legs, which the custom was to break off before entombment: this was done to prevent it being again used, and in order that the ghost of the chair should duly accompany its owner to the other world for future service.

In the rich and varied collection gathered by Mr. Petrie in his investigations, the whole life of the people is brought before our eyes, from the toys of the children, through their every-day life, down to their death and embalming. We seem to be dwelling in Egypt and observing the daily life and customs of this old, old race. There are many things shown which make us, living in this nineteenth century after Christ, with all its wonders and inventions, feel astonishment at the knowledge and practice of the Egyptians who lived 1500 years before Christ. Amongst other marvels of Mr. Petrie's collection may be mentioned a delicately wrought lady's hand-mirror, ornamental beads for embroidery so small that one wonders how they could be made—93 only weigh a grain, papyri dating from the time of Abraham, hinges that interlock, and an incubator for hatching eggs.

The tomb contained twelve large wooden coffins, all the mummies having been badly embalmed. The best preserved of the

series was that of a lady bearing the name of Maket. Her name was engraved on a gold scarab, on a small silver one set in a ring, and on another ring. Her coffin also contained the lady's bead necklaces, earrings, powder and paint pots—no doubt kept filled by the fashionable perfumer of the day, her mirror, wooden comb and various other toilet nick-nacks; and it also contained two long flutes. Happily these had been placed in their proper case; it is owing to this thoughtful precaution that they have been preserved from the decay, which, no doubt, has overtaken many such slender delicate reeds that have been interred with mummies elsewhere. The pipes seem to be made of some thin cane or hollow water-reed. Athenæus says they used to use the lotus-thorn. When found they were of a darkish yellow; but the better to preserve them Mr. Petrie covered them with a solution of wax, as is the custom to dress old articles of wood thus buried.



NOTE.—A indicates the mouthpieces, both mouthpieces being in the mouth at the same time; the other letters indicates the notes made by unclosing the respective holes.

One flute possessed four finger-holes, the other three. The measurement of the flute with four holes is: length, $17\frac{5}{8}$ inches; to the first hole, $2\frac{7}{8}$ inches; to the second, $1\frac{3}{8}$ inches; to the third, $1\frac{3}{8}$ inches; to the fourth, $1\frac{3}{8}$ inches; and to the end, $10\frac{5}{8}$ inches. The measurement of the flute with three holes is: length, $17\frac{7}{8}$ inches; to the first hole, $1\frac{3}{8}$ inches; to the second, $1\frac{3}{8}$ inches; to the third, $1\frac{3}{8}$ inches; to the end, $13\frac{1}{2}$ inches. The outside diameter is but a $\frac{1}{4}$ inch, so they are exceedingly slender. We can get a fair idea of their size by remembering that they are about the thickness of any ordinary lead-pencil. The finger-holes are not round, as in present flutes, but oval. This was most likely because round holes would have weakened the pipes. These pipes were evidently much too precious to be handled much or experimented with to any extent. *Fac similes* were made with thin brass, cane, and paper, and as they gave exactly the same sounds as the originals, experiments were continued with them. There was considerable doubt how these

antique flutes were blown. It seemed at first as if they must have been blown across the tops as you blow into a key, and as is done in modern Egypt with the "nay." But, though they yielded distinct notes, they were not true musical tones, and all efforts to increase their intensity was unavailing. Many experiments were tried, the successful one being the use of a simple reed cut in a straw of wheat. All evidence seems to point to the fact that this was the medium adopted by the Egyptian players. In the cases of some discovered flutes, pieces of barley straw were found beside them, and in one case a piece of straw was sticking in the embouchure of the pipe. The most conclusive evidence, however, is from a painting taken from a tomb in Thebes, and now in the British Museum in London. This painting represents a feast and dance in honor of the god Vulcan; girls are represented playing on pipes exactly corresponding to those under consideration, with this important exception: about an inch before they enter the mouth the brown color ends, and the rest of the tube is white. So experiments were made in various ways of cutting the straw, with the result that at least the silence of 3000 years was broken, and the double flute of the Lady Maket spoke once more.

And now we come to the importance of the discovery from a historical point of view. Groves' "Dictionary of Music" is the principal authority on all musical subjects that has been published during the last few years. In the article on "Scale" we read that our scale dates from the time of the Greeks, 500 B. C. From the tones elicited from the Lady Maket's flutes we find that in 1500 B. C. they used precisely the same intervals of scale, the same arrangement of tones and semitones as we do to-day. We got our scale *through* the Greeks, not *from* the Greeks; and Miriam sang her song—whatever the tune may have been—in a scale built in the same way as the scales in which we sing and play, nearly 1900 years after Christ.

The notes which have been distinctly elicited from the newly discovered flutes, are sufficient for the purpose of proving that the division of tones and semitones was the same at that early date as it is to-day. It stands to reason, however, that after a burial of 3,000 years, these instruments cannot at once find lips and fingers skilful enough to produce their entire possibilities. It is more than likely that by different pressure of blowing, and by use of the harmonic

notes, as in modern flute playing, an entire chromatic scale can be produced; and doubtless further investigation and experiment will give us more definite information on these points. The use of the harmonic notes is the more likely when it is considered that the fundamental tones more easily produced are of very light quality and weak tone; and as these flutes were the kind used in funeral processions, their sound would be lost in the shuffling of feet; whereas the harmonic tones are more penetrating and would not be so easily lost.

Of course each new discovery in any department of science is considered as all important, very often as the furthest possible reach of investigation. We are apt to think it is impossible that anything more can be done in the way of rapid travel than the modern express train or the Atlantic greyhound. Still the experience of the past has shown us that there are more wonders to come. Notwithstanding past experience, one cannot help feeling that it is very unlikely that we can get any nearer to the creation of the world in the matter of musical history. And that these discoveries bring us very near to the beginning of the world's history is evident when you reflect that we have discovered flutes which were in use when the matters recorded in the earlier chapters of the Book of Exodus were being enacted in Egypt. It is exceedingly unlikely that any instruments of greater antiquity can be discovered, and it is hard to imagine in what other way any authentic information can be discovered. Truly, however, we live in an age of wonders, and there is no telling but within the next few years, some of the indefatigable gentlemen who are continually excavating, deciphering and interpreting in those distant Eastern lands, may turn up the tomb, mummy and musical library and instruments of Jubal himself; and then, surely, we shall be as far back as it is possible to go, if Genesis IV, 21, is a reliable record, as we have all been taught to believe.

BOTANICAL JOTTINGS.

Extracts from paper read before the Hamilton Association, 14th May, 1891.

BY A. ALEXANDER.

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My object in this paper is not to speak of Botany in general, either as to its study or history, for both of those have been already brought before this Association in able and charming papers, read by our friend Dr. Burgess, of Montreal. I would rather content myself by simply relating some facts and observations clustered around a few plants that are familiar to myself, hoping that some of those hearing me may be induced to begin this delightful study, and that perchance those who have commenced the study of plant life may be led to form a closer intimacy and friendship with Flora's children, and thus be led to go beyond the mere collecting, arranging and classifying of plants, to study the plants themselves, that is, study the organs or parts of plants in regard to the different forms and uses which the same kind of organ may assume. This is what we call vegetable morphology. Without this, Botany may be made one of the dullest, while with it, it is one of the most alluring of all the sciences. And since the introduction of the *new* morphology, Botany has been redeemed from what I might call the vicious circle of mere classificatory schemes, and brightened by the fresh and quickening breath of the new thoughts and ideas in regard to the unity of all the living organisms comprehended in the animal and vegetable kingdoms.

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There has also been a new physiology, as well as a new morphology in recent years, which has fixed all its attention on the adaptation of the plant to its natural environment. This I treated of at some length in a paper entitled the "Elasticity of Plant Constitution," read before the Biological Section about a year ago, and therefore will not say more on that here. The fascinating study of the mutual relations between flower and insect

in particular, which was set on foot about the close of the last century by Sprengel, has been introduced with new force in our own times. The results of observations in this direction can be best understood by reading such books as Darwin on orchids and those on cross fertilization. Some of them, I think, are now in our Free Library. Since his time, recent as it is, many have followed up the subject, and Lubbock, Müller and others have added much to our stock of knowledge, so that the study may now be made as fascinating as the reading of a first-class novel, and much more real, because more true.

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The fact is, I think the clue has now been found to all the main avenues of the science, and even the keys of its lesser inner rooms are, for the most part, well within the reach of any enlightened observer.

I want specially to-night to call attention to the arrangement for cross-fertilization in one or two plants with which I am familiar, for to speak of the various modes and arrangements plants have for accomplishing this would fill volumes; it is one of the most interesting parts of botanical study.

Time would fail to tell of the sedges so inconspicuous to the ordinary observer, and yet so full of entrancing wonderment on close examination, in this matter of ensuring cross-fertilization; of the night-blooming plants, which depend on moth fertilization, being nearly always white or pale yellow—good reflectors in the twilight or moonlight—and fragrant, as the moth hunts by smell chiefly, though partly guided by sight; and many others.

Emerson tells us in his "Life of Thoreau" that he was out one day for a walk with him when he (Thoreau) was looking for the "*Menyanthes trifoliata*" (Buckbean), a sweetly scented bog plant. He detected it across the wide pool, and on examination of its florets, decided that it had been in flower five days. He then tells us that he drew out of his pocket his diary and read the names of all the plants that should bloom on this day, whereof he kept account as a banker when his notes fall due. "The Cypripedium not due till to-morrow," he added. That would mean about the 20th May, near Concord, Mass., where Thoreau lived; here it would be about a month later, and in the north where I first

made the acquaintance of Thoreau's *Cyripedium*, about July 1st.

This habit of exact observation of the time and place of the blooming of plants is a most important one, and adds much to the interest and value of the study. I would advise all who are entering upon the study to practise it; you will thereby gather a large and valuable fund of interesting information; you will then be able to tell when you may go into the woods and find the plant you are in search of.

I would like to remark here that in preparing a Local Flora, the time of flowering of each plant is an important consideration. I am satisfied that many interesting facts in this connection escape the notice of botanists, because of their reliance upon the dates given in the manuals. Take the time of the flowering of the *Hepatica triloba*, for instance, one of the most common Spring flowers. I have found it in Mount Albion ravine as early as the second week in March, while it has been found on one or two occasions as early as the last of February. The difference is not always in the season so much as in the fact that we do not think to look for them so early, or do not know of the most likely situations to find them in bloom.

When the flowers of *Hepatica* come out in Spring, the last year's leaves are still present, but apparently functionless. The new leaves are developed, and perform their work during the late Spring and Summer months, resulting in the production of one or more buds in which are contained the rudiments of next year's development.

If these buds be examined in, say November, they are found to consist of from five to seven scales enclosing each other, and under each, except the first one or two, will be found a flower bud on a scape a quarter of an inch or less long, the whole being densely covered with long silk hair, which must afford much protection during severe weather. In the centre, covered by the flower buds and their protecting scales, the rudiments of next year's leaves are found, also thickly covered with long straight hair. The outermost flower blooms first, and, when there is a lack of warmth, seems to appropriate to itself all the activity of the plant, lengthening its scape to one or two inches, coming into bloom and even perfecting its seeds while the other flowers remain snugly covered by their protecting scales. Sometimes a second bud will burst from its scale before the first has run its course. The scape is always shorter in these early

blooms. Of course, in April and May, these buds all come into flower at once, and are usually found open together, forming a beautiful object in the early spring days. It is wonderful the size the Hepaticas will attain to when they are free from the struggle necessary to keep their place among many competitors. I have some planted in my garden, growing in the shade of a cedar hedge, some of them with no less than sixty-five flowers out at the same time.

These folded early flowers and leaves may be seen by securing a whole plant in the late Autumn or early Winter, and cutting it vertically through the centre, when, with a glass of moderate magnifying power, the beautiful provision for the protection of these earliest floral gems may be seen as I have described above.

But let us return to this *Cypripedium*. It belongs to the family of orchids, a high-bred race, fastidious in habits, sensitive as to abodes. Most orchids are rare in our northern flora, and yet, as those of us who have gathered these charming plants must have often felt, even this species, which is certainly not one of the very rarest, retains the family traits in its person, and never loses its high-born air and its delicate veining. As I come across it in my wandering in the summer among the rocky islands of the inner channel of the Georgian Bay, under some evergreen, standing holding up its head with graceful dignity, I invariably get down beside it in its soft mossy bed and fondle it, and can never divest myself of the feeling that each specimen is a choice novelty. It certainly is *choice* if it is not a novelty. The specific name of this plant is *Cypripedium acaule*.

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< To any who appreciate curious forms as well as graceful outlines and brilliant colors, there can be no wild flower of our own woodlands more attractive than the Pink Lady's Slipper. The generic name signifies Venus' Slipper, and Americans have called it the Moccasin Flower, from its marked resemblance to the foot covering of the Aborigines. The popular name given to the common species of France—*C. Calceolus*—is "Sabot de la Vierge" and "Soulier de Notre Dame," or, "Our Lady's Slipper." It seems to be a passion with the reverent children of the Church of Rome to dedicate the most beautiful things of earth to her who, in their thought, is the most beautiful being in heaven; so it seems the

flower now under review is one of these. Like most orchids it has an arrangement of parts which renders it very difficult, if not impossible, to be fertilized by its own pollen. The stamens and pistils are united into a single organ called the "Column," which projects forward from the stem into the open space at the top, and within the sack-like labellum or "lip." The stamens lie back of the stigma in such a position that the pollen could not, except by the help of insects or other artificial means, be transferred from the one to the other. But the flower is admirably contrived so as to solicit and use the help which such insects as bees and flies may bring to it. The large, gayly colored pendant bag, which makes the most conspicuous part of the flower, is opened with a narrow slit down the front, and the edges of the opening are turned inwards. This forms a regular trap, easy to get into (as most traps are), but quite impossible to get out of—at least by the same door. The "busy bee," searching for toothsome morsels, easily penetrates to the interior of this floral sac through the narrow open door. Once in, and satisfied, he looks about him for a way out. He finds it at last, but not by the way he came in. At the top of the flower, on either side of the "Column," he finds a passage into the open air, quite wide enough for a small but enterprising bee to push his way through. In doing this, however, he brushes against and frequently carries away upon his hairy sides or back the sticky pollen masses of the open anthers. Now, if he enters another flower of the same species, as he will be very likely to do if he got something to his taste in the other, and in due time makes his exit through the only open door, he will certainly get some of this pollen on the stigmatic surface of that flower, and fertilize it, for the stigma is covered with minute papillæ, like the teeth of a comb, which project forward, and the pollen is effectually combed off him as he goes by.

Yet, notwithstanding this elaborate contrivance for fertilization, and this curious adaptation of means to that end, it remains true, as I have proved by actual observation, that few plants are ever fertile, they being chiefly propagated by the root, which keeps its life from year to year.

Just one more example, to give me an opportunity to speak of another and very different fertilizing agency, namely, the wind. Wind-fertilized plants, as a rule, are not attractive, by reason of the almost colorless or entirely absent petals, and the one I choose is,

perhaps, the least interesting of all plants, except when we happen by accident to come into too close contact with it. I mean the common nettle, which you may see almost anywhere in waste, neglected spots, and in perfection on the side of the mountain, eastward, on the north side of the railway track, where they sometimes reach the height of six feet.

You are familiar with the nettle. What a contrast to the beautiful orchid which we have just discussed! We might speak of its sting. As a rule, the sting is the only point in the whole organization of the family over which we ever waste a single thought. I am afraid that is because of our own ordinary human narrowness. In each plant or animal, we interest ourselves about that one part alone which has special reference to our own relations with it for good or for evil. In a strawberry, we think only of the *fruit*; in the orchid, which we have had in review, of the *beauty of the flower*; in a deadly nightshade, of the *poisonous berry*, and in our nettle, of the *sting*. Now I frankly admit that the nettle sting has an obtrusive and unnecessary pungent way of forcing itself upon human attention; but that does not sum up the whole life history of the plant. The nettle exists for its own sake we may be sure, and not merely for the sake of occasionally inflicting a passing smart upon meddling fingers. Let me further say, before we leave the nettle sting, that I think it one of the most highly developed among the devices by which plants guard themselves against the attacks of animals.

But let us to the flower. In most plants the flower is the most conspicuous part of all. Yet in this particular plant it is so unobtrusive that most people never notice its existence in any way. That is because the nettle is wind-fertilized, and so does not need bright and attractive petals. The flowering branches of the nettle consist of a lot of little forked anther-like spikes, sticking out at right angles to the stem, and half-concealed by the leaves of the row above them. Like many other wind-fertilized flowers, the stamens and pistils are collected on different plants, a plan which insures cross-fertilization without the aid of insects. If we pick one of the stamen-bearing clusters, we will see that the flower proper is made up of four tiny leaf-like petals, and with four stamens doubled up in the centre. If we touch one of the ripe flowers with the point of a pencil, or some fine point, in a second the four stamens jump out elastically as if alive, and dust the white pollen all over our fingers. Why should

they act like this? Such tricks are not uncommon in bee-fertilized flowers, because they insure the pollen being shed only when a bee thrusts his head into the blossom; but what use can this device be to the wind-fertilized nettle? I think the object must be something like this: If the pollen were shed during perfectly calm weather, it would simply fall upon the ground without reaching the pistils of neighboring plants at all; but by having the stamens doubled up with elastic stalks it happens that even when ripe they do not open and shed the pollen unless upon the occurrence of some slight concussion. This concussion is given when the stems are waved about by the wind, and then the pollen is shaken out under circumstances which gives it the best chance of reaching the pistil.

We leave our nettle by remarking, that as regards *stings*, it is one of the best protected plants; as regards *flower* and *fruits*, it is merely one of the ruck. So we see one plant survives by dint of its prickles, another by dint of its attractive flowers, a third by its sweet fruit, and a fourth by its hard nut shell, and so on.

Thus there is opened up to us a vast field of interesting study, with a profusion of the most fascinating paths around the whole, and outside of technical names and formal classification, not excelled by any other branch of scientific study and accessible to us all. When these facts in plant history and life come to us, we feel that our life is too short to read but a very few of the entrancing pages of this wondrous book of nature.

Report of the Philological Section.

HAMILTON ASSOCIATION,

MAY, 1891.

The Philological Section was organized at a meeting held on the 20th of November, 1890, when a chairman and a secretary were elected and a night of meeting chosen.

Five meetings have been held, and it is proposed to hold two more before the summer holiday season.

The papers read have been as follows :—

DECEMBER 18th.—“The Life and Work of F. Bopp.”—H. P. Bonny.

“The Home of the Early Aryans.”—A review of the discussion, suggested by Canon Taylor's work.—Chas. Robertson, M. A.

JANUARY 15th.—“An Introduction to the Study of Grimm's Law.”—A. W. Stratton, B. A.

FEBRUARY 26th.—“The Origin of Languages.”—Presenting the claims of Hebrew.—Dr. H. Birkenthal.

MARCH 26th.—“The Development of the French Language.”—An examination of the circumstances under which it arose.—W. H. Schofield, B. A.

APRIL 23rd.—“Anglicisms in Lower Canadian French.”—H. P. Bonny.

Each paper has been followed by a somewhat full discussion of matters of interest suggested by it: twice lists of topics have been distributed among the members some time before the meeting.

The section has been above all things instructive. Original work is not to be expected at first; but the number of workers is very promising, and augurs well for the future success of the section.

A. W. STRATTON,
Secretary.

CHAS. ROBERTSON,
Chairman.

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AN INTRODUCTION TO THE STUDY OF GRIMM'S
LAW.

Read before the Philological Section, January 15th, 1891.

BY A. W. STRATTON.

When a man's attention has been drawn to the language of another people, he is constantly on the watch for points of resemblance with his own; and he who seeks will find perhaps not a few. It was so in a marked degree when the study of Greek literature became popular at Rome. How largely the vocabularies of the two languages agreed may readily be seen from such a comparison as that made in Halsey's "Etymology of Latin and Greek;" and the comparatively early development of Greek civilization caused this agreement to be explained as due to the derivation of the Latin from the Greek of an early time. Something very similar occurred when Englishmen noticed how many of their words, not known to be imitations of any foreign words, differed but slightly from the Latin, it might be, or the Greek or the Hebrew; and the theology of the time required that all should be traced to Hebrew, the original speech, it was said, "used between God and man."⁽¹⁾ Here was a vast and inviting field of study, but the rude guess-work of the first attempts at comparison made the results almost valueless.

Some valid distinctions were, of course, made before the days of scientific etymology, e. g. that of the relations of the English *fraternal* and *brotherly* to the Latin *frater*. This distinction was recognized by Horne Tooke⁽²⁾ (1736-1812), a man to whom it was given to see darkly and partially many of the things made clearer to us by the study of Sanskrit, then unknown in Europe. How nearly he anticipated Rask and Grimm may be seen from the following passage:⁽³⁾ Speaking of prepositions he says:—"Though it is not from Asia or its confines that we are to seek for the origin of this part of our language, yet it is worth noticing here that the Greek, to

(1) See Pres. White's article in the Popular Science Monthly, Jan., 1891.

(2) See his "Diversions of Purley, Bk. II., Ch. 6.

(3) Divers. Purley, I. 9.

which the Gothic has in many respects a considerable resemblance, employs the word *thura* for *door*, and both the Persian, which in many respects resembles the Teutonic, and the Chaldaean use *thro* for *door*. The modern German (directly contrary to the modern English) uses *thur* for our *door* and *durch* for *thorough*; and it is remarkable that this same difference between the German and the English prevails in almost all cases where the two languages employ a word of the same origin having either of these initials.⁽¹⁾ He instances *distel* and *thisle*, *dorn* and *thorn*, *theur* and *dear*, *thaler* and *dollar*, *theil* and *deal*. Attention to the sound rather than the spelling of these German words might have led to a tenable theory of consonant-shifting. But everything cannot be expected from Horne Tooke, and to show the progress made by modern etymologists we must quote from him again (*loc. cit.*):—"Do (the auxiliary verb, as it has been called) is derived from the same root, and is indeed the same word, as *to* [of the infinitive.] The difference between a *t* and a *d* is so very small, that an etymologist knows by the practice of languages, and an anatomist by the reason of that practice, that in the derivation of words it is scarce worth regarding."

When the Sanskrit came to be studied in Europe, a comparison of its forms with those of Persian, Greek, Latin, Gothic, English, German, Celtic, etc., showed beyond all doubt

- (1) That these languages were all connected both in vocabulary and in grammatical forms;
- (2) That no one of them could be said to be the parent of the others, but that all alike must be referred to a common source.

Rasmus Christian Rask (1787-1832), a Danish scholar who, at thirty-five years of age, "was master of twenty-five languages and dialects, and is stated to have studied twice as many,"⁽¹⁾ extended in his essay on the origin of Icelandic (1818) the list of correspondences of letters in the Classical and Germanic languages previously established by a Swede named Ihre. Four years later Jacob Grimm (1785-1863) published in the second edition of his "German Grammar" a law of shifting of mutes not only as between the Germanic and Classical languages, but, also as between the High German, and especially in its older forms, and the remaining Germanic dialects.⁽²⁾

(1) Encycl. Brit. Vol. XX., p. 286.

(2) On the extent of Grimm's debt to Rask see Sweet's article in the Encycl. Brit., Vol. XI., pp. 200-201.

From his comparison Grimm finds the changes of the vowels in the Germanic dialects to be "not arbitrary, but on the contrary according to a deeply-rooted but as yet undiscovered law" (Ger. Gram., Vol. I, p. 58c). In the consonants, however, "the relations appear more certain and permanent; dialects whose vowels for the most part differ, retain frequently the same consonants. The four liquids (*l, m, n, r*) are constant. . . . Like the liquids run the three spirants (*v, h, s*), essentially unchanged through all the German dialects. . . . Quite otherwise is it with the other consonants; a marked difference between the High German and all other dialects is revealed. In the labials, linguals and gutturals, the Goth. tenuis answers to the H. Ger. aspirate, the Goth. media to the H. Ger. tenuis, the Goth. aspirate to the H. Ger. media" (pp. 58c-1.) These results he tabulates as follows:

Goth.	P	B	F		T	D	Th		K	G	
O. H. G.	F	P	B(V)		Z	T	D		Ch	K	G

A comparison of Germanic with Greek, Latin and Sanskrit consonants leads to an extension of this law. "Even more worthy of remark," he says, "than the agreement of the liquids and spirants is the difference of the lip, tongue and throat sounds [of Greek, Latin and Sanskrit], not only from the Gothic, but also from the Old High German system. Precisely as the Old High German in all three classes has removed one step from the Gothic form, the Gothic was itself already shifted one step from the Latin (Greek, Sanskrit). The Gothic is related to the Latin just as the Old High German to the Gothic:" (p. 584). The whole is arranged in a table thus:

Greek	P	B	F		T	D	Th		K	G	Ch
Goth.	F	P	B		Th	T	D		K	G	Ch
O. H. G.	B(V)	F	P		D	Z	T		G	Ch	K

and thus:

Gr.	Goth.	O. H. G.		Gr.	Goth.	O. H. G.		Gr.	Goth.	O. H. G.
P	F	B(V)		T	Th	D		K	G	
B	P	F		D	T	Z		G	K	Ch
F	B	P		Th	D	T		Ch	G	K

This law of change is best exemplified in the dental series.

Sanskrit.	Greek.	Latin.	Gothic.	Anglo Saxon.	English.	O. H. G.	N. H. G.
<i>daqa</i>	<i>dika</i>	<i>decem</i>	<i>taihan</i>	<i>tien</i>	<i>ten</i>	<i>zehan</i>	<i>zehn</i>
<i>dant</i>	<i>odont-</i>	<i>dent-</i>	<i>tunthaus</i>	<i>toth</i>	<i>tooth</i>	<i>sand</i>	<i>sahn</i>
<i>dama</i>	<i>dakru</i>	<i>lacrima</i>	<i>tagr</i>	<i>tear</i>	<i>tear</i>	<i>sahar</i>	<i>sahre</i>
<i>dha</i>	<i>domos</i>	<i>domus</i>	<i>timr</i>	<i>getimbre</i>	<i>timber</i>	<i>zimbar</i>	<i>zimmar</i>
<i>rudhira</i>	<i>the-</i>	<i>-do</i>	<i>don</i>	<i>don</i>	<i>do</i>	<i>tuon</i>	<i>thun</i>
<i>rudhir</i>	<i>eruthros</i>	<i>ruber</i>	<i>rauds</i>	<i>read</i>	<i>red</i>	<i>rôt</i>	<i>roth</i>
<i>madhu</i>	<i>thugater</i>		<i>dauhatar</i>	<i>dohtor</i>	<i>daughter</i>	<i>tohter</i>	<i>tochter</i>
<i>trva</i>	<i>mithu</i>			<i>medu</i>	<i>mead</i>	<i>mëtu</i>	<i>meth</i>
<i>tri</i>	<i>tu</i>	<i>tu</i>	<i>thu</i>	<i>thu</i>	<i>thou</i>	<i>du</i>	<i>du</i>
<i>trs</i>	<i>treis</i>	<i>tres</i>	<i>threis</i>	<i>threo</i>	<i>three</i>	<i>drî</i>	<i>drei</i>
<i>tanu</i>	<i>têrsomai</i>	<i>torreo</i>	<i>thairsan</i>	<i>thyrstan</i>	<i>thirst</i>	<i>dursten</i>	<i>dursten</i>
	<i>tanaos</i>	<i>tennis</i>	<i>thynne</i>	<i>thynne</i>	<i>thin</i>	<i>dunni</i>	<i>dünn</i>

The law is sometimes⁽¹⁾ stated thus :

	Class.	L. Ger.	H. Ger.
I.	A	S	H
II.	S	H	A
III.	H	A	S

Such statements of the shiftings are easily remembered and may be employed with advantage in elementary works to direct attention to the regularity of the changes. But we must not conclude from these popular statements that the change is from the Classical languages to the Low German, and from the Low German to the High German. High German is not derived from Low German, nor does it spring from Sanskrit or Greek or Latin. The change was rather from the "primitive" Indogermanic to the "primitive" Germanic, and from it to High German; the languages cited have a bearing upon the shiftings only in so far as they indicate what we may assume to have been the nature of the mutes in the respective "primitive" forms. Nor must we assume that the symbols A, S, H denote precisely the same sounds in the three columns and conclude that the movement is circular. That was Professor Earle's view when he wrote in his "Philology of the English Tongue" (pp. 6-7):—"A succession of small divergences, which run upon stated lines of variation—lines having a determinate relation to one another, and constituting an orbit in which the transitional movement revolves,—this is a phenomenon worthy of our contemplation. It is the simplest example of a fact which in other shapes will meet us again, namely, that the beauty of philology springs out of that variety over unity which makes all nature beautiful and all study of nature profoundly attractive." But the discourse is based on the misunderstanding of the text.

These considerations suggest another statement of the law. The first shifting may be set down as follows:—*In the Germanic branch the primitive Indogermanic mutes underwent a general shifting; the aspirates were changed, to media, the media to tenues, while the tenues become fricatives.* To the examples given above the following may be added in the other series.⁽²⁾

(1) As in Morris' "Historical Outlines of English Accidence."

(2) For convenience, High German equivalents are given here.

Sanskrit.	Greek.	Latin.	Gothic.	Anglo Saxon.	English.	O.H.G.	N.H.G.
<i>bhāj-</i>	<i>phagos</i>	<i>fagus</i>		<i>bec</i>	<i>bech</i>	<i>buohha</i>	<i>buche</i>
<i>bhuj</i> ⁽¹⁾	<i>phuego</i>	<i>fugio</i>	<i>biugan</i>	<i>bugan</i>	<i>boze</i>	<i>bougen</i>	<i>beugen</i>
<i>ṣana</i>	<i>kannabis</i>	<i>cannabis</i>		<i>hanep</i>	<i>hemp</i>	<i>hanaf</i>	<i>hanf</i>
<i>pad</i>	<i>pod-</i>	<i>(s)labricus</i> <i>ped-</i>	<i>sluþan</i>	<i>sluþan</i>		<i>slifan</i>	<i>schleifen</i>
<i>hamsa</i>	<i>por-eno</i>	<i>ex-per-ior</i>	<i>fofus</i>	<i>fof</i>	<i>foot</i>	<i>fuoz</i>	<i>fuss</i>
<i>hyas</i>	<i>chen</i>	<i>(h)anser</i>	<i>faran</i>	<i>faran</i>	<i>fare</i>	<i>faran</i>	<i>fahren</i>
<i>jna</i>	<i>chthēs</i>	<i>heri</i>	<i>gans</i>	<i>gos</i>	<i>-goose</i>	<i>gans</i>	<i>gans</i>
<i>janu</i>	<i>gi-gno-sco</i>	<i>(s)nosco</i>	<i>gistra</i>	<i>giestra</i>	<i>yester-</i>	<i>gestre</i>	<i>gestern</i>
<i>grad</i>	<i>gonu</i>	<i>genu</i>	<i>kunnan</i>	<i>cunnan</i>	<i>know</i>	<i>chennu</i>	<i>kennen</i>
<i>kāpala</i>	<i>kardia</i>	<i>cor(d)</i>	<i>keniu</i>	<i>eneow</i>	<i>knee</i>	<i>chniu</i>	<i>knie</i>
	<i>kephale</i>	<i>caput</i>	<i>hairto</i>	<i>heorte</i>	<i>heart</i>	<i>herza</i>	<i>hers</i>
			<i>haubith</i>	<i>heafod</i>	<i>head</i>	<i>houbit</i>	<i>haupt</i>

(1) These words, as Lanman remarks, "So far as the meaning goes may well be taken as cognate; but the Germanic raises phonetic difficulties which are not yet satisfactorily cleared up."

We must now seek to determine the time of this first general shifting. Our earliest sources of knowledge of the forms of the Germanic languages are the Germanic words quoted by Latin writers, as *sapo* by Pliny, *framea* and *glæsum* by Tacitus. If the Goths and Getæ are identical, the plant-names from Dacia given by a Greek writer, Dioscorides, deserve consideration.⁽¹⁾ Dating from about the same time are some words borrowed from the Scandinavians by the Finns and Lapps, as Finnic *nuotta* 'net' (Old Norse *not*), *raippa* 'rope' (O. N. *reip*), and Lappic *saipo* 'soap' (Swedish *sapa*), *diwres*, 'dear' (O. Sw. *dyr*): these words are quite numerous. Next in order of time we have a number of inscriptions in Rûnic characters from about 250 A. D., all of which are short; one from Wallachia, coming from heathen times, reads *Gutoniowi hailag* 'dedicated to the temple of the Goths.' Far more satisfactory as an evidence of the character of the language in early times is the translation of the Bible into Gothic made by Wulfila (311-381 A. D.); the most important of the manuscripts is of the sixth century, but the forms are certainly much earlier, for it is doubtful whether the language long survived the maker of the translation. Judging by these data we may safely conclude that the shifting began before the time of Christ; in the Gothic we find it practically complete.

The history of the alphabet also throws some light on the matter. Canon Taylor in his "Greeks and Goths" has urged strong reasons for believing that the Gothic runes were derived from the Ionian alphabet of about 500 B. C. Now the character, which in Greek represents *g*, in Gothic inscriptions denotes *k*, and we have a similar shifting of value from *ch* to *g*: this would seem to indicate the retention of old spellings after the sounds had changed. In the dentals the change of value is from *th*, *d* to *d*, *th* respectively, while the sign for *t* remains unchanged. Whatever conclusion we draw from these facts concerning the nature of the first sound shifting, we can see that the tendency to change did not cease for some time after the introduction of the alphabet among the Goths. Assuming that the words from which come our *hemp* and *path* were borrowed after the German tribes came into contact with Roman civilization, we find the tendency existing still later: but these words were in the language before *Kaiser*, which Kluge believes to be the first borrow-

(1) I do not know anything of these names further than that they are said to be of Germanic form.

ing from Latin. I do not know of any unshifted forms, known to be Germanic, from which we might learn of a time before the general spread of the changes, and so determine roughly the date of its beginning. As to the close of the period, there was no shifting when the words *apostol*, *candel*, *pawa* were introduced into Anglo-Saxon in the sixth or seventh century after Christ.

The second shifting remains to be considered. A reference to the illustrations given above will show that only in the dental series is the shifting complete in Modern German; *p* has become *f*; *b*, *f*, *g*, *k*, *h* remain unchanged. Grimm cited Old High German forms such as *prechan*, *pim*, *kans*, *chuni* to show the completeness of the circle of change; but even in the earlier periods of the language these are found alongside unshifted forms. The shiftings varied in different parts, and were most thorough in Upper Germany. To our partial statement of the law given on page 91 we may add generally that *the subsequent shifting was similar, but varied in extent in the several districts, modern literary German exhibiting a general change only in the dental series.*

We can very well determine the date of this movement. It took place as Sayce⁽¹⁾ points out, at a time subsequent to the wars between the Teutons and Romans which led to the overthrow of the Roman Empire; thus (*via*) *strata* and *campus*, our *street* and *camp*, became in Old High German *straza* and *kamph*, *champf*. The year 600 of our era is assumed to mark fairly well the setting in of the process, but its progress was slow; as late as 842 we meet *dag* (A. S. *daeg*, G. *tag*), and it is interesting, in connection with Mr. Sweet's remarks quoted on page 100, to notice that *godes* (G. *gottes*) existed then beside the nominative *got*.

It is customary to speak of "exceptions" to Grimm's law, and and here may be set down explanations of some forms which the law as stated fails to account for.

1. Onomatopoeic and imitative words at once suggest themselves. The sounds of the parent language remain practically unchanged in Gr. *klagge* (*gē* = *ngg*), L. *clangor*, E. *clang*, G. *klang*, and like words, for they are all imitations of like natural sounds. With these may be grouped such words as Gr. *pappa*, L., E. and G. *papa*, which are merely doublings of the earliest formed sounds

(1) Introduction i., 307.

serviceable for speech, and, as children's words, not likely to be influenced by the analogy of shifted forms.

2. Again we find the tenues regularly unshifted in certain combinations:—

	Gr.	A. S.	Eng.	O. H. G.	N. H. G.
<i>sk</i>	<i>skeptron</i>	<i>scaft</i>	<i>shaft</i>	<i>scaft</i>	<i>schaft</i>
<i>sp</i>	<i>spathe</i>	<i>spada</i>	<i>spade</i>	<i>*spato</i>	<i>spaten</i>
<i>st</i>	<i>aster</i>	<i>steorra</i>	<i>star</i>	<i>sterno</i>	<i>stern</i>
<i>ft</i>	<i>pemptos</i>	<i>fifta</i>	<i>fifth⁽¹⁾</i>	<i>funfto</i>	<i>fünfte</i>
<i>ht</i>	<i>okto</i>	<i>cahta</i>	<i>eight</i>	<i>ahto</i>	<i>acht</i>

The permanence of the tenues in these groups is evidently due to the presence of the surd spirants *s*, *f*, *h*. The variation in the *sk* group shown in many instances in modern English (*sh*) and in almost all in modern German (*sch*), does not belong to the primitive Germanic: the early documents of both languages preserve the *k*. Similarly in *fremde* the High German, because of the influence of the sonant *m*, has retained the *d* of the primitive Germanic seen in A.-S. *fremde*. The *d* of the M. H. G. preterite forms *nande*, *rumde*, *solde* is to be explained in the same way.

3. A number of seeming exceptions will readily be understood if we bear in mind the laws of sound change in the several languages. Take for example the cognates Skt. *duhitṛ*, Gr. *thugater*, Goth. *dauhtar*, A.-S. *dohtor*, E. *daughter*, G. *tochter*, which point to a primitive **dhughatar*. The change in Sanskrit from *dh* to *d* was evidently to avoid the use of an aspirate so near the *gh*; a similar dissimilation regularly occurs in Greek, as in *pephileka* for **phephileka*. Again, primitive 'mediæ aspiratæ' between vowels were often represented in Sanskrit by *h*. The *g* in Greek is an instance of a change often found, as in *egon* (Skt. *aham*), *mégas* (Skt. *mah*); compare also *brémo* (Skt. *bhramati*, Lat. *fremo*). The retention of *t* in Germanic forms has been explained already: the *h*, *gh*, *ch* require further consideration.

4. When the necessity was shown for postulating the existence of a language which stood in the same relation to the known language

(1) For the *th* see below; page 97.

ges of the Aryan family as Latin to the Romance languages, men thought that they were coming near to a knowledge of the primitive speech of man, and the simplicity assumed for it was supposed to belong to the primitive Indogermanic as well. For example the vowels *e*, *o* were assumed to have been developed at a time when the community had become divided, and similarly only three series of mutes (*p*, *t* and *k* sounds) were allowed to have been original. Now Skt. *jna* corresponds to Gr. *gignosco*, L. (*g*)*nosco*, Goth. *kunnan*, E. *know*; and Skt. *çata* to Gr. *hekaton*, L. *centum*, Goth. *hund*, E. *hundred*; but Skt. *jiv* as evidently corresponds to Gr. *bios*, L. *vivus*, Goth. *kwiuis*, E. *quick*; and Skt. *catur* to Gr. *tettares*, L. *quatuor*, Goth. *fidwor*, E. *four*. Just as it has been found necessary to assume that *e* and *o* existed in the parent language, so an understanding of these correspondences has been made possible by the recognition of an original palatal series (*k* sounds) and velar series (*q* sounds) in place of a single guttural series.

5. We come now to a series of shiftings first explained by Karl Verner, of Copenhagen, in 1875. In the comparisons given above (page 90) no mention was made of the familiar words *father*, *mother*, which at first seem to illustrate the law so well. In the Middle English equivalents of these words a *d* is almost always found in place of *th*. The following table will be found convenient:—

Skt.	<i>pitṛ</i>	<i>matṛ</i>	<i>bhratr</i>
Gr.	<i>patēr</i>	<i>méter</i>	<i>phrater</i>
Lat.	<i>pater</i>	<i>mater</i>	<i>frater</i>
Goth.	<i>fadar</i>		<i>brothar</i>
A.-S.	<i>faeder</i>	<i>modor</i>	<i>byppor</i> ⁽¹⁾
Mid. Eng. ^b	<i>fader</i>	<i>moder</i>	<i>brothér</i>
O. H. G.	<i>fater</i>	<i>muotar</i>	<i>bruodar</i>
N. H. G.	<i>vater</i>	<i>mutter</i>	<i>bruder</i>

A careful examination of such correspondences as these led Verner to the following conclusions:—1st, that the position of the primitive Indogermanic accent was not restricted as in classical Greek and Latin, or modern English and German; 2nd, that in the primitive Germanic the accent was still free in position, but was marked not only by a rising pitch of voice but also by stress secured by expul-

(1) In this and the following table the *th* sound in *thing* is indicated by inverted *t*, and that in *this* by inverted *d*.

sion of surd breath. The several stages in the history of our words *father* and *brother* may be set down thus:—

**patar*, **fajar*, **fapar*, **šadar*, Goth. *šadar*, A.-S. *faeder*, M. E. *fader*, Eng. *father*.

**bhratar*, **brozar*, ———, ———, Goth. *brozar*, A.-S. *broþor*, M. E. *broþer*, Eng. *brother*.

The law of change commonly known as Verner's law may be stated as follows:—*Primitive Indogermanic* k, (q), t, p, shifted without exception to the surd spirants h, th, f. But when the vowel next preceding did not originally bear the principal accent, primitive Germanic h, th, f, became the sonant spirants gh, dh, v, and later the sonant stops g, d, b. In other words, a surd standing between sonants tends to become sonant, unless some such influence as the expulsion of surd breath in accenting the syllable to which it belongs, counteracts that tendency and causes the retention of the surd.

This principle will explain how the Indogermanic participial suffix *-to* seen in Gr. *poietos*, L. *captus* appears in English as *-d* (*loved*), the original accent following the *t*, while the noun suffix seen in L. *cantus* appears as *-th* (*birth*), the original accent preceding the *t*; again, Skt. *antara* corresponds to Goth. *anþar*, E. *other*, G. *ander* while Skt. *antar* corresponds to Goth. *undar*, E. *under*, G. *unter*. It will explain also the differences in the singular and plural of such Anglo-Saxon preterites as *wearth*, *wurdon*; *beah*, *bugon*. The same principle is seen in what is commonly known as rhotacism, the change of *s* (in the Germanic languages through *z*) to *r*, in syllables originally unaccented. It is thus that we can connect the comparative suffixes of adjectives in Greek and Latin, originally showing *s*, with those of Gothic containing *z* and those of English containing *r*; and it is thus also that we can reconcile the Anglo-Saxon equivalents of such preterites as our *chose* (sing. *ceas*, plur. *curon*). The recognition of this important principle of sound change has served to make clear some obscure points even in non-Germanic languages.

6. Some seeming inconsistencies in Anglo-Saxon and English forms are to be attributed to our tendency to make words like others with which we are familiar. Such "levellings by analogy" are seen in the change from A.-S. *faeder*, *modor* to E. *father*, *mother* through the influence of *brother* (A.-S. *broþor*), and in that from A.-S. *fiþta*,

sixta, to *E. fifth, sixth*, by the analogy of such ordinals as *fourth, seventh*, (*A.-S. feortha, seofotha*), etc.

Enough has been said in regard to this matter to show the wisdom of requiring a physical explanation for every sound-change which we can trace historically, except when there is sufficient evidence of the workings of analogy. We must keep in mind both physical necessities and mental associations. On the relation of these two influences Sayce has said⁽¹⁾:—"It must not be supposed that all the changes of pronunciation that serve to distinguish one branch of the Aryan stock from another took place simultaneously. On the contrary, they were slow and gradual; first one and then another new fashion in sounding words sprang up and became general; when once the new pronunciation had from any cause taken a firm hold of the community, analogy caused every word to be submitted to its influence, unless special reasons, such as accent, stood in the way, until in course of time the process of shifting the sounds was completed."

A question remains: How are we to account for these extensive shiftings in the Germanic group and it alone?

1. At first, when it was thought necessary to assign reasons, climatic influences were appealed to, but we were not told what precise influence on speech-sounds was exercised by the various varieties of natural surroundings. Now it must be admitted that cold and warm, mountainous and low-lying districts have characteristic modes of utterance, especially in the position in which the sounds, whether vowels or consonants, are formed. I do not know of any evidence that changes from sonants to surds or from mutes to fricatives in the same position are due to similar influences. Granting that there is such evidence, it is hard to see what have been the peculiar climatic conditions of the roving Germanic peoples.

2. From Max Müller comes the following theory⁽²⁾:—"The Aryans before their "separation" possessed at least the three orders of mutes seen in *dʰ, d, t*. The Latins lost the aspirates and were content to denote them by spirants (*f, h*) or mediæ. The low German tribes also lost the aspirates, denoting them by mediæ, but for purposes of distinction pronounced original mediæ as tenuous, and again were forced to represent the tenuous by the fricatives. The

(1) "Introduction" i. 308.

(2) Science of Language, Vol. II., Lecture V.

High-German similarly, substituting tenues for the original aspirates, had to employ mediæ for original tenues and breaths for original mediæ.—The mistake of assuming that the so-called Low and High German shiftings were contemporaneous has been shown above (p. 91). The account of the second shifting is quite misleading; the value of the explanation suggested for the first may better be considered later.

3. The anthropologists have shown that from the earliest times men of more than one race have spoken Aryan languages, and there is much to favor the view that the divergences we have noticed are due, at least in part, to the acquirement of the language by a people of another race. Canon Taylor⁽¹⁾ notices a significant fact connected with the second shifting. "By race the North-west region of German speech is largely Teutonic, the Eastern Lithuanian and Slavonic, the central region is Celtic, and the Southern is Ligurian. During the last thousand years German speech has been slowly winning back its lost provinces, but without displacement of population. The Low German speech of the conquerors was modified when it was acquired by the native tribes. The primitive Low German dialects are only spoken in those Frisian and Dutch districts which are Teutonic in blood as well as speech." Experience shows the correctness of the following:—"We may take it as an axiom that, whenever a new language is acquired by foreigners or by subject races, there will be a class of sounds which will be pronounced with difficulty and will therefore as a rule be evaded or inaccurately pronounced. *This is especially the case with the soft and aspirated mutes.*" (V. 5.) The Germanic languages seem to have departed furthest from the primitive sound system and to have lost more than others of the primitive inflections. This accords well with the theory that the Germanic peoples were originally non-Aryan.

4. No theory, however, concerning the general Germanic shifting can be considered satisfactory, if it fails to take account of similar changes occurring to a limited extent in several cognate languages.

- (a) In old Iranian *p, t, k* were unchanged only before vowels and after sibilants; otherwise they became spirants, as Avestan and Old Persian *fra*, Skt. *pra*, Gr. *pro*, Lat. *prio*, E. *for*. In Greek they seem to have retained generally their form of

(1) Origin of the Aryans, Ch. V. 2.

articulation. "In some districts" says Brugmann "especially in Attica the sounds appear to have been spoken for a long time with aspiration. Yet from the inexactness and inconsistency of the written representation it is not possible to determine accurately the extent of the tendency." In the Umbrian and Oscan dialects in Italy *kt* and *pt* became *ht* and *ft*, as Umbr. *rehte*, L. *recte*; Osc. *Uhtavis*, L. *Octavius*. In Old Irish after vowels *t* and *c* became the spirants *th*, *ch*, as *mathir*, L. *mader*, E. *mother*, etc.

- (b) In Armenian *mediæ* became tenues, as *tiv*, Skt *div*, L. *dies*.
 (c) In Iranian, Old Irish and Balto-Slavic, for the most part in Armenian, and medially in Latin, aspirated *mediæ* became simple *mediæ*, as Lat. *medius*, O. Ir. *medon*, Skt. *madhya*.

Similar shiftings in Greek have been noticed above (p. 95). The Germanic shiftings may be due to such causes, whatever they were, as produced the changes just noticed, only that the former became general probably by the working of analogy. "Most sound-changes," remarks Sweet⁽¹⁾ "seem to begin under special circumstances, and if they do extend themselves over the whole range of the sound in question, it is only gradually. A change such as that of *d* into *t* may begin at the end of a breath-group, and be then extended to the ends of words within a breath-group, as in German, and finally to all the *d*'s in the language, as when every Arian *d* became a *t* in Germanic." In the Germanic, with its want of a literature, or, as Canon Taylor would rather say, because of the want of a literature in the language adopted by the Germans, there was no language-tradition strong enough to secure unshifted forms against the influence of analogy; while on the other hand the people of India, Persia, Greece and Rome used a language which was in a manner fixed in literature.

The last word has not been said on Grimm's law. Enough general statements have been made concerning it, and numberless conclusions made regarding the early relations of the peoples with whose languages it has to do; but how few of these are trustworthy! Stricter methods, it is to be hoped, will give more reliable results. Especially a better determination of the nature of the sounds in question, and a careful study of the High-German shifting and of modern German dialects may make clear many things that are yet obscure.

(1) Grundriss I. Sect. 486.

(2) History of English Sounds, p. 16.

ANGLICISMS IN LOWER CANADIAN FRENCH.

Read before the Philological Section, April 23rd, 1891.

BY H. P. BONNY.

The subject of which this paper treats should be one of considerable interest to us as Canadians; and, from a philological point of view, it must always prove a matter worthy of attention to notice the effects produced upon language from the intimate association of two races speaking different tongues, yet united under the same central government. This paper is little more than a collection of specimens of the Anglicisms in common use in Quebec, hastily gathered from such sources as I had access to. Still, if I can but induce others to take up the subject, my labor will not have been altogether in vain. The majority of my illustrations are to be found in M. Alphonse Lusignan's "Fautes à corriger" and in the corrections published by him in the columns of *La Patrie*, under the heading of "Corrigeons-nous." I am under a lasting obligation to M. Lusignan, not only for his kindness in authorizing me to use any matter bearing on my subject written by him, but also for the trouble he has taken in answering certain questions I propounded. He, moreover, wrote in my behalf to M. Napoleon Legendre, of Quebec, who has kindly presented me with his most valuable little work entitled "La Langue Française au Canada," which has been of great use to me in preparing this paper. Mr. Robert Sellar, of Huntingdon, was kind enough to write a letter full of information bearing on the subject, from which I will quote later on.

I will divide the Anglicisms into five classes:

- (1) Colloquial;
- (2) Journalistic;
- (3) Legal;
- (4) Commercial;
- (5) Parliamentary.

In most, if not all languages, we find certain words performing yeoman service—for instance, the verb *faire* in French and the substantives *Schlag* and *Zug* in German. Mark Twain remarks of the

two words above mentioned: "In Germany, when you load your conversational gun, it is always best to throw in a *Schlag* or two and a *Zug* or two, because it does not matter how much of the rest of the charge you may scatter, you are bound to bag something with them." In English, "box" and "set" will serve for examples of words conveying meanings which in other languages it requires a number of different words to define. Hence we find the French Canadian using our word "set" instead of *parure* if he is speaking of a set of diamonds; of *meuble* or *meublement* if furniture is under consideration; of *serie* or *collection* in the case of books; of *service* if a tea set is spoken of. Then we have *set de broches à tricoter* instead of *jeu de broches*, etc., "a set of knitting-needles;" *set de dents* for *dentier*, "set of false teeth;" and many other instances.

In English we have the word "epergne" to designate a sort of table ornament. It looks and sounds very much like a genuine French word, but you will not find it in Littrè. It has found its way into the language of our neighbors in Quebec to take the place of *surtout de table*.

If a young man is about to take unto himself a wife we say "he is going to marry so-and-so," and we accordingly find some French Canadians borrowing this expression and saying *il va marier telle ou telle* when they should say *il épouse*, etc., or *il va se marier avec*, etc.; *il va marier* would mean that he intended to give his sister or some one in marriage. Our English "stand" in the sense of "cabstand" is in common use instead of *place de fiacres*. Our verb "to originate" appears in the form *originer* instead of *provenir* or *tirer son origine*.

If we are certain about something we say "I am positive of it;" this phrase has been borrowed and *J'en suis positif* is found taking the place of *J'en suis sûr, certain*. "Castor oil" becomes *huile de castor* instead of *huile de ricin*: *huile de castor* would mean "beaver oil." An *almanach des adresses* or *bottin* is often converted into *directoire* or *directory*. A locomotive is frequently called an *engin* from our engine. Sometimes a French Canadian is found saying: *Venez que je vous introduise a Mlle. telle ou telle*, making use of a literal translation of our word "introduce," when he should say *Venez que je vous présente*, etc. The housewife will talk of *coalail, sassepanne, fleur*, and *sideboard*, instead of *pétrole, casserole*, or *coquemar, farine* and *buffet*. Her husband will speak of his *bottes de cuir patent* instead of *cuir verni*, and, if he be a sportsman, of his *ammunitions*

instead of munitions. *Je vous fais apologie* is used instead of *je vous fais excuse*; *change pour un dollar* often takes the place of *monnaie pour un piastre (dollar)*. *Elle chante à la perfection* is used instead of *en perfection, dans la perfection*.

Among other colloquial Anglicisms may be mentioned: *payer un compliment* for *adresser un compliment*; *payer ses respects* for *présenter ses respects*; *salle à diner* for *salle à manger*; *loquet* for "locket" instead of *medaillon (loquet is a door latch)*; *consistant* for "consistent" instead of *logique, conséquent*; *avoir de trouble* for *avoir de peine, difficulté, mal*; *permettez que je vous trouble*, etc., for *que je vous dérange*, etc. Then we find a number of English verbs adopted and conjugated according to the first conjugation, for example:—*bouncer, bolter, blackballer, biter* (to beat), *scréper* (to scrape), *slaker* (to slack), *logher* (to log), *saider* (to side track). This last example is a very convenient Anglicism, for its French equivalent is *pousser les wagons sur une gare d'évitement*.

I will conclude this list of colloquial Anglicisms with a choice specimen of Acadian French, quoted by M. Lusignan, from an article on the French Canadian press that appeared in a French review:—"Je voudrais bien vous *driver*, mais ce matin j'attelai mon *team*, et à peine sortie de la *stable* les chevaux prennent leur *race*. Ah! ça allait *fast*! Et quand je vins pour *dévirer* [O. F. = tourner] le *corner*, je tombe par terre, les chevaux partirent tous seuls. Ils furent *pognés* [O. F. = blessés] et je fus *findé*."

I will now proceed to the Anglicisms to be met with in the daily papers. First of all, here is a list of words which, although French, are often printed as spelt in English: *libel, rebel, traffic, exercise, dance, license, sulphuric, tansy*, for *libelle, rebelle, trafic, exercice, danse, licence, sulfurique, tanaïsie*. Names of foreign cities are frequently to be met with in their English form instead of the French one: thus we have *Antwerp, Leghorn, Athens, Cairo, Mecca, Hague*, etc., for *Anvers, Livourne, Athènes, Le Caire, La Mecque, La Haye*, etc. We find *un éditorial* or *un article éditorial* used in the place of *un article de fond, de tête de la réduction, premier Montréal, Québec*, etc.; *deputé-ministre* for *chef du bureau au ministère*; *il est rumeur que* for *on dit*; *hydrant* for *borne-fontaine*; *hose* for *boyau*; *plant for le matériel, outillage*; *collecteur* (collector) for *garçon de recettes*; *adresser une assemblée* for *haranguer, faire un discours, porter la parole, adresser la parole, s'adresser à une assemblée*; *lecturer for*

faire un discours; *l'attraction de la semaine* instead of *l'attrait*, etc. [this Anglicism has also made its appearance in France]; *damme* (dam) for *digue, barrage artificiel*; *bris de promesse de mariage* for *rupture*, etc.; *baronnesse* for *baronne* [*baronnesse* was used in France in the XV. century]; *assaut* (assault) for *attaque*; *plastrage* for *plâtrage*; *plombeur* for *plombier*; *site* (site of a building) for *siège, emplacement*; *comité de santé* (board of health) for *commission d'hygiène*; *medecin de santé* (health officer) for *hygiéniste public*; *connexion, connection*, for *raccordement* (in speaking of train connections); *tramps* for *vagabonds*. These are only a few of the Anglicisms to be met with in the columns of the press. Among the advertisements you will come across such specimens as *grocerie, groceur* for *épicerie, épicier*; *gauts de kid* for *gauts de chevreau*; *briques à feu* (fire bricks) for *briques réfractaires*; *il y a une belle ouverture* (there is a fine opening) for *une belle occasion s'offre, il y a une bonne chance de réussite*; *notice* for *avis*; and a very large number of others.

The members of the bar are great offenders against the purity of their mother tongue. Here are a few examples of legal Anglicisms:—*réferer à la file* for *consulter la liasse*; *identifier* for *constater l'identité*; *commenter le presentement* for *commenter le rapport*; *grand jury* for *jury d'accusation*; *petit jury* for *jury de jugement*; *je crois avoir satisfait le tribunal* for *je crois avoir prouvé au tribunal*; *je suis satisfait* for *je suis convaincu, persuade*; *boîte aux temoins* for *la barre, barre du tribunal*; *boîte aux coupables, accusés* for *banc des accusés, prévenus*; *filer une application* for *déposer*, etc.; *le terme de la cour est clos* for *la session*, etc.

In commercial life the number of Anglicisms is legion. M. Lusignan informs me that nearly all the terms in use in factories and workshops are English, and that the same is true of nautical terms employed on the St. Lawrence. Some other Anglicisms to be met with in the commercial world, are:—*rencontrer un billet* (to meet a note) for *payer un billet, faire face à, acquitter*, etc.; *lettre enregistrée* for *lettre chargée*; *je collecte mes comptes* for *je fais mes recouvrements, je vais faire mes rentrées*; *transiger des affaires* (transact business) for *faire des affaires, échanger, échanger, casher une cheque* for *encaisser*, etc.; *maller une lettre* for *mettre une lettre à la poste*; *billet promissoire* for *billet*; *investir* (to invest) for *placer*; *investissement* for *placement*; *acheter en approbation* for *acheter a l'épreuve, a l'essai*; *très payant* for *très lucratif*.

In the Dominion House of Commons Anglicisms occasionally drop from the lips of honorable members from Quebec, and I think the worst specimen I have met with has been heard in Ottawa more than once: *moi pour un* (me, for one) for *pour moi, quant a moi, en tant que j' y suis concerné*, etc. Then we have *l'année financière*; *rappeler une loi* for *rapporter une loi*; *voteur* for *votant, électeur*; *les argents publics* for *sommes, deniers, crédits publics*; *un règlement est en force* for *un règlement est en vigueur*; *supporter* for *appuyer*; *dépêche des affaires* for *discussion, examen, prise en considération*, etc.; *membre* for *député, représentant*; *résumer le debat* for *repréndre le debat* [*résumer = to analyse*]; *était opposé par les députés* for *était combattu*, etc.; *législater* for *légiférer*; *faire application* for *demander, solliciter, soumissionner*; and many others.

Before proceeding further I may as well state that the above division into classes is merely for convenience of reference, and does not preclude the possibility of an Anglicism quoted under one heading being classed under one or more of the others. In addition to the Anglicisms already given, I will quote the following miscellaneous ones: *indictement* for *acte d' accusation*; ⁽¹⁾ *qualification* is used in the same sense as in English, instead of *capacité, aptitudes*; *billets complimentaires* for *billets de faveur*; *aller faire prendre un portrait* for *aller faire faire, aller faire tirer un portrait*; *sous ces circonstances* for *dans ces circonstances*; *je vous observe que, je vous remarquerai que* instead of *je vous fais observer que, je vous serai remarquer que*; *un bloc de maisons* for *un pâté de maisons*; *dépôt* for *gare, station*.⁽²⁾

With the view of gaining as much information as I could about the use of Anglicisms in Quebec, I opened up a correspondence with the gentlemen mentioned in the beginning of this paper. M. Lusignan, before replying, submitted the letter I wrote to him to a club of leading French Canadians in Ottawa, to see whether their views coincided with his own. My first question was: "Is the use of the English language increasing or decreasing among the French Canadians of the Cities of Montreal and Quebec?" The reply to this was:—

(1) This word, although borrowed by the French-Canadians from the English, is found in Old French. It is going out of use in Quebec.

(2) This last example is a curious instance of a word being borrowed by the Americans from the French, and employed in a sense very different from anything for which it is used in France, finding its way back into the vocabulary of a French speaking people with its new meaning. It is not likely to live for any length of time, for educated French Canadians are waging war against it.

1. "The knowledge of English is increasing among the French Canadians of these two cities; it is almost general in the case of men and children.
2. Its use is more extended, owing to the growing importance of business interests and the increase of population.
3. The French Canadians do not make greater use of it in their intercourse with one another.
4. The language is more carefully taught in educational institutions."

To the second question: "Do the working classes mix many English words and expressions with their French?", the reply was: "Yes, a great number. All nautical terms from Ottawa to Gaspé are English, and English, or Anglicised French, is used in the lumbering operations. Nearly all the terms used in factories and in the various trades are English. The number of Anglicisms is legion, even in the press and among members of the bar."

My last request was for information about literature bearing upon the subject. M. Lusignan gave the names of several works, but stated that they were out of print and not easily obtained. He informed me, however, that M. L. Fréchette is preparing a work on the French of Canada, but that it would be some years before it is completed.

I next wrote to Mr. Robert Sellar, editor of the *Huntingdon Gleaner*, and his reply is all the more valuable when the fact is taken into consideration that, not being a French-Canadian, race prejudice cannot possibly bias his views. He stated that to the best of his knowledge "English has no leavening influence upon French as written in the Province of Quebec; that French writers give point to what they say by occasionally quoting an English phrase or maxim; and that in writing upon mechanical or business subjects they frequently use English words." He gave an instance, clipped from a French Canadian paper, which I will quote: "La police de toutes les villes voisines fut immédiatement avertie, et on espère reprendre l'évadé vu qu'il porte une marque difficile à cacher; un *black eye* des mieux conditionnés que Mackie lui fit en le capturant."

Mr. Sellar further stated: "The habitants have incorporated many English words in their vocabulary for the reason that the English term is shorter than its equivalent in French." I asked him

whether he thought there was any likelihood of English ultimately becoming the spoken language of Quebec. He replied: "There are probably three or four times as many French Canadians who speak English as there were twenty years ago, but they do not use English in speaking among themselves. They find that it is to their interest to learn English, that they cannot get on in the world unless they do, and they show a laudable eagerness to acquire the coveted language. Parents sacrifice a good deal to send their children to English schools, and one of the attractions of the so-called colleges and commercial academies that have sprung up so thickly within the past dozen years is that they teach English. The French have the faculty of language in a marked degree, and learn English with a facility that is astonishing to the Anglo-Saxon. In another century, perhaps a shorter period, the French of Quebec will be described as a bi-lingual people, but that they will cease to use their mother tongue I consider improbable. My reasons for such conclusions are:—

1. "The natural, the divinely implanted love for one's mother tongue.
2. The influence of the clergy and the politicians.
3. The disappearance of the English element from the rural parts of Quebec.
4. The existence of a sufficient mass of French-speaking people to resist outside influence. When you find a body of over a million, compact and autonomous, it is absurd to expect that they will change their speech."

In addition to the reasons already given for the continued use of the French language by our fellow-citizens in Quebec, there is another very important one. There is a determined effort being made by the literary men of Quebec to free their language, as much as possible, from the Anglicisms at present in common use, and this effort is meeting with considerable success. M. Lusignan's censorship in the columns of *La Patrie* is most evidently exercising a decided influence upon the French of the daily press.

Canada has no reason to be ashamed of her French Canadian authors. Two of them have already enjoyed the honor of being crowned by the Academy of France. L. H. Fr chet te, Cremazi , Benjamin Sulte and L. Pamphile LeMay are French Canadian poets all marked by purity of style, excellence of verse, and an intense

patriotism. Dr. Larue and Ernest Gagnon have distinguished themselves as ballad writers, Garneau and Abbé Ferland are no mean historians, and I might give you the names of many other French Canadians who are aiding in building up a national literature; for the writings of our French-speaking fellow-citizens are Canadian in every sense of the word. We must no longer labor under the delusion that the French Canadians speak a mere patois or jargon of archaic and Anglicised French. The language spoken in Quebec is little else than the French of Racine and Voltaire, enriched by many words and expressions created and employed to express things peculiar to the country and its climate.

United by the triple-bond of faith, speech and customs, the people of Quebec are not likely to fall an easy prey to our own aggressive mother-tongue. When it is taken into consideration that they are ministered to by priests who speak the purest of French, it is easy to understand how it is that they manage to withstand so successfully the influence of intercourse with ourselves. In fact, in many instances, Lower Canadians of Anglo-Saxon origin have become as French as their neighbors. Prof. Elliott, of Johns Hopkins University, says in the course of an interesting article on the French in Canada:—"As a natural effect of this rapid increase in population we find a gradual uprooting of the weaker race in point of numbers, that is to say the English. The wonderfully absorbing power of the French element in Lower Canada has here produced the curious phenomenon of a people, in certain parts of the country, who bear all the racial characteristics of the English or Scotch, such as blue eyes, light hair, florid faces, and who have the names of Warren, Fraser, McDonald, McPherson, etc., but also are still unable to speak a word of the mother tongue. The English names of roads, of towns, of counties, give abundant proof as to who were the occupants of the soil a few years ago. To-day it is the offspring of the Gallic stock that possesses the land. Their unswerving purpose, encouraged by the clergy, is to take back their old domains by the peaceful process of repopulating them with descendants of their own blood, and, at the present rate of increase, we may safely predict that it will not be many generations before they shall have accomplished this unique feat."

It is hardly the place in a paper like this to touch upon the political side of the subject. It is a significant fact, however, that

the French Canadians, in spite of all manner of obstacles thrown in their way, have succeeded in having their own tongue placed on an equal footing with ours in the Dominion Parliament and the Supreme Court.

I have not touched upon the influence of English upon the language of the French Canadians in the New England States, where they are placed under very different conditions to those which exist here. The fact is, I have had neither time nor opportunity to gather many facts bearing on the matter. From what little information I have been able to obtain, it seems that, in many instances, the French Canadian in the United States has become so far Americanized as even to translate his name. Thus we find Lenoir, Leblanc, Lebrun, etc., metamorphosed into Black, White, Brown, etc.

I will close this paper with a quotation from Louis Fréchette's "Pêle Mêle," where he is speaking of Jolliet and the old French pioneers who laid the foundations of civilization in our noble Dominion :—

"Et toi de ces héros généreuse patrie,
Sol Canadien, que j' aime avec idolatrie,
Dans l' accomplissement de tous ces grands travaux
Quand je pèse là part que le ciel t' a donnée
Les yeux sur l' avenir, terre prédestinée,
J' ai foi dans tes destins nouveaux."

Report of the Biological Section.

HAMILTON ASSOCIATION,

SEASON 1890-1891.

A. E. WALKER, Esq., *Chairman.*

THOS. WM. REYNOLDS, M. D., *Secretary pro. tem.*

The work of the Section during the past season has in spite of many difficulties been carried on with a very fair amount of success, and the interest that characterized former meetings has still been maintained. The great difficulty that has been encountered has been the removal from the city of some of the prominent workers, a loss which has been particularly felt, coming so soon after Dr. Burgess' removal. The members referred to are J. Alston Moffat and A. W. Hanham. Both gentlemen have rendered valuable services to the Section, especially in Entomological work. Mr. Hanham was perhaps best known by his work in Conchology, to which he devoted great attention of late; he was also at the time of his leaving the city Secretary of this Section. His place as Secretary has for the time been filled by the election of Dr. Reynolds. While we regret the loss of these members, there is, we are pleased to say, an influx of new workers, while a number of our old members are still with us and rendering valuable aid. Mention must be made of the many interesting notes on all branches of Natural History that have been furnished by Mr. Yates, of Hatchley, a corresponding member of the Association, whose name is well known to readers of our Transactions. During the summer of 1890, as in that of 1889, the members held their meetings at the residence of Mr. Alexander, and spent several pleasant and profitable evenings. Mr. Alexander has also furnished the Section some interesting notes on the Flora of his summer residence amongst the islands of the Georgian Bay. As intimated, through the exertions of Mr. Hanham, who has been

greatly assisted by Mr. George Leslie, a large addition has been made to our list of Shells for the district. Mr. Alexander has also made extensive additions to the Herbarium. In addition to the series of notes by Mr. Yates, presented from time to time, many other papers and items of interest have been brought forward, notably a paper by Mr. J. B. Turner on the Anatomy of Birds, and one on Comparative Forms of Animal and Vegetable Life, by Mr. A. E. Walker. During the coming summer it is expected that good work will be accomplished, and as many field days as possible will be organized in addition to the other work that may be done.

REPORT ON CONCHOLOGY.

Since May 1st, 1890, the following species have been added to the Hamilton List :—

ZONITES INTERTEXTES, *Binney*.

Taken by Geo. M. Leslie, May 24, 1890.

ZONITES MULTIDENTATUS, *Binney*.

Taken by Mr. A. W. Hanham, Nov. 6, 1890.

ZONITES FERRUS, *Morse*.

Taken Nov. 6, 1890, by Mr. Hanham.

ZONITES BINNEYANNUS, *Morse*.

Taken by Mr. Hanham.

HELIX PULCHELLA VAR. COSTATA.

Taken April 21st, 1891, by J. H. Lemon.

LIMNÆA COLUMELLA (?)

Taken by Mr. Hanham.

LIMNÆA REFLEXA, *SAY*.

Taken by Geo. M. Leslie.

LIMNÆA ———.

Two specimens of a *Limnæa*, taken by Mr. Hanham, are likely to prove new.

Considering the small number of collectors, this is a good showing for one year's work.

The taking of *Helix pulchella* Var. *costata* is of much importance, as I think this is its first appearance in Canada.

Besides the finding of these new species much other work has been done.

Our *Limaxes* have been identified as

LIMAX AGRESTRIS, Linn.

LIMAX CAMPESTRIS, Binney.

TEBENNOPHORUS CAROLINIENSIS, Bosc.

Specimens of a *Zonites*, taken in 1890, have been identified as *Zonites suppressus* (Say.) and more specimens have been found.

Several good specimens of *Unio Subovatus* have been taken from Hamilton Bay. This species was added to the list on the strength of a few detached valves, but is now fully entitled to be recorded. A large specimen, taken August 23, was alive. This is the only live specimen taken here.

Mr. Hanham, during the summer of 1890, took several shells which are very rare here, and so strengthened their records very much.

A considerable number of dead shells of an *Amnicola*, which is considered by Mr. Pilsbury to be a new species, has been taken, and it is hoped that some good specimens will be found this summer. Mr. Hanham took the first specimen in 1889.

Last year several searches were made in localities which were quite new, and always yielded something interesting or new. It is hoped that the same will be done in 1891.

After a storm in the spring of 1890 Mr. Hanham collected a very large number of shells which had been cast up from the Bay. It was hoped that a like opportunity would present itself in 1891, but such was not the case.

GEO. M. LESLIE.

The following is a list of the shells which have been taken up to date in this District.

TERRESTRIAL.

1. *Limax agrestis*, Linn. Common.
2. " *campestris*, Binney. "
3. *Tebennophorus Caroliniensis*, Bosc. Common.
4. *Zonites fuliginosus*, Griff. Rather rare.
5. " *intertextes*, Binney. Rare.
6. " *nitidus*, Müll. Common.
7. " *arboreus*, Say. "
8. " *radiatulus*, Alder. Not common.
9. " *indentatus*, Say. Rare.

10. *Zonites indentatus*, Var. This is the variety with the open umbilicus. Rare.
11. " *minisculus*, Binney. Rare.
12. " *ferrus*, Morse. Rare.
13. " *exigius*, Stimpson. Rare.
14. " *multidentatus*, Binney. Rare.
15. " *fulvus*, Drap. Common.
16. " *milium*, Morse. Rare.
17. " *Binneyanus*, Morse. Rare.
18. " *suppressus*, Say. Rather rare.
19. *Helix* (*Patula*) *alternata*, Say. Common.
20. " " *perspectiva*, Say. Rare.
21. " " *striatella* Anth. Common.
22. " " *lineata*, Say. Scarce.
23. *Punctum* *Pygmæum*, Drap. Scarce.
24. *Helix* (*Mesodon*) *Throides*, Say. Common.
25. " " *albolabris*, Say. Common.
26. " " *Sayii*, Binney. Rare.
27. " (*Stenotrema*) *monodon*, Rack. Uncommon.
28. " " " Var. *Fraternum*, Say.
29. " " " Var. *Leaii*, Ward. Rare.
30. " (*Triodopsis*) *tridentata*, Say. Common.
31. " " *palliat*a, Say. Rather rare.
32. " (*Vallonia*) *pulchella*, Müll. Common.
33. " " " Var. *costata*. Rare.
34. " (*Strobila*) *labrynthica*, Say. Rare.
35. *Pupa fallax*, Say. Common but local.
36. " *corticaria*, Say. Rare.
37. " *armifera*, Say. Common but local.
38. " *contracta*, Say. Rather common.
39. " *milium*, Gould. Rare.
40. *Vertigo ovata*, Say. Rather rare.
41. " *ventricosa*, Morse. Rare.
42. " *pentadon*, Say. Rather common.
43. *Ferussacia subcylindrica*, Linn. Common.
44. *Succinea avara*, Say. Rather common.
45. " *obliqua*, Say. Common.
46. " *ovalis*, Gould. Common.

FRESH WATER MOLLUSCA.

47. *Carychium exigium*, Say. Common.
48. " " " Var. *Exilis* Lea. Common.
49. *Limnæa stagnalis*, Linn. Common.
50. " *palustris*, Müll. Common.
51. " *humilis*, Say. Common.
52. " *desidiosa*, Say. Common.
53. " *caperata*, Say. Not common.
54. " *gracilis*, Jay. Rare.
55. *Physa gyrina*, Say. Common.
56. " *heterostrophia*, Say. Common.
57. *Bulinus hypnorum*, Linn. Common.
58. *Planorbis campanulatus*, Say. Common.
59. " *trivolvus*, Say. Common.
60. " *bicarinatus*, Say. Common.
61. " *albus*, Say.
62. " *deflectus*, Say.
63. " *exactus*.
64. " *parvus*, Say.
65. " *nautilus*, Linn. Rare.
66. " *armigerus*, Say.
67. *Ancylus rivularis*, Say. Rather rare.
68. *Valvata tricarinata*, Say. Common.
69. " *sincere*, Say. Common.
70. *Melantho decusus*, Say. Common.
71. *Ammicola limosa*, Say.
72. " " var. *pallida*.
73. " *Cincinnatiensis*.
74. " sp.
75. *Pomatiopsis Lapidaria*, Say. Rather common.
76. *Pleurocera Subulare*, Lea. Common.
77. *Goniobasis livescens*, Menke. Common.
78. *Sphærium Sulcatum*, Lam. Common.
79. " *rhomboideum*, Say. Rare.
80. " *truncatum*, Linsley. Rare.
81. " *partumeium*, Say. Not common.
82. " *stramineum*. Common.
83. " *occidentale*. Common.
84. *Pisidium abditum*, Prime.

85. *Pisidium compressum*, Prime. Rare.
86. *Unio alatus*, Say. Rare.
87. " *gracilis*, Barnes. Rare.
88. " *gibbosus*, Barnes. Rare.
89. " *complanatus*, Sol. Common.
90. " *Nasutus*, Say. Common.
91. " *Luteolus*, Lam. Common.
92. " *subovatus*, Lea. Rare.
93. " *pressus*, Lea. Common but local.
94. *Margaritana marginata*, Say. Rare.
95. *Anodonta ovata*, Lea. Rare.
96. " *plana*. Common.
97. " *Benedictii*, Lea. Common.
98. " *fluviatilis*, Dillwyn. Common.



NOTES ON DOMESTIC ANIMALS.

Read before the Biological Section.

BY WM. YATES, HATCHLEY.

Some years ago we remember being much interested in reading an article in Dickens' *All the Year Round*, under the heading "What Horses think of Men." To get at a true surmise of the condition of animal intelligence the thesis seemed to us to start at the right point, and to people whose business it is to have the care and training of farm animals there were useful suggestions to be gleaned from its perusal.

A majority of our farmers take much pride in dilating on the grand qualities and accomplishments of the horse, and the charm that the education of the horse is known to have for our tillers of the soil seems to be that that animal is amenable to judicious treatment, and that his disposition and idiosyncrasies are a reflex image of those of the human being, to whose management and tutorship his "breaking in" has been intrusted; and also that the intelligence of the animal is capable of being usefully modified and extended by gradual and repeated incentives to the obedience of a superior will.

We think that it can also be shown that the bovine race are nearly as plastic and impressionable from exterior sources as are their equine associates of the field or barnyard, and, in fact, the assumptions apply with greater or less truth to nearly all the tribes and classes of inferior animals.

In the course of a number of years of observation and familiarity with the habits, instincts and behaviour of the bovine tribe as exemplified in the pastures and in the cattle byres, we have become convinced that these latter possess strong claims to more than a glimmering of reason, and that in a rudimentary form the workings of those higher brain faculties, that are sometimes exclusively claimed for human beings, are not unfrequently demonstrated by cows and oxen. We feel quite sure that they are not only capable of drawing the plough and the harrow, but that they can draw *inferences* too, and are sometimes far from slow at taking a hint, and

this sometimes, not to the benefit or exclusive interest of their human proprietors, in fact they are rather apt sometimes to improve on his teaching and to carry the *morale* of his tuitions beyond the point of strict economics and strict regard to the thriftiness of field crops.

In their emotional nature, too, we may see that they display more than a faint copy of semi-human traits. In their devotion to their young offspring—in their sympathy with each other in moments of danger—in their demonstrations of hope, fear, indignation and revenge they give evidence of a long memory and an invincible inclination to pay off old scores. In fact there would seem to be no reason to doubt the rationality of brutes—that is, their capability of inferring results from past experience.

In brutes, as in human beings, there is a gradual accumulation of experience, beginning at the zero level of birth, and culminating in a degree of sagacity that keeps the inventiveness of the stockman on the alert to baffle and out-mancœuvre. The young calf has not only instinct, but an inquiring gaze may be noticed in its eyes on the approach of a moving object, and its mental acquisitions ascend through a scale of faculties that seem identical with those of psychological growth in a child.

In the adult ox or cow we can see a change of attitude and plan of operations, in conformity with a change of surrounding circumstances, and they have much self-will and adaptability in overcoming opposing influences.

Hunger and thirst are the impelling energies of their lives—and in the animal world the whole tuition of seniors seems to consist in imparting to the young the knowledge of *what to seek and what to avoid*. They teach them *not* to trust to appearances, that the world is full of snares and illusions, and that eternal vigilance and suspicion is the price of safety. This is more obviously true of wild or semi-wild animals, and cattle that roam the wild woods are much more noted for cunning and acuteness and abundance of resources than such as are waited on and regularly fed by the stock-keeper.

A well known source of expense and trouble to the farmer is the tendency of animals to jump over or to break down fences. This quality is called "*breachiness*," and animals that have a strong tincture of the propensity get a bad name, and are deteriorated in value. They learn this trick by degrees. Sometimes, when chased

by a dog, to escape the danger and worry, they will spring at a fence that in their normal mood would securely confine them in their accustomed bounds, but perhaps the rails break or are thrust aside, and the breach opens to them "fresh fields and pastures new." This is a discovery and a revelation that is sure to be utilized in the future life scheme, and by the force of example is communicated to the less adventuresome members of the herd.

We may as well attempt to illustrate what we have been just advancing by relating incidents in cattle life that occurred within range of our own experience.

The pair of oxen by whose help we cleared up, logged, fenced and ploughed 30 to 35 acres of wild bush land, were of average size, intelligence and quality, but we have only space and leisure to jot down a few of their peculiarities and exploits. Their behaviour towards each other as life associates and yoke-mates, and sometimes rivals, was a delightful study, and almost always as entertaining as a comedy in real life. We named them Dick and Diamond. In ox-teams one is usually the master spirit, and this one the custom of the country tries to place on the off-side. In our case this was "Diamond." He was rather the smaller as to size and brawn, but had a demoniacal temper when aroused, and had a most formidable and bison-looking frontispiece. The nigh ox was a symmetrical and handsome bovine, gentle and placid and non-combative in disposition, and when *unyoked* deferred and yielded subserviently to his despotic companion. Both were nearly of the same color—a light red. One of their escapades, if correctly described, will better show their relative mental status than a lot of definitions. To "Diamond" dame rumor, at the time of our purchase of the team, had affixed a slight stigma of "breachiness," but not of a very confirmed type, *i. e.*, 'twas said that he had'n't yet acquired the proficiency of throwing down *good* fences, but that he was an adept at jumping ordinary ones, so we took the precaution of surrounding two acres of rich meadow with a strong and high stake and ridged fence for the team's special use, but after some time we were disagreeably surprised one morning to find both Dick and Diamond knee deep in clover in the field next their proper allotment. They both pretended not to know the way out, and we were obliged to lower the rails of one panel almost to the ground level before we could oust the trespassers. But after much search

we found where two or three rails had been displaced and whence the *sortie* had been made. The fence was repaired and strengthened, and for a time all went smoothly until, on a certain morning, on going to "yoke up" we found that Dick was crippled and incapacitated for work by an injury to his hind quarters; there was much swelling and lameness, and the cause—a mystery! We caused the invalid to be examined by one in the locality who had a reputation for veterinary knowledge, but all he could say was, that the swelling at the base of the abdomen was the result of violence, perhaps of jumping, and that the animal had alighted astride of the fence or a stump, (these were numerous). However, the inconvenience soon passed off with rest, etc., and we had ceased to think of the matter, but we soon noticed in the evenings, after our day's logging was done, and unyoking in the pasture had taken place, the buffaloes did not begin to graze or ruminate, but seemed agitated and restless, and the question arose, what could be in the wind now? "Diamond" would look vacantly skyward and give a longing low or two, and then lick his shoulders, where the yoke might perhaps have rubbed and chafed him; "Dick" looked puzzled and expectant, standing still at a little distance, and closely watching his ill-natured mate! We thought the farce worth watching, and stayed quietly in a secluded spot for an hour or more to find out what the *denouement* might be. After some time "Diamond," with treachery in his mien, advanced a few steps towards his somewhat timorous but colossal-sized mate, but the latter moved on, still deliberately followed by "Diamond." With both the pace became accelerated one all around the small field, pursuer and pursued; after a number of perambulations "Diamond" having gotten his terrified "pard" just where he wanted him, i. e., in a corner, made a roar of triumph, and with a mighty lunge, sprang on to poor trembling "Dick," goring the latter unmercifully, whose only chance of escape from the dilemma was to charge the high fence like a battering ram, which of course gave way before this irresistible onset, and the pair were once more in the clover blossoms, "Diamond" no doubt chuckling at this repeated successful result of his "*ruse de guerre*."

So here was the wished for explanation of the mysterious swellings and lameness that had lost me several days' use of my team in seeding time, and caused me a journey in quest of the cow-leech.

After this experience I found it necessary to give this pair of bovines the closest surveillance both by night and by day, and by so doing extracted much help and benefit from their many years of service and usefulness, and I parted with these companions of many happy hours and laborious, sweat-producing days, with sincerest regrets.

It was an invariable rule with "Dick" in the later part of his career, when unyoked at the end of his day's work, to stand at a distance of about twenty yards from "Diamond," and *not to lie down until the latter had done so*, and then to lie down at a distance, with his head towards his evil genius, whose every movement had to be guarded against.



Report of the Geological Section.

To the President and Members of the Hamilton Association :

In submitting this report the Section desires to intimate that the usual interest in the work done by the members during the past year has been maintained.

Since the removal of the Association from the Alexandra Arcade to the more comfortable apartment in the new Library Building, we have enjoyed our meetings more thoroughly than formerly, and are pleased to state that our membership has increased.

With the exception of the three months required for moving and fitting up, we have had a meeting every month, at which papers of more than usual interest were read, excepting January, 1891, when we adjourned after the preliminary business was completed. The Chairman, Col. C. C. Grant, has been most indefatigable in his exertions to make these meetings a success.

Through the Chairman and Mr. A. E. Walker, the attention of the members has been specially called to the discoveries of new forms and species of fossil sponges and stromatoporæ, of which a liberal donation has been made to the Museum.

Following are the names of the papers, authors, and dates on which they were read :—

- Fossil Stromatoporidæ, by Mr. A. E. Walker, May 23rd, 1890.
- Cœlenterata and notes on Burlington Heights, by Col. C. C. Grant, June 27th, 1890.
- Asteroidæ, Living and Fossil, by Col. C. C. Grant, July 25th, 1890.
- Indian Ossuary at Burlington Beach, by Col. C. C. Grant, Nov. 28th, 1890.
- Marine Annelids, Errantia and Tubicola, by Col. C. C. Grant, Dec. 26th, 1890.
- Irish Celts and their Relics, Part I., by Col. C. C. Grant, Feb. 27th, 1891.
- Irish Celts and their Relics, Part II., by Col. C. C. Grant, March 27th, 1891.
- Irish Celts and their Relics, Part III., by Col. C. C. Grant, April 24th, 1891.

C. C. GRANT,
Chairman.

A. T. NEILL,
Secretary.

STROMATOPORIDÆ.

Read before the Geological Section, May 23rd, 1890,

BY A. E. WALKER.

The subject for our consideration to-night will be those obscure fossil forms belonging to the genus *Stromatoporidae*, of which there are innumerable species, which have caused so much discussion to all palæontologists, in fact a perfect zoological stumbling block so far. At first sight they much resemble *Eozoon Canadense*, but their mode of fossilization and structure are remote; they have been referred to as corals, sponges, foraminifera, and even to hydractiniae, based probably on an imperfect acquaintance of the microscopic structure of these forms. In the first place, it is extremely difficult to get these fossils so well preserved as to show their true structure. They are dense, compact forms, and the slow process of infiltration of the silicates or carbonates gives time for these deposits to recrystallize, and in a measure to destroy their delicate structure. This is most particularly the case with those found in the Niagara formation, and in the Guelph. These forms commence in the lower Trenton, and follow up through the Hudson River, Clinton, Niagara, Guelph, and through the Devonian. I am not aware of their being found in the Carboniferous, as I have had no opportunity of examining any of the later formations.

In the year 1879 I sent a specimen to Sir J. W. Dawson, from the carboniferous limestone of Marble Head, Ohio, which was most beautifully preserved; the concentric laminae and pillars are in the condition of opaque calcite, apparently retaining its minute structure, and not affected by crystallization; the interspaces or chambers are occupied by transparent calcite, permitting all the structure to be very well seen, either on polished surfaces or transparent slices. It was from this specimen that he published his report of the microscopic structure of *stromatoporidae* idea, which I place before you. "It is evident that the animal matter of the stromatopora must have occupied the chambers and interspaces, and must have extended from chamber to chamber, also through the pores and hollow pillars.

Such a structure is obviously that of a rhizopod rather than that of a sponge. Further, the arrangement of the laminae and pillars is very nearly allied to the *Parkeria* and *Loftusia*, as described by Carpenter and Brady."

I am here quoting Dr. Dawson's remarks. He further says:—"The supposed oscula on which has been based a reference of these forms to sponges are certainly not constant. Although these forms have a strong resemblance to *Eozoon*, the main structural difference is that while *Eozoon* has a delicately tabulated proper wall of nummuline type, that of stromatopora has coarse perforations and pores." In the great Niagara limestone, as seen at Niagara Falls, the masses of stromatopora occur precisely as *Eozoon* occurs in the Laurentian limestones, and are mineralized with quartz and dolomite, and often converted into crystallized masses void of any structure. The first general impression was, that these forms belonged to the family of the sponges, the idea being that the lateral pores and openings were the inhaling, and that the perpendicular tubes and pores and vermiform star-like openings were the exhaling oscula. These are distinctly seen in those classed as *Cœnostromæ*, and in *Caunopora Walkerii*, also in *Caunostroma Restigouchense* and others; still there are other forms which show nothing that can be considered as an osculum. It would seem that they cannot be classed with the foraminifera, as they show no pure nummulitic wall. Yet I think that Dr. Dawson and Carpenter lean to this view. There also seems a difficulty in placing them with the sponges. Why not place them with the *Hydrocorallinae*, or *Milleporæ*? These forms build or deposit on other forms layer by layer, as does the stromatopora, and the tubules in the laminae of the *Millepora* *Alcicones* have much resemblance to the former. There are structural differences, but we find the most extraordinary differences in the many forms of stromatopora. Although the forms of the *Milleporæ* of the present day may be much modified from the ancient type, it is not greater than what we find in other forms. If they should be found to belong to the *Hydrocorallinae*, they are existing at the present day in great masses on the coral reefs and attached to shells, seaweed or other forms, as did the stromatopora of old. I have found the stromatopora enter by enveloping a favorite, also entirely surrounding a group of *Diphyphyllum* and other corals, also surround-

ing an *Orthoceras*. I have lately found one form of stromatopora entirely enclosing another.

As this subject is still under consideration by many specialists, I shall not give you more than the few remarks already made, but will show you specimens of *Eozoon*, *Loftusia*, *Millepora* and many forms of stromatopora from the Clinton and Niagara, of our own locality, and other forms from the Guelph and Devonian. You will be able to judge how they vary in structure; also, how obscure and poorly preserved some of them are. Although you will see many beautiful specimens, there are still many others belonging to the Niagara that I have not as yet obtained.

It would be as well, before we discuss these specimens, to get a general idea of their structure. This is what Sir J. W. Dawson says of a well-preserved specimen from the coriferous limestone of Ohio: "In these the concentric laminae and pillars of the fossil in the condition of opaque calcite, apparently retaining its minute structure, and not affected by crystallization, and the interspaces or chambers are occupied by transparent calcite, permitting all the structure to be very well seen in transparent slices."

In these specimens about three interspaces and two laminae occur in the space of a millimetre; and though neither the laminae nor the interspaces are uniform in thickness, the latter are about twice the width of the former. In some places the laminae rise into conical or rounded eminences with corresponding depressions; in others they are nearly flat and concentric, this difference being apparently accidental. The laminae are connected with each other by pillars, which are either round or somewhat flattened. The texture of the laminae is not spicular, but perfectly continuous and finely granular, as if made up of minute fragments of calcite. When the mass is broken parallel to the laminae, the pillars appear as minute tubercles (but a true exterior surface is smooth.) The laminae are pierced with numerous round pores about one-tenth of a millimetre in diameter. Some of these pass through hollow pillars across one interspace into the next. The laminae themselves are here and there pierced with horizontal tubes, which thicken the laminae where they pass; they appear to traverse the laminae obliquely from one space into another, or from the hollow pillars laterally. They may be called canals. In addition to the ordinary laminae, some of the chambers or interspaces are sub-divided by very thin secondary lam

inæ. In a few cases these are attached to ordinary laminæ as a sort of inner wall. The ordinary laminæ in the more regular specimens are often of great continuity, extending without interruption for several square inches.

The above is an accurate description of the most common type of stromatopora, when in its natural condition. I have a specimen here which I obtained from the Clinton, about half-a-mile east of the Jolley Cut. It is of parasitic growth incrusting a favosite; the entire form was some five inches in diameter, enclosing the favosite all but the under side in a hemispherical form, thinning out at the margins. It has been named by Professor J. W. Spencer, *Caunopora Walkerii*. He describes it in the following manner:—Laminæ thin and obscure with chambers entirely filled with supplemental matter, only occasionally traversed by short, tortuous canaliculi, connected with the vertical tubes. Vertical pillars connecting laminæ removed or obscured by the filling, but with numerous connecting pores apparent and filled with matter different from the rest of the mass. The organism is traversed by irregularly situated tubes producing orifices on the surface of about one-half millimetre diameter, and scattered over the surface from 2 to 4 mm. apart. The connecting pores are crowded together, and are apparently situated around centres, or sometimes around the larger tubes. These tubes extend down into the substance and appear to traverse several thicknesses of the laminæ. I have chosen these two forms described by Sir J. W. Dawson and Prof. J. W. Spencer from the fact that they are most divergent. Another form, *Cœnostroma Antiquum*, from the Niagara at Thorold, is an incrusting form, differing from all others of the class *Cœnostroma* from the fact that each group of tubulæ is separated by a thin layer of clay before the next was formed, showing that each group of tubulæ was of separate and independent growth; in other respects it differs but little from the other forms of *Cœnostroma*.

I might mention that these forms are found in the Dolomite limestone of Niagara and Guelph; in fact these forms are almost always associated with magnesian rocks, and are so abundant at times as to make up certain layers. The study of these forms was comparatively in its infancy until lately. I see that Prof. Nicholson and others have published a most elaborate work on these forms of late, most carefully illustrated; but as it is in connection with a

work that covers a number of years, I am afraid that it cannot be obtained separate from the other volumes.

There is no doubt but that we shall soon be able to place these forms in their proper order, and get a more correct idea of their mode of growth and reproduction. I do not myself feel competent to go extensively into this subject, which has puzzled so many wiser heads. I will now close these remarks, so that we may have an opportunity to discuss the following specimens I have here from the

NIAGARA FORMATION.

Stromatopora,	concentrica, Goldfuss.
Cœnostroma,	constellatum, Hall.
Dictyostroma,	undulatum, Nicholson.
Cœnostroma,	botryoideum, Spencer.
"	restigouchense, "
"	antiquum, Nicholson.
"	constellatum, Hall.

1 not named.

1 Concentrica inclosing coenostroma antiquum.

CLINTON FORMATION.

Stromatopora,	concentrica, Goldfuss.
Caenopora,	Walkerii, Spencer.

GUELPH FORMATION.

Cœnostroma,	Galtense, Nicholson.
Stromatopora	ostiotata, "
"	mammillata, "
"	substriatella, "

2 others, not named.

DEVONIAN FORMATION.

Cœnostroma,	densum, Nicholson.
Stromatopora	substriatella, "
"	granulata, "
"	nodulata, "
"	punctulata, "
"	tuberculata, "

2 forms unnamed.

NOTES ON BURLINGTON HEIGHTS.

Read before the Geological Section, June 27th, 1890.

BY COL. C. C. GRANT.

A young naturalist recently called my attention to a particular portion of the continuation of "Burlington Heights," which probably may, to some extent, have escaped observation. The locality in question is called "The Sand-pits," on the Dundas road. Here, under a shelving bank containing cavities in a bed of fine, loose sand, were obtained a large number of sub-fossil remains—teeth and bones of rodents, land snails, etc. I excavated the bed to a depth of ten inches or more. The sand had apparently fallen from overhead, covering up many successive generations of the fauna in question. I failed to obtain any specimens of fresh water mollusca or fish remains, but a few of the teeth bear rather a marked resemblance to some of the latter. They may, however, belong to some small land animal—a bat, for instance. Two are submitted for examination.

The caverns in the ridge were very likely known to the Indians, and possibly may have been frequented also by the fauna of the neighborhood. If so, we may expect to find their remains in good preservation, owing to the cementing materials—carbonate of lime, calc-sinter, etc.—which bind the gravels and sands together. These would envelope and preserve the specimens by excluding air and moisture.

Since the officials of the Grand Trunk Railway of Canada debarred the naturalists of our Association from their respective pursuits—not only along the line, but even inside the fences—the above locality may afford, at least some of us, a fresh field for research.

NOTES ON THE ASTEROIDEA, ETC., LIVING AND FOSSIL.

Read before the Geological Section, July 25th, 1890.

BY COL. C. C. GRANT.

My acquaintance with both living and fossil is so extremely limited that the Section must not expect to find much original matter in the brief notes I have taken. The information respecting this exceedingly interesting class is derived chiefly from the writings of European naturalists already known to you, or of scientific men in the United States on recent deep sea dredging expeditions.

In the Silurian rocks of Canada, including the specimens obtained in Anticosti a few years ago, I collected altogether a dozen true star-fishes. Some were in duplicate; one from the Clinton beds was described and figured by Dr. Spencer, now State Geologist of Georgia; four, perhaps five, I think, were new species; two were pronounced to be new forms of *Stenaster* and *Palasterina*, by the late E. Billings, who seems to have laid them aside so carefully that they have never turned up since his successor, Mr. Whiteaves, was appointed Palæontologist. However, a duplicate of one of them was forwarded to the Irish Geological Survey Office, Dublin, and as the parcel containing it was received by the late Mr. Bailey, I conclude it may be found in a museum case of Hamilton organic remains. It is so small that likely it may have escaped observation. The living star-fishes, not only the ones usually found on reefs and in shallow water, but also at great depths, possess almost as varied an assortment of colours as the mollusca themselves. In the "Cruise of the Blake" the younger Agassiz states:—"Colonies of ophisthrix may be found on the flats and keys of the Gulf (Mexico), blue, green and red, while here and there a yellow or vermillion star marks the soft ophomexa flaccida. These and their companions, living in a strong light and in warm shallow water, present brilliant and well marked colors—nor are these that inhabit the depths of the ocean always pale. On the contrary many are bright orange and red. The colors of these, however, do not appear

to be fixed, for he adds, 'like other things from the ocean abysses, they likewise fade in alcohol.'

A dried specimen of a modern star does not display the minute worm-like feelers, feet or suckers used both in locomotion and to seize prey. It can in an instant extend or withdraw them when living; they are hollow and each is connected with a globular sac, containing fluid, within the body of the animal. At the will of the star the vesicle contracts, forcing the watery matter into the corresponding sucker—a contraction of the sucker has an opposite effect. I noticed frequently how quickly it withdrew the feet on touching it.

The *Ophiuroidea*, or snake stars, furnished with long whip-like arms, have no true suckers. Some species have spines. They appear to depend on their arms solely for progression.

The *Euryales* we have not met on the Irish coast. Forbes, as well as I recollect, pronounces it very rare on the coast of Scotland. It is about a foot in diameter, and has peculiar branching arms, which it uses as a net to enclose its prey.

The *Brittle Stars* are said to be abundant on all the shores of Great Britain and Ireland. There are ten native species. The *ophéozoma rosula*, a very beautiful one, displays splendid colors arranged in regular patterns. No two are coloured alike. The brittle star derives its name from an extraordinary habit it has of casting off its members when you touch it. E. Forbes found by plunging it suddenly into a bucket of fresh water it lost the power, and became paralyzed. The largest species are found in the Tropics:

The *Asterie*, stars with stellate body and flat rays, are ranged into a different group. One member, at least, goes even beyond the brittle stars, for it not only dismembers itself, but it breaks the arms into fragments as well. The following account is so quaintly given of the capture of "*luidea fragilissima*," you may perhaps forgive the quotation from Professor Forbes, Edinburgh: "The first time I ever took one of these creatures I succeeded in getting it into the boat entire. Never having seen one before, and quite unconscious of its suicidal powers, I spread it out on a rowing-bench, the better to admire its form and colors. On attempting to move it for preservation, to my horror and disappointment I found only an assemblage of rejected members. My conservative endeavors were all neutralized by its destructive exertions, and it is now badly

represented in my cabinet by an armless disk and diskless arm. Next time I went to dredge on the same spot I determined not to be cheated out of a specimen in such a way a second time. I brought with me a bucket of cold, fresh water, to which article starfishes have a great antipathy. As I expected, a luidea came up in the dredge—a most gorgeous specimen. As it does not generally break up before it is raised above the surface of the sea, cautiously and anxiously I sunk the bucket to a level with the dredge's mouth, and proceeded to introduce luidea to the purer element. Whether the cold air was too much for him, or the sight of the bucket too terrific, I know not, but in a moment he proceeded to dissolve his corporation, and at every mesh of the dredge his fragments were escaping. In despair I grasped at the largest, and brought up the extremity of an arm with its terminating eye, the spineous eyelid of which opened and closed with something exceedingly like a wink of derision."

The *Common Cross-fish*, so destructive to oyster beds, is often dredged minus one of its five fingers. The fishermen suppose that it had incautiously inserted the lost member between the valves of the oyster, and had it amputated. This was proved to be a popular error years ago. The star smothers the bivalves by enclosing the valves until it is forced to open its shell. This statement of an eye witness bears out what Professor Forbes said on the subject in the main. The Professor seems to think, however, that the star fish may paralyze his victim by injecting a poisonous fluid. That perhaps may be erroneous. We must not forget at the same time, that the mytilus (mussel) proves poisonous at times, and medical experts attribute this to their feeding on the eggs of the stars. [A well-known writer for a paper in Dublin recently lost his wife and three children from eating mussels.]

The *Goniasters* I had nearly omitted altogether. They approach the sea urchins; the rays or arms are shortened. Many of the Bahama stars would recall this group to recollection, probably. Other Genera, recently established, are unknown to me. I have not seen the figures, and one cannot form a correct idea from description alone. As regards the fossil star-fishes of the Cambrosilurian and our local rocks, all I obtained were small, two were exceedingly minute. The *Palasterina Jamesii* of the Cincinnati group (Hudson River) is said to be four inches across. A *Tæniaster*,

figured by Dana, appears to be unusually large also, if the natural size is correctly given.

The *Petraster*, from the Niagara shale, described by Mr. Billings in the Proceedings of the Canadian Geological Survey, was found at Stoney Creek (not Grimsby), by my friend Johnson Pettit. A *Cyclocystoides* I discovered at Anticosti is in the Redpath Museum. It is not definitely settled as to whether it belongs to the *Asterioidea* or *Cystideans*.



NOTES ON AN INDIAN OSSUARY AT THE BEACH,
HAMILTON, ONT.

Read before the Geological Section, Nov. 28th, 1890.

BY COL. C. C. GRANT.

I recently learned from a young friend of mine that an Indian ossuary or bone pit had been exposed in excavating sand and gravel on the spur of the new Grand Trunk Railway line at the Beach. Unfortunately I discovered others previously had an inkling of the matter, and it was only after several days spent in excavating the fine sand that I obtained clear proof that the part I had selected for my antiquarian researches had most undoubtedly been recently disturbed. However, as I noticed that some exceedingly small "wampum" appeared to have escaped the observation of the previous searchers, I came to the conclusion that it might be as well to work on and endeavor to ascertain the dimensions of the ossuary, and also if any part had, by chance, been unnoted by the earlier explorers.

The work of removing the sand itself is very tedious. When you get down about two and a-half or three feet, the water from the swamps and lake close by percolates through the former Beach, so you are compelled to excavate nearly knee deep in water, and the bones, wampum and relics are chiefly found about a foot below the surface of the water.

It strikes one as very strange that the Red Men should have selected such a low, swampy burial place. It was mentioned, I think, by one of the members of our Association, recently, that Lake Ontario was some two feet higher than usual this year. The circumstance may afford us some explanation of what at first sight seems difficult to understand. On the other hand, several old residents of this city have assured me that the water of the bay is considerably lower now than it was thirty years ago.

In the first circular pit I discovered, in addition to the wampum beads, a Spanish silver coin of Charles III., dated 1776. On exca-

vating beyond the edge I found a layer of undisturbed gravel. Several pits have been sunk by men and boys at various points nearer the railway track since I commenced operations—some few, indeed, before. One of the excavators informed me he found the skeletons regularly arranged in a circle, heads touching, feet outwards. These, I presume, were the bodies of such as had more recently died than others, whose remains were cast up promiscuously, as described in the paper by our President on "The Discovery of Burlington Bay."

I commenced a fresh excavation near the track, but was compelled to leave it for the present at least. I have obtained from it already some wampum, brass bracelets, much decayed, as might have been expected from their environment.

I was reluctantly obliged to postpone further researches until next year in consequence of cold weather setting in.

I think it probable that there are some undisturbed burial pits between the railway track and Mr. Lottridge's house. The gentleman in question obtained some years ago a remarkably fine collection of Indian relics from an ossuary close to his residence, together with a silver chalice, which I suppose belonged to one of the French Jesuit Missions. I understand Mr. Lottridge, quite recently, unearthed other Indian remains in putting down some fence posts not far from the place where I have been working.

NOTES ON CCELENTERATA (ZOOPHYTES) AND RECENT CLASSIFICATION.

Read before the Geological Section, June 27th, 1890.

BY COL. C. C. GRANT.

Passing over still lower forms of life among the invertebrates, rhizopods, foraminifera and sponges, we come to a group called zoophytes, defined by Dr. Geikie as radically symmetrical animals with a body composed of cells, arranged in an outer and inner layer, including a body cavity, sub-divided into :—

Hydrozoa—including the fresh water hydra, the marine jelly fishes, millepores, campanularia, sertularia and the extinct graptolites.

Ctenophora—spherical or cylindrical medusæ, including *Venus' girdle*, and *beroë*—North Seas.

Actinozoa—polyps and *actinæ* (sea anemones).

Rugosa—the older corals in which the calcareous partitions are arranged in multiples of 4 with transverse partitions. *Zaphrentis*, *amplexus*, *cyathophyllum* are examples.

Alcyonaria—including *alcyonia*, *pennatula*, *gorgonia*; animals with light plumed tentacles, calcareous bodies and horny skeletons.

Zoantharia (modern forms) tentacles, 6 or multiples of 6—star corals. Mushroom (*fungidæ*) madrepores.

Hydrozoa.—Although I am informed the fresh water hydra is found in Canada, I have never seen it in any stream or brook here. Indeed, I doubt if I ever saw it since I was a small boy. I was standing in a tributary to the Blackwater, in the County of Cork, Ireland, engaged in turning over the stones in the brook, hunting for loaches with a three-pronged fork I had surreptitiously secured from the kitchen, when I distinctly saw through the clear water what looked to be a plant stalk moving close to my feet like a looping caterpillar. The whole proceeding appeared so uncanny that I made such haste for dry land that I stumbled and plunged headforemost into the brook, leaving my angling belongings behind me. Reflecting that the loss of the fork may lead to disagreeable enquiries, I was induced to make an attempt for its recovery as well as to

examine more closely the cause of the panic. Well, there on the very margin, depending from the branch of a plant, was another member of the family to which my unwelcome acquaintance belonged, fixed by the tail.

On relating my adventures to an old friend of my father's subsequently, he seemed highly amused, and told me what I thought was a plant was a live animal called "a hydra," that if its body was cut into small pieces, each after a short time became a complete animal. Then he informed me the name was derived from the myth of a serpent with many heads slain by Hercules—as fast as he cut them off they put in a fresh appearance.

The famous naturalist Louis Agassiz, was, I think, the first to transfer not only the graptolites but some of the lower forms of corals to the hydrozoa, while the elder Sars boldly asserted that the modern sertularia, tubularia, campanularia, commonly called "sea-wreaths," "sea-feathers," "sea-bells," all closely allied to graptolites, are merely alternating generations of the medusæ, that these hitherto supposed polyps and their numerous united families proceed from a single medusa larvæ, and that they in their turn produce complete and perfect acalephæ; that however unlike they may seem to be they are identical. Few of us, perhaps, may ever be afforded an opportunity of studying the lower forms of marine life. This, if it can be proved, seems very wonderful.

Several years ago the Italian naturalist Chamisso asserted of the linked salpa, composed of chains of individuals united, which glides like a snake through the blue water of the Mediterranean, every link a distinct animal, but moving as if actuated by a common impulse, and pursuing the same course as if controlled by a united will, that each separated link gives birth to a chain of linked individuals, while the chain itself produces but a solitary salpa. This extraordinary statement is now a well authenticated fact.

Graptolites.—Although it was known to many in Canada and the States that the local rocks of this city are rich in these remains, the circumstance does not appear to have attracted much attention elsewhere.

Dr. Spencer, F. G. S., in 1884 described and figured in the *Bulletin* of the Museum, Columbia (Mo.) University, several fossils from the neighborhood of Hamilton, previously unknown, including about thirty new graptolites, remarking that he was in pos-

session of some twelve others too imperfect for description. It is to be regretted that Professor Spencer ceased to hold the Chair of Geology in the Missouri University before the completion of the second volume promised, for I believe we could have furnished him with at least seventy additional species unknown on this continent, from our Niagara and Clinton beds. That would represent about twice the number discovered in the lower Silurians. Some naturalists, however, consider the graptolites to be more nearly related to the bryozoans. This opinion I think untenable. Even while admitting that it is a difficult matter indeed to classify the lower forms of life, our local chert beds contain numerous bryozoans. They are colorless in the matrix, with a solitary exception. Dr. Spencer figured and described the vein-like marking of *Rhinopora Venosa*, (which undoubtedly presents a black impression in the chert), as a *doubtful graptolite*. It was only after publication that we clearly ascertained the rest of the bryozoon presented precisely a similar appearance to the markings left in the chert by "retepora," "clathropora," "fenestella," members of the same group.

In all cases the true graptolites are stained and colored black with us. In a few rare instances the bituminous matter scales off when drying. It may not be out of place to remark that an erroneous idea prevails among palæontologists generally, viz: that these hydrozoa are usually found in shales, seldom in limestones. The very contrary seems nearer to the truth, I noticed both here and at Anticosti.

The *Medusæ* or jelly fishes of modern times are quite numerous on the south-west coast of Ireland. In their natural element they are very beautiful objects, although deficient in the rich coloring which a Tropical climate imparts to their more favoured family elsewhere. When cast ashore they have been described as disgusting slimy things which merely leave a thin coat on the strand when the body inflated by water disappears like a soap-bubble. Boys when swimming frequently find the contact with what we call sting-nettles very disagreeable. The famous swimmer, Capt. Webb, who crossed the Channel to France, apparently cared less for the distance than the *acalephæ* he expected to meet on the passage over.

The beautiful *velellæ* (chiefly inhabitants of the Tropics), are often conveyed by the Gulf Stream and cast on the Irish coast. It presents an oblong, flattened, transparent body (rounded at the

angles) from which depend numerous deep blue tentacles. From the upper surface, which is covered with dark blue spots, is a thin plate rising vertically along the back, used as a sail, so say the oldest naturalists. But I think I have read something like this about the nautilus:—

“Spreading their sail-like arms to catch the breeze.”

The idea may be poetical, but it is very erroneous.

The *Physalia*.—Of a higher order as regards size, pre-eminent in beauty, and surpassing all other medusæ of the Tropics, is the *physalia caravella*, or Portuguese man-of-war, so called by the ancient mariners from a supposed resemblance to the caravels of this once great maritime kingdom. The transparent body about a foot in length and four inches wide displays every shade from purple to violet, while the comb-like sail at the upper extremity is brilliant crimson, the tentacles hanging from the lower portion of the body itself trail behind in rear. They are also coloured, the shades slightly differing from the body tints. It can extend the arms to a distance of twenty feet; they can contract themselves so as almost to disappear altogether; they possess the means of paralyzing the prey they embrace.

On my passage to Jamaica in a troop ship, I induced the cook to rig up for me a rough sort of landing net out of some spare ones he boiled the vegetables in for the midshipmen's mess. I felt quite pleased at the great interest the young gentlemen themselves took in the proceeding, more especially when one of them volunteered to take up a position in the bow (from whence the sailors harpoon the dolphins) to angle for me. “I have him this time,” cried the young reefer (or rascal), and as he lifted the net I eagerly pressed forward to the front, and fearing my beauty might succeed in slipping back into its native element, I seized it firmly. Had I grasped a red hot iron bar I could not have dropped it more suddenly. Whether the shock proceeded from the body itself or the tentacles I am unable to say, but I never felt anything so painful. Indeed, nothing can be more truthful than the remarks of Dutertre, in his history of the Antilles, where he alludes to the corrosive qualities of this extraordinary creature:—“Even man, when he comes in contact with its tentacles, needlessly or through ignorance, suffers excruciating pain. One day when sailing in a small boat I saw a *physalia*, and being anxious to examine it more closely, I tried to get hold of it.

Scarcely had I stretched out my hand when it was enveloped in a net of tentacles. After the first impression of cold (it had a cold touch), it seemed as if my arm to the shoulder had been plunged into boiling oil, and I screamed with pain." I dare say I would have done the same had no one been present. I fear I used some very unparliamentary language instead.

The bituminous matter in the chert beds, more especially near the base is difficult to explain away in a satisfactory manner. While it seems probable it was derived from animal or vegetable remains, I think it improbable that the sponges ever have contributed anything to the substance, for they are confined to the upper or glaciated beds. It is evident also that the graptolites, (rarely found so low down), can scarcely be the source. Impressions of plants occur, but they are not so numerous or so well preserved as in the limestone beneath where no bituminous matter is found. It has been suggested that jelly fishes (medusæ) which would leave no markings to record their existence, may have been the source. It appears to be probable.



BRIEF NOTES ON MARINE ANNELIDS, ERRANTIA
AND TUBICOLA.

Read before the Geological Section, Dec. 26th, 1890.

BY COL. C. C. GRANT.

Since the discovery of the "conodonts" (fossil teeth) by Prof. Pander in the lower silurian rocks of Europe (pronounced by Owen to be the spines or denticles of mollusks or annelids), considerable attention has been directed to this minute class of organic remains. Perhaps the largest and finest collection was obtained by Professor George J. Hind, from the Clinton palæozoic beds at Dundas. In this neighborhood at a similar horizon the paired burrow of a lob-worm and the trails of other annelids are often seen. It is no easy matter to distinguish a crushed or flattened fucoid from the trail of a worm in a muddy sediment, when the former was cord-like in structure. But I think I am in possession of satisfactory proof that many of the so-called trails are really algæ. It is singular that with a solitary exception no teeth have been found as yet here. True, they are so minute they may easily escape observation, but then they have a horny or chitinous lustre which the practised eye must quickly observe.

Like the common earth worm or leech the marine annelid is capable of considerable extension or contraction, the rings or segments of the body are joined together by an elastic skin. They have red blood. Many are provided with eyes, and some species (the Errantia) have powerful jaws armed with incisive teeth. From the signature of the body the latter alone are likely to be found preserved in a fossilized state. I have frequently seen them darting off apparently with the wriggling motion of the eel, not crawling along the bottom; indeed they seemed to be some inches above it. Water in rippling over a shallow shore is rather deceptive, however. A well-known European annelid, *Eunice sauginea*, attains a length of from two to two and a-half feet. According to the naturalist, De Quatrefages, it possesses no less than 300 body rings, a brain, 3,000 nerve branches, 280 stomachs and twice as many hearts. While Nature

has been so exceedingly lavish regarding the internal structure, she has been far more so in respect to external appearance, for nothing can be more brilliant or beautiful than the colouring of many of the species of the despised class known as the vermes. One naturalist finds the tints most exquisite, surpassing even the flowers of the Tropics. Another states they combine the hues of the humming bird with the metallic lustre of the South American beetles, while a third emphatically protests against the ignorance which prevails respecting his pre-eminently beautiful Nereis, Euphrosyne, Eunice, Alcypa, names selected from Grecian Mythology, expressive of the most intense admiration of the little-known, neglected, but truly beautiful creatures.

The *Tubicolæ*, or solitary annelids, possess the means of secreting mineral matter, carbonate of lime, from the water, to form the tube or shelly covering for their protection. This tube was sufficiently hard to permit of fossilization. Our modern *Serpula* is a familiar example. You may notice it frequently attached to oysters and other shells; this worm is furnished with a beautiful crown of feathery tentaculæ, doubtlessly for the purpose of attracting and seizing its passing prey. It is said they are used for the purpose of creating a current and drawing microscopical organisms within its influence. Nature may have had another object also in view when she embellished the feathery crown with such brilliant colouring and varied tints as it possesses.

I am enabled to submit for your inspection a well preserved specimen of a cornulites, a member of the family from the glaciated Niagara chert of Hamilton. Although the tubicolæ are solitary, strictly speaking, entire colonies are often found attached to shells in our day, and in precisely the same way we find them grouped on the valves of the Cambro-silurian brachiopods. In many instances the worms appear to display a tendency to form irregular circles, as if they wished to make the most of the limited space at their disposal. Dr. James Hall, the Director-General of the New York State Geological Survey, contends that the coiled spirorbis and the ortonia of the late Professor Nicholson merely represent a cornulites in the earlier stages of its growth. The slabs figured in illustration strongly corroborate his views.

Nemertes Gigas.—Perhaps the most extraordinary of the vagrant annelids is the great *Nemertes*. There are two species, one violet col-

ored and the other brown. Both seem very rare; the late Professor Adams, of the Queen's College, Cork, informed me he was unable to recall anything answering to the description of the specimens I had seen on the southern coast of Ireland. I subsequently discovered my animated ribbon, with a pointed snout, described by the German naturalist, Dr. Hartwig. His description was so much superior to mine that I trust you may feel disposed to pardon the extract for its accuracy.

"This giant worm forms a thousand seemingly inextricable knots, which he is continually unravelling and untying. When he desires to shift his quarters, he stretches out a long ribbon surmounted with a snake-like head. The eye of the observer sees no contraction of the muscles, no apparent cause or instrument of locomotion. The microscope, however, reveals vibratory ciliæ covering the body. He hesitates, he tries here, and there, until at last, often at a distance of 15 or 20 feet, he finds a stone to his taste, whereupon he slowly unrolls his length, and while the folds are unravelling themselves at one end, they form a new Gordian knot at the other. It is from 30 to 40 feet long."

In "The Cruise of the Blake," the younger Agassiz gives a representation of a vagrant annelid, sagitta, dredged in the Atlantic. It presents a ventral fin and the rounded tail of a fish. Many of us, (judging from its outward appearance), would feel disposed to place it above the hag-fish or lamprey, but I presume the nervous axis has been detected and the classification is quite correct. It certainly leads one to think of connecting links and such things. The description afforded us is not so full or satisfactory, perhaps, as some of the other chapters, but the work itself, taken altogether, is to this continent of greater interest and importance than any record ever published hitherto. It is the noblest contribution that the United States ever gave to science. No work possesses greater fascinations for the naturalist. We may all learn something from it. Can this be said of many of the novels we find so often in the hands of the younger generation?

The marine annelids of Anticosti (at least the few I saw) struck me as devoid of the brilliant colors noted elsewhere, but they are singularly active. They have need to be so, for their principal foes there, the eels especially, are exceedingly numerous. At night I have seen them by dozens on the margin of the shore feeding on the

heads of cod-fish flung aside by the fishermen, and the mouths of rivers and streams are paved with them on their way to the spawning ground.

A very singular fossil puts in an appearance in the lower green and red Clinton shales here. Although I discovered it a quarter of a century ago, I believe it remains as yet undescribed. I submitted it for examination to several Palæontologists, both on this continent and Europe. The general opinion seems to be, that it represents *the track* of something as yet unknown. One gentleman in the old country states, "it reminds me of such an impression as a beetle may make pursuing its way over a muddy shore." Now we have no evidence that such a thing existed until the Jurassic Age, that is, as far as I know. Contrary to the almost unanimous opinion, the late Mr. Billings supposed it to be *organic*, and he mentioned he had seen something not unlike it in still older rocks (Cambro-silurians). I noticed it usually occurs entangled as it were, among the branches of sea plants. I have always held the same view as the one entertained by the late Palæontologist of the Canadian Geological Survey, as regards its organic nature. I considered it may have been a species of nemertes possessing a body which admitted of partial fossilization at least. This necessitates, however, an explanation of the absence or disappearance of the outer skin. It also requires the production of any instance where the more durable parts of an annelid is shewn to be internal not external—that I admit is a difficulty. We are merely groping in darkness now, "children seeking for light," as the Rede lecturer at Oxford recently said. We know not how soon the veil may be drawn aside that conceals many a secret of Nature yet involved in obscurity.

Sir W. Dawson kindly furnished me with a paper recently published in "The Quarterly Journal of the Geological Society," entitled "Burrows and Tracks of Invertebrate Animals in Palæozoic Rocks and other Markings." In this Sir William refers to the impressions from the Clinton beds of Hamilton. In a few cases you may remark I appear to hold a different view. Well, while the distinguished veteran Palæontologist states that there is confessedly some difficulty in separating the marks known as "phymatoderma" from fucoids, and even the stems of coniferous plants. I may claim pardon if I have expressed an erroneous opinion in some instances. I do not for a moment doubt that marine worms, as stated by Sir

William, must have culminated in regard to size, abundance and range of organization at a very early geological period. In fact we have very conclusive evidence of that in the neighborhood of this city—Hamilton. At the same time I believe that many of the supposed annelid trails, casts or burrows may yet be classified as marine plants or true fucoids. I have much pleasure in submitting for the examination of the Section photographs of specimens of Clinton slabs from Hamilton, as given in Sir Wm. Dawson's paper. His suggestion that the worm-like stem of a lingula may have formed such burrows as we see occasionally seems so probable that I fancy many must concur in that.



IRISH CELTS AND THEIR RELICS.

Read before the Geological Section, Feb.-May, 1891.

BY COL. C. C. GRANT.

Within the past century much additional light has been thrown on the subject of Pre-historic and Pagan Ireland, by Dr. O'Donovan, Eugene Curry, Professors Graves and Todd, Trinity College, Dublin. The Ossianic Society, by giving us translations of the lays and traditions of the Gael have contributed also not a little valuable information respecting our Celtic forefathers. However, on the whole it may be admitted that the knowledge we possess of our early history is very little indeed. The Monkish chroniclers evidently entertained but slight affection for the bards, an order likely to keep alive the memory of things they were desirous of consigning to oblivion. Probably this may account in some degree for the very meagre details of pre-Christian times incorporated in our oldest manuscripts.

The Royal Antiquarian Society, of Ireland, (embracing Irishmen of all creeds), is one of the noblest conceptions that ever emanated from the distinguished sons of our Irish soil. Independent of the knowledge we are likely to acquire from this union, we may also realize the dream of the poet and patriot, whose mortal frame reposes in Irish soil, the land of his birth.

“And O! it were a glorious deed
To show before mankind,
How every class and every creed
May be in love combined;
May be combined yet not forget
The fountain whence it rose,
As filled by many a rivulet
The stately Shannon flows.”

I.

As in all records of ancient races, doubtless there is much that is fabulous in the early history of Ireland. Who were the primitive inhabitants—from whence did they come? This problem may

never be satisfactorily solved. All who accept the theory of the Aryan migration must admit that many of the so-called Celtic myths may yet prove to be based on actual facts. Ireland abounds in limestone caverns which probably are rich in organic remains and implements, such as were found in England, Belgium and France, but as far as I know no proper examination under duly qualified geologists has been made, save in one instance, when the late Professor Leith Adams opened a few ossiferous caves in the County of Cork. This state of things does not seem exactly creditable to Irish geologists. The Anthropological Society of Great Britain has an unexplored field there for further research, and surely it would be of unquestionable importance to science if our neglected caverns or grottos were forced to reveal the hidden secrets they perhaps retain. Continental explorers have unquestionably proved that a race of men like the modern Esquimaux in interglacial times, if not earlier, left their skulls and bones there mixed with the remains of animals still existing in the Arctic Regions, elsewhere extinct. Within the past half century in a cranogue at Lough Gur, in the County of Limerick, the bones of the Arctic bear were unearthed. Does such a find indicate a more southerly range as its habitation? Further exploration can alone throw light on the subject.

It is probable that Inis-Ealge (the noble island), received at an early period, pre-historic of course, a few colonists from Great Britain in their hide-covered corroghs. The bardic annals, alluded to by more recent writers, mention a people named Fomorians, or sea robbers, who visited the island on plundering expeditions previous to the arrival of the Fir-bolg colonists, so called from the leather bags they carried. Tighernagh, Abbot of Clonmacnoise, who lived in the eleventh century, considered all records regarding historical tradition beyond B. C. 305 as doubtful chronicles. Many of the statements would appear to him incredible which no man to-day would doubt who has studied the topography of the island, or who has been impressed with a view of such extraordinary monuments as were raised by the pastoral Fir-bolg or highly civilized Danaan, the skilled mechanic. The burial places of the kings of the latter people, Dowth, New Grange, etc., Dr. Petrie states "rank after the Pyramids of Egypt," yet all we know respecting them is this, "a thousand years ago they were broken into and plundered by Ostmen (Danes)."

Military Architecture—Pagan Ireland.—Among the most ancient stone forts in existence are Dun Ængus and others in the Island of Aran, and what is known now as Staignes in the County of Kerry. The former is the more extensive, the latter in extraordinary preservation for a ruin that Wilde mentions as having existed for at least 2,000 years. I have not seen either, but an excellent model of the Kerry fortress, composed of stones used in its construction, enables one to form a clear idea of the structure. The original is nearly circular, 114 feet in diameter, 13 feet thick at the base, and a little more than 5 feet under the coping stone; there are two chambers in the massive wall. A series of steps inside the latter led to platforms for the defenders. It was built without mortar or cement, in what is known as the Cyclopean style of architecture. I am not at all surprised that the Dublin *Antiquarian* remarks :—“ One is led from similarity in structure to the earliest Pelasgian monuments of Greece to suppose an identity of people.” The stone fortresses like these are said to be the work of an early colony called Fir-bolgs, Belgian Celts perhaps. The bardic chronicles, our early annals, inform us they came from Greece originally, that they were of Sythian descent. Is it not strange that the new Aryan discovery of Max Müller was known in Ireland more than a thousand years ago? The jests of a few English critics on the subject seem rather out of place.

Stone Habitations—Clocháuns of Fir-bolgs are found chiefly in the islands off the west coast of Ireland. Some are circular, dome-shaped buildings; formed by the flags overlapping, (the principle of the arch being apparently unknown), large enough to house several families. Dr. Petrie supposes a few, at least in Aran, were erected as monasteries and religious establishments in the sixth century. If his opinion is correct they must have taken the monuments of the primitive inhabitants as their models. While admitting there is still strong evidence that monastic communities were established in the western islands long before the Norman invasion, I confess I am disposed to think the early Christians may have, possibly from this ancient, pastoral people, known to us as Fir-bolgs, Dumnonians, etc., acquired the cells and Pelasgian remains subsequently converted to the purposes of Christianity when this religion was substituted for Paganism.

Sir Wm. Wilde states, the Celtic city of Fahan, near Ventry

Harbour, abounds in cahirs and clochauns. From the description given of it, it appears to be of very great antiquity. In a note to a chapter of the History of Ancient Ireland, by Mr. Haverty, the writer expresses his belief that we have the descendants of these Belgian colonists yet among us. The brachycephalus (round skull) may be frequently noticed in Connaught and among Kerry men in confirmation of this opinion.

Mortuary Urns and Cremation, Pagan Ireland.—The mortuary urns of the pre-historic inhabitants of Ireland are very beautiful, both in design and execution generally, but I have seen some few exceptions which one may compare with the rude pottery of the Indian ossuaries in Canada. They are found both in tumuli, i. e., Druids' altars or cromlechs, and in what we call kists and caverns, rarely however in the latter. In most cases they contain ashes and burnt bones. The kist itself is a small bee-hive like structure, (sometimes square) a little beneath the surface of the soil, and probably was formed where the body was cremated. In addition to human bones, remains (teeth) of the dog have been found also in the urns, which leads us to conclude the hound was cremated with the master. The cromlechs may have been the sepulchral monuments of the more distinguished chiefs. The memorable discovery of the one in the Phoenix Park, Dublin, A. D. 1838, first opened the eyes of antiquarians to the real nature of the so-called altars and sacrificial stones, when the pick and spade of the working man solved a problem which all the learning of Europe failed to decipher. In levelling a mound about fourteen or fifteen feet high the labourers came on a massive flagstone resting on others placed perpendicularly. They had previously discovered a little outside this, i. e., the central point, four small kists containing burned bones; inside the chamber formed by the flags were two complete male skeletons placed not full length (the space did not admit of that), but bent as it were at the knees; a number of small littoral shells, pierced for a chaplet or neck-lace apparently, lay close to each skull; a bone pin, two arrow points and a flint knife were lying near by also. The circumstance of finding the two modes of burial in the same mound Sir Wm. Wilde notes as "a remarkable fact." Warren Moorhead, I think, mentions that the Red Men of Ohio at a recent period frequently interred their dead in the pre-historic burial places of the mound-builders.

It is stated that many of the jet and amber beads in the Royal Irish Academy, Dublin, were obtained from tumuli like the one in Phoenix Park. I can find no confirmation of this, and am inclined to think the amber, at least, was obtained either in war at a subsequent time, or by barter with the Northmen. The shores of the Baltic have been long famous for the production of the mineralized gum, amber. This is the only place from whence it was obtainable, I believe, in the North-west of Europe.

This ancient people have left us their stone axes (celts), flint arrow-points and spear heads, perhaps, I may add, the copper celts likewise in our National Collection in Dublin, Ireland. The celts alone are about 500. If we compare the flint and stone weapons and tools of this ancient tribe or people with a like collection manufactured by Mound-builders or Indians, we may immediately perceive the marked superiority of the former as regards design. They had attained a more advanced stage of civilization, perhaps, than the mere hunting Red Man of this Continent. It is singular that as yet we have obtained no stone gouges such as you may remark in almost every collection one sees here. The gouges of this material now in our Irish Museum were presented to the Irish Academy by the King of Denmark. The bronze ones in our National Collection were moulded by artificers, I think, who had taken the more ancient stone ones as their models. Some of the latter may have turned up since I left Dublin thirty years ago. In one of the mortuary urns a flattened piece of copper was found with calcined bones. This leads one to believe our Irish Celts were acquainted with at least one of the metals at a very early period.

The bone weapons—daggers or skeans and other implements—in all amounting to between forty and fifty, I think, in Dublin in 1861, are older than the time of the mechanical Danann or warlike Gædhil. This may be an erroneous opinion on my part. In a paper contained in the Proceedings of the Anthropological Society of Great Britain some years since, the writer stated:—"The stone and flint implements are almost alike in Denmark, France, Ireland, New Zealand and Mexico, and the pottery of this (the stone age), is akin also with similar ornamentation, while the tools and weapons of the bronze age in Italy, Switzerland, Ireland and Denmark bear a near resemblance." In a general sort of way the assertion holds good probably, but an expert antiquarian in many cases could point to some

peculiarity in manufacture which enables him to detect differences which men who have not made the matter a study cannot perceive. For my own part I was unable to recognize a collection of stone and flint implements from the Highlands and Lowlands of Scotland when mixed with a like assortment from such as are seen in our Irish Academy, Dublin.

Where a marked superiority may be noted in a few instances, it may be owing to individual skill as well as to the spare time a pastoral family tribe may have at their disposal for manufacture. No doubt the number of celts in the Irish Academy (500 nearly thirty years ago when I was in Dublin), may have been considerably increased since then.

In the papers published by the Belfast Naturalists' Field Club, some years ago, it was stated that many of the beautiful bronze spears and swords now in the Belfast Museum were found in that district in tumuli. The latter are of two kinds, one long and tapering (rapier like), the other short and wide (leaf shape). If the statement is quite accurate it goes far to prove that the people of the bronze age buried their dead in the same manner as the race which used stone and flint instruments.

It certainly is difficult to understand how men unacquainted with the use of metals (as the earlier colonists), could have raised up and placed in position the enormous masses of rocks which form the covering flags of several of the Ulster cromlechs. One of the blocks (Cloughmore), is granite. It is 13 feet long, 10 wide, and 5 in thickness. Its estimated weight is 50 tons; several others weigh but little less. It appears to me equally difficult to offer any satisfactory explanation regarding the Irish mound-builders. The tumuli of Ulster seem more numerous than in Connaught, where the descendants of the Fir-bolg Celts are supposed by many Irish antiquarians to be still represented. I differ altogether from the writers who suppose the differently shaped bronze swords may be attributed respectively to the Belgian and Danann tribes. Both I think characteristic of the latter. The kistvans of Ulster are tumuli on a larger scale, containing several chambers. I cannot say whether they are confined to the province. I have not seen them in any others; that is purely negative evidence and does not show their non-existence. An Irish guide was asked the meaning of this term by an English tourist. "Sure, man alive," was the reply, "'tis the

place you live in when you're dead." In the Irish bull he unconsciously repeated the belief entertained by our Celtic or Aryan forefathers, viz., that the soul or spirit frequents the place where the mouldering clay is deposited. Stone circles similar to the one at Stonehenge in England, and Brittany, are not uncommon. What they were used for still remains an unsolved problem. The same may be said of the pillar stones, although in some cases there is reason to suppose some of the latter were erected to mark the spot where a favorite chieftain or champion had fallen in battle.

II.

There was one kind of burial omitted in my last notes respecting Pagan Ireland, perhaps because it seems to have been an unusual one, viz. :—when the king or chieftain was interred in a standing position, as an ancient poem states, "with the red javelin in his hand and his face to his foes." Two skeletons at least were discovered in this upright position, in one instance the covering flag rested on the skull apparently. No weapon or ornament was found, so I think we may infer the spear-heads were iron, which could not be very well preserved under such circumstances, that is if the arms were actually placed beside the dead warriors, as stated by the bard. A great many, if not the majority, of the bronze spears and celts in Ireland were obtained from fords, in deepening the beds of rivers, and in bogs. Owing to the green crust which has formed on them they frequently present the appearance of malachite. In fact, one is led to believe the immersion they had undergone materially contributed to their extraordinary state of preservation. Many of the iron spear-heads and javelins also were discovered in like situations, but I cannot say if any deposit of carbonate of lime was noticed as encrusting them. I am disposed to think they must have suffered more from oxidation unless they were so protected.

At Kildrinagh Ford, on the River Nore, Queen's County, a very interesting discovery was made by the Board of Works some years ago. On removing about a foot and a-half of the loose gravel and sand, the workmen came on the remains of a bridge of black bog oak, and embedded in the harder layer beneath were three skulls; near the human remains were four bronze swords, two iron ones and two iron spear-heads. As far as I can recollect one skull had a skean or dagger sticking in it. However, I may confound

this with another "find" in or near Borris in Ossory. There is no reason to suppose that the weapons were deposited at different periods, they were all lying at the same level, the iron ones not lying above the bronze. The same circumstance was remarked when deepening the fords of the Shannon, but at Meelick and Keelogue the stone celts were invariably below the others, according to intelligent supervisors of the workmen. The matter is doubted by others.

Weapons of the Irish Celts.—We have no means of ascertaining when the Pagan Irish became acquainted with the use of metals. It appears likely enough that the primitive Fir-bolgs had acquired a knowledge of melting and moulding copper. The rude axes and tools of this material were evidently modelled on the stone ones of the earlier times. The succeeding colonists, if we may credit the bards and annalists, were the artificers of the magnificent collection of bronze swords, spears and war axes now in Dublin, London and other places. Two great battles were fought at North and South Moytura, ending in the defeat of the Belgians or bagmen. "The memorials on the fields" Wilde remarks, "to this day attest the truth of the statements recorded by historians." To the superiority of the weapons and magic, i. e., skill of their more highly civilized foes these Fir-bolgs attributed their defeat. It is said they were driven to the Western islands and other inaccessible places, but returned and became gradually absorbed in the general population. Eugene Curry was in possession of an ancient manuscript giving quite a different version of the second fight at Moytura. He arrived at the conclusion that the result was not a complete victory. It ended in a compromise by which they remained in undisturbed occupation of Connaught. This, if true, would go far to explain the marked difference in physical appearance between the peasantry of the West and other parts of Ireland.

Copper Spear-heads.—Only a few have been found. It is not improbable that some of the weapons of this material were re-cast subsequently, as has been suggested, when it was ascertained that tin possessed the property of improving it for military purposes.

Bronze Spear-points, etc.—Although our National Collection is the largest in Europe, viz., 276, it by no means represents the actual number discovered within the past century. The British Museum also secured many of our specimens. When I was quartered at Birr, now Parsonstown, I saw in possession of a local antiquary

there, an exceedingly fine collection of Celtic relics. It was particularly rich in bronze spear and javelin heads. I understand Mr. Day, of Cork, has also a remarkable one. In fact the private collections are very numerous. Bronze arrow points are rare comparatively speaking. The Irish and Welsh Kern, the true bowmen of Crecy, used steel or iron points. This material does not admit of being well preserved for any great length of time unless in very exceptional instances. I may notice here a singular fact relative to King Edward's wars in France. One of the Irish leaders, an Earl Kildare, was created a knight for valor on the battlefield; another, the Prior of Kilmainhan (Butler), was made an earl for services rendered on our foe. Numerous as are the bronze swords and skeans in the Royal Irish Academy (280 odd), I do not think we possess a single specimen of the former retaining the handle of the blade. "Solinus mentions," remarks Wilde, "that the Irish formed the hilts of their weapons from the teeth of large sea monsters, which they polished to a beautiful whiteness." If the walrus furnished the material it seems difficult to understand why such a substance as that was not preserved. Gold-hilted swords are frequently mentioned by our annalists. On one of the blades found in a bog in Limerick County, a portion of the gold mounting was attached to the handle; on another, from Tipperary, was a fragment of the precious metal weighing twelve pennyweights and nine grains. In 1751 a sword was found with a plate of gold, rivets fastening it on one side, weighing between three and four ounces; another was discovered two years after similarly ornamented. It is not improbable that in some instances many of the weapons were flung aside when they had been stripped of the gold plates forming the handles. No complete scabbard has yet been found, but I think I noticed the bronze tip of one which possibly was fixed on a leather sheath. It is not likely that such would have been preserved unless in very exceptional instances.

Dr. Crawford, a distinguished member of the Anthropological Institute and Fellow of the Royal Society of Great Britain, endeavors to show the bronze weapons of North-West Europe were of foreign introduction, in the course of barter. From the small hilts of the swords, Danish probably, he supposes they were the work of an Asiatic people.

A considerable number of our Irish antiquarians think they may

have been derived originally from the Phœnicians, the earliest navigators and merchants, who founded Carthage, and sent colonies to Sardinia, Sicily and Spain, a thousand years B. C. They traded to the Cornish coast for tin, one of the constituents of bronze.

Several of the Irish weapons have been analyzed, and are found to contain from one to fourteen per cent. of tin, and in some instances a small percentage of lead also.

Although the Sidonian origin is not generally accepted, I confess I cannot see the improbability of it. The early Celtic Danian tribe, in Ireland, have left us several of the moulds for casting spear heads and battle axes. The circumstance does not prove that the manufacture of the metal implements had, as has been stated, gradually been developed, and not originally acquired from a foreign source. Pouchet's theory is that the small-helved swords (Scandinavian) were used by the women of North Europe, who usually fought among the men.

Bronze Celts, Axes.—Ireland is known to antiquarians as "the land of the bronze celt." No country known to us can display such a collection as she possesses. In the Dublin museum cases alone, there are 686; and altogether 1,500 more are known to be in possession of private collectors, etc., independent of a large collection purchased or obtained by the British Museum. You may find them likewise scattered all over the United States, great numbers having been purchased from dealers by American tourists. Many of the Scandinavian celts are decorated in the same way and fashioned in the Irish manner, but when the suggestion was made that the Ostmen may have acquired them during the centuries of incessant warfare they waged against civilization, the singular fact was mentioned by a Celtic scholar, that although copper (*umha*) and tin (*stan*), white and red bronze, (*ban and derg umha*), are mentioned by the earliest annalists, they seem to be ignorant of any implement whatever bearing a resemblance to a bronze celt. He considered this a positive proof of very great antiquity.

It may be remarked, comparatively little of the monkish records have been preserved. What escaped the Danes fell, in after times, into the hands of men equally ignorant.

More than a century ago Dr. Hamilton, F. T. C. D., exhibited to the Antiquarian Society a bronze celt in its stone mould; several

castings of a like material as well as of clay, sand and mixed metal have been more recently obtained.

The palstave, or winged celt of Scandinavian antiquaries, is frequently found in Ireland, as also the rude plain one and the socketed variety.

A bronze celt now in Berlin, Germany, was discovered in a tomb in Etruria. I have not seen a representation of it.

The sculptured stones of the great pyramid and catacombs of New Grange, County Meath, already referred to as the burial place of the Danann kings, bear a marked resemblance to the incised ornaments of some celts. While their use is as yet considered a matter of uncertainty and conjecture, I hold the circumstance of finding them so frequently in river fords is strong proof of their use as battle axes.

I think only three bronze mace heads have been discovered. I may be mistaken, but I am under the impression that it has been stated this was a weapon peculiar to the Franks, and another writer is of opinion it was borrowed from the Saracens in the time of the Crusades. Anyway, mention is made of a church dignitary, who was averse to shedding blood with such a carnal weapon as the sword. After a desperate resistance he was made prisoner on the battlefield, and confined in the tower. The Sovereign Pontiff demanded his immediate release, as one of the church's children. The Plantagenet king in reply forwarded to Rome the battered coat of mail his captors had found under the prelate's ecclesiastical habit, with the query, "Is this your son's coat or no? Does your Holiness recognize in this implement (the mace), with which he brained two of our trusty knights, any resemblance to a bishop's pastoral staff?" History does not inform us regarding the result. We may hope the warlike prelate ultimately obtained his liberty, and that his Majesty was satisfied with the joke at the church's expense. The steel spike mace, so common in the middle ages, is alluded to by Scott in the encounter between Richard Cœur de Lion and the Saracen, Emir Saladin. I understand it is represented also in battle scenes from the Assyrian palaces.

Pillar and Ogham Stones.—These have been for many years the cause of some little discussion and controversy among Irish antiquarians. Although bracketed as above, perhaps it were better to separate them into plain or pierced and inscribed pillars. One

party contends the former were used as boundary stones in the same way as the milestones we find on our ordinary roads still. The other asserts that the early annalists in many instances allude to them as marking the burial place of a champion. It seems to me the translation of two distinct manuscripts by Dr. Petrie, in his work on the round towers, ought to be deemed sufficiently conclusive on the point. See the following extracts:—

“The pillar stone of Buide, the son of Muiredh, where his head lies.”

And in describing the death of Fothadh, slain at Ollarba, fought A. D. 285, “There is a pillar stone at his cairn and an ogham is on the end which is in the earth.”

A mortuary urn, containing bones and ashes, was found at the foot of a block of stone erect, in the County Antrim, not many years ago. With respect to the pierced pillars we know it was an eastern custom to set up memorial stones by various ancient races.

Danish Rath.—Scattered all over Ireland, met with everywhere, are the circular earthen entrenchments, ignorantly attributed to the “Ostmen,” and known as Danish raths. They are usually surrounded by a deep fosse, or trench, partly filled in sometimes. Doubtless they were further strengthened by a palisade, for I recollect finding in one of the ditches a pointed stake; it owed its preservation to the boggy soil in which it was imbedded.

Old men who had a vivid recollection of the insurrection of '98, informed me “the raths” were formerly more numerous, and that numbers had been levelled by the gentlemen and farmers about.

Many of them evidently are of great antiquity, “Rathcroghan,” for instance, where the Connaught kings were inaugurated. The houses, huts or dwelling places were formed of timber or wicker-work plastered with clay, and covered with reeds or rushes—of course, such perishable material would quickly disappear. Some of the churches were built of timber, “more Scottorum,” according to Bede.

When we reflect that wolves were very numerous until comparatively recent times in Ireland, that we were not always so much given to peaceful pursuits, as in our own day, that there may be even a slight foundation for accusing us of “cattle-lifting” occasionally, you may see the absolute necessity of our forefathers taking the precaution of erecting such places of refuge.

I opened a rath not far from Carrig-Cleena, in the County Cork,

a cave where Cleena, the Queen of the Fairies, is supposed to hold her Court. On removing the sods and surface soil from a central point the spade came in contact with a large flag resting on others in an upright position. On removing the upper slab I discovered an underground passage, running apparently in the direction of the nearest rath. Owing to foul air I was unable to penetrate more than a few yards, but I came to a small chamber, built of stone, without mortar or cement, bee-hive shaped like the kists. Probably all the raths around were connected in this manner for defensive purposes.

A gentleman in Mayo, some miles from Castlebar, pointed out to me a similar chamber in a rath there. He suggested it may have been used for storing wheat, etc; I thought so too. The chamber had also a spring well. The site was in a military point of view admirably selected in every way. I am inclined to believe some of the raths were occupied more recently than is suspected. I obtained, on more than one occasion, tobacco pipes differing but slightly from clay ones now used; a hand quern for crushing wheat, etc., is precisely like the ones you may remark in the cabins of the Connaught peasantry yet. I have seen coins of James II., which were said to be obtained from the trench of a rath.

In the Rhind lecture for 1889 Professor Munro concluded as follows:—"The earliest lake dwellers of the stone age knew the arts of spinning and weaving, cultivated the cereals, had domestic cattle, paid attention to ornament, and in fact were in possession of all the elements of civilization." After a period of transition the stone passed into the bronze, characterized by higher refinement and knowledge. He thinks the latter was brought about by the advent of a new race of settlers. From the sudden appearance of the iron age and the perfection which iron itself appears to have attained at once, he showed it indicated a new race of people who had conquered the old lake dwellers. His conclusion was that they were a branch of the original Celts, i. e., the ancient Aryan stock.

The extract above differs little from what he stated in his work "Scottish Lake Dwellings." Neither does it in a general way from my conclusion regarding the early inhabitants of Ireland.

In one of the Irish cranogues, Dunshauglin, Meath, among a vast number of antiquities, human remains, etc., several slate and bone disks were discovered, precisely like the ones from the Canary Islands, Teneriffe. The cranium of a Guanche mummy coincides

in several respects with the heads in our tumuli. The disks, as Wilde suggests, were used probably for spinning thread.

III.

I may be reminded that the Irish Annals refer to the landing of a chief, called Partholan, and his sons, before the men of the stone age, Fir-bolgs. We may, I think, dismiss it as questionable if not altogether untrustworthy.

Indeed some modern writers are disposed to question the existence of the Danann Tribe altogether; they consider they were merely the succeeding generations of the Celtic Cimmerians or Kimri, which, under more favorable conditions than they had previously enjoyed, gradually acquired an independent civilization unindebted to outside influences. If this could be established it would be a singular fact in the history of mankind. Such development may not be impossible, it certainly was unusual. I hope I have not misunderstood the purport of this criticism, which appeared in an English paper after the catalogue of Irish antiquities was published. The actual words I cannot recall. It was not an unfair one on the whole, but the writer I think failed to see that he possessed only a very superficial knowledge of the subject. I do not intend to imply by this that the critic was unacquainted with Celtic English antiquities, but he appeared to me to know very little respecting our Irish ones, and more especially their surroundings. The bardic traditions relative to the Milesian invasion, which was said to have taken place 1700 years B. C., was rejected also on the grounds of its utter improbability.

I do not suppose a people using stone implements only, could have fashioned such vessels or canoes, as may have enabled them to reach the Irish shores in the way related. The succeeding wave of immigration possibly introduced the Dananns, a tribe highly civilized. If they were not actually Phoenicians, as many of us think, from whence did they acquire the knowledge they unquestionably possessed? The glass beads and ornaments of blended colors found in their mortuary urns, burial mounds and catacombs, can scarcely be excelled in the present age. That the Sidonians were acquainted with navigation admits of no denial, and we learn from the father of history and others, that at a very early age indeed, their ships sailed round Africa. In Wilde's narrative, "Travels in Egypt, Pal-

estine, Tyre, &c.," referring to the last you may find this extract: "As an Irishman I felt no small degree of interest on first touching the motherland, whose colony we claim to be. I asked myself, was this the city whose antiquity was of ancient days, the mart of nations? Could this be the strong city Tyre, the daughter of Sidon, whose ships were constructed of the fir trees of Senir, the cedars of Lebanon, the oaks of Bashan, which pushed her colonies beyond the Pillars of Hercules to Gades and the Isles of the West?"

Again, the same writer remarks, when describing some of the peculiarities of the tombs he discovered at Tyre, (Palætyrus), "I mentioned the similarity that existed between the ground plan of the Egyptian, Phœnician, Grecian, and also the Irish, as exhibited in cromlech or pyramid of New Grange, in all of which the tomb consists of a stone chamber having three recesses or tabernacles for bodies, i. e., one on each side and one opposite the entrance. Now, in these chambers that I have just described the same character is preserved, showing a similarity of sepulchral architecture throughout these several countries." Herodotus, who lived 413 B. C., states, he "was informed by the priests of Hercules that their temple was in existence since the city was built 2,300 years before." The celebrated Sir Isaac Newton in his "Chronology of Ancient Kingdoms," mentions the Phœnicians going to the coast of Spain, building Carteia, Gades, and Tartessus; others going further to the Fortunate Isles, to Britain and Thule. History tells us, the Persian fleet, sixty in number, were defeated by twelve Sidonian ships. They must have been superior both in size and skill to overcome such a disparity of forces. The suastika, or symbol of fire, which Schliemann claims to have discovered recently, in what he considers the ruins of Troy, is also engraved on sculptured objects from Africa, India, Greece, Denmark and Ireland.

When I was quartered in the Ionian Isles I was presented by a Greek Monk with an oval lead bullet about the size of a bantam's egg. It was found in a tomb in Cephalonia, and was supposed to have been used by a slinger in Pagan times. There is in Dublin a mould which was formed apparently for casting such missiles.

In a paper by John I. Robinson, A. R. H. A., on "Celtic remains in England," referring to photographs taken by Mr. Allen, I find this statement:—"I think that the light now being thrown on the subject goes to prove the truth of the Irish annals and traditions.

It is manifest that the art of designing interlaced ornaments came originally from the East, where it is still practised. The interlaced work on Nestorian MSS. might be mistaken for the illuminations out of an Irish one of the eighth century,"

If the Danann tribe (Phœnicians) occupied the greater part of the island for some 197 to 300 years, how comes it, (it may be asked), that no ruins of temples such as the Sidonians were known to possess, can be pointed out in proof of such occupation? Permit me to say in reply to this query, is it probable Heathen temples would be permitted to exist while Christian edifices were required for churches and monasteries? We know, in numerous instances, the material used in monastic buildings was converted to the purpose of erecting the castles and strongholds whose ruins are to be seen everywhere.

In Kiltinan, which is still inhabited, a female form may be noticed, one hand grasping a dagger, the other a crescent. The stone, thus engraved, was evidently derived from an older building. Not far from this, about a mile or so from Mr. Cook's demesne, when examining the remains of a ruined chapel or church, I discovered built into the walls, a block containing the raised, rudely sculptured form of a nude Astarte, perhaps. I am not aware if this interesting relic has been noted previously. I cannot entertain a doubt that it must have been taken from some Pagan Temple, although a brother officer of mine suggested that it might have been intended as a representation of Eve before the fall.

An inscribed stone, which had disappeared since the time of Charles I., was quite recently discovered built into the pier of an old gate with the inscription face turned inwards. It would be tedious to enumerate where and under what circumstances many of our ogham Celtic pillars were recovered.

From the many monuments ascribed to the Dananns, coupled with the historical tales and traditions respecting them, Dr. O'Donovan considers they were a real people. It may be inferred they were skilled in arts unknown to their successors, "they could work diabolical things by magick, and were accepted the chiefest magicians in the world." The learned antiquarian concludes that they may have lingered in retired situations in Ireland for many centuries after their subjugation by the united efforts of the Bag-men and Milesians apparently. He adds, "It appears to be

strange that our genealogists trace the pedigree of no family to this people, while we have several families of Fir-bolg descent mentioned." The circumstance stated may lead some to infer they were a different or distinct race, and possibly were exterminated or expelled by the combined Celts. Had they been observed in the population subsequently we may discover some peculiar idiom or root derived from a foreign source. We must leave this to some future Max Müller. The Persian word *khan* has the same meaning as *cean* in Erse. The Eastern origin of the latter seems evident. Crom of Pagan Ireland is the Egyptian *chrom*. While you may permit me to point to a few weapons and ornaments attributed to this wonderful people, I may mention they are credited with having conveyed from the East the "*lia fail*," or stone of destiny, in the coronation chair, which Protestant England holds sacred, believing it to be the identical pillow of Jacob, which he set up as an altar! Instead of newly upholstering that blessed old antique, as was done lately to modernize it for Her Gracious Majesty's descendants, it would be more judicious, perhaps, to have handed it over in its original condition to the safe custody of the British Museum than retain it where it now is, as a monument of medieval English superstition in this enlightened age. The Established Church may rest assured few of us would feel inclined to claim such a Celtic relic as this.

The succeeding wave of humanity that swept over Europe and left their footprints indelibly impressed on every prominent mountain chain, on the banks of the principal rivers also, was derived apparently from the east. It is remarkable that two emigrations are referred to, one towards the north, the other westerly by Gibraltar. The latter is what we are concerned about, since the majority of the Irish people and nearly all the inhabitants of the Scottish Highlands derive descent from the Scythio-Iberian colonists, known to us as Milesians. It is probable that Spain had a Celtic population before the arrival of the latter there. I can see no reason to doubt the bardic accounts, because some critics think it hard to imagine a wandering tribe, at such an early period, having a knowledge of navigation which would enable it to find a way across the sea from Galicia to Ireland. They admit that Phœnicians and Greeks were navigators, using sail vessels thousands of years ago; that ships (not mere boats or canoes), are undoubtedly represented on the tombs of Egyptian Kings. But Oh! it would seem too much to ask them to

believe our Celtic ancestors were acquainted with any vessels, save such as were formed out of the hollowed trunks of trees, or hide covered corrochs. The Latin poet Claudian knew better, when referring to Niall's successful expedition into Gaul, then a Roman province, he states: "*Totam cum Scotus Iernem movit et infesto spumavit remige Tethys.*"

The chronology of our pre-Christian annals is obviously erroneous, but this does not affect their general authenticity. In this I most cordially concur, since Protestant and Catholic fellow countrymen alike, accepted the writings of Moses, the Jewish priest of Isis, learned in all the Egyptian Mythology.

Round Towers.—No Celtic remains have been the cause of such angry controversy and difference of opinion among antiquarians as the extraordinary structures which I believe are peculiar to Scotland and Ireland:—

"These grey, 'old pillar temples,
The conquerors of time."

As regards their origin and use, that remains an unsettled point. Some consider they were pre-Christian sepulchral monuments, Sun, or Baal towers, or dedicated to Pagan purposes. Among the individuals holding these, or closely allied views, may be named General Vallancy, Dr. Lanigan, the Librarian of Stowe, Sir Wm. Betham and others. The advocates of the purely Christian origin were Sir R. C. Hoare, Petrie, O'Donovan. The latter was the dead antiquary referred to by poor D'Arcy McGee:—

"Kings that were dead two thousand years,
Cross-bearing chiefs and Pagan seers,
He knew them all!
And bards whose very harps were dust,
And saints whose souls are with the just,
Came at his call!"

The celebrated prize essay on the subject by Petrie leaves the matter still undecided. No doubt during the Danish invasion they were used as safe retreats. Human remains have been found inside as well as outside. The sculptured crosses over the door-way noticed in a few instances may have been carved long after the building itself was raised. That they are frequently contiguous to monastic establishments may be admitted, and the circumstance does not seem of much importance when we reflect that Christian edifices

would naturally arise in the close vicinity of the towers when converted to religious uses. It seems remarkable that no mention is made of such wonderful buildings until the introduction of Christianity.

The popular idea respecting the builder, no doubt, may have some foundation, but the Gobhan Saer could not have been the architect of all. Some are far more ancient than others. Lightning destroyed many, of which not a vestige remains, and man's hand, and I may add, unfortunately, neglect, proved yet more destructive than even the elements. However, the Royal Antiquarian Society of Ireland will in future look to the preservation of the ones yet remaining. Several have been already repaired, even previous to its recent reorganization.

Evidence can be produced in proof that one at least was erected in the sixth century and another restored in the twelfth. But no trace of the latter now remains. Taking into account that we have no proof that the principle of the arch or mortar was known before the introduction of the Christian religion, I am inclined to agree with Petrie and O'Donovan.

Weapons of the Milesians.—We possess no reliable description regarding the weapons of these colonists previous to the introduction of Christianity. The battle axé and sword were in use from a very remote time as well as the sling and bow. In the priceless illuminated MS. of the Gospels now in Trinity College, called the Book of Kells, old as the sixth century, you may notice a warrior holding a spear. The head above the shaft is coloured blue (steel); it is a peculiar shape, quite unlike the bronze ones of an earlier time. The figure displays the round target of the Highlander in his left hand. This circular shield with the central boss, may also be remarked on the most ancient of the sculptured crosses. These sculptures frequently commemorate battles and other incidents. In some cases are horses, chariots, fighting groups of soldiers—of these two are armed with spears and crescent-like shields, opposed to others with the long hacking Danish or Irish sword. The figures have suffered so much from the weather, and wanton injury as well, that it is no easy matter sometimes to trace the outlines. One, dressed in the kilt, was said by a guide to represent Adam. So you see the Celts may claim the primitive costume as well as the primitive language, else small reliance can be placed on tradition.

In a hurried examination of the Irish swords (claidem), claymores which came under my observation, I found it exceedingly difficult to distinguish Danish from Celtic, or the latter from early Norman. If we reflect that for some 300 years the inhabitants of Ireland waged an almost incessant warfare with the Baltic Vikings, both Fingalls and Dubhgalls (fair and dark foreigners), and subsequently with the Norman-Welsh invaders, with varied success, you may readily perceive how the difficulty arises. The victors on a battlefield would naturally collect and appropriate the arms obtained in war, handing them down as heir-looms. In several of the illuminated Celtic MSS. and monumental remains, the long cross-handled sword, used for cutting and stabbing, is often represented. I am not disposed to accept altogether the views of some antiquarians—that the mere guard for the fingers and hand is quite sufficient to enable us to pronounce positively, this weapon is Irish, that Danish.

Many years ago, when I was Regimental Adjutant of H. M. S. Bedfordshire Regiment, at Corfu, a discussion arose after dinner at the table of Captain Domville, R. A., (an Irishman too), a very distinguished general officer in after times. The subject of discussion was the origin of the Highland claymore. "Well, gentlemen, if you will excuse me for a few seconds," said our host, laughingly, "we may allow the old Italian himself to have a word in the matter." He returned shortly after with a magnificent Andrea Ferrara claymore in remarkably fine preservation, with the maker's name inscribed or engraved on the blade. My grandfather, who left Monymusk, Aberdeen, about 1740-45, considered such an inscription the only test of a genuine Ferrara. The majority of the basket-hilted swords in the Highlands were not made by the famous Italian artificer, and are merely modern imitations of his handiwork.

I am inclined to believe the celebrated armorer borrowed the idea of the hand-guard from a yet more ancient Milanese craftsman. My son-in-law, Mr. George Duggan, is in possession of a Milan sword I obtained at the Ionian Islands, bearing a close resemblance as regards blade and guard to the Scottish weapon. I presume it dates from the time when the Venetians ruled the Adriatic. The handle plate remains complete, but a small fragment of silver was attached to a rivet, proving conclusively that the metal ornaments had been removed.

A sword found in an old slated house, which was said to have

been occupied by one of Cromwell's officers, was given to me by the finder. The handle was dark, not black, oak; the guard steel, with brass or bronze pommel; the blade a long cutting one, point broken off. It did not widely differ from the swords of the Ironsides. It is doubtful if it could be classed as a Celtic relic.

Glass Urns, Ornaments, Beads.—It can hardly be denied that glass was known to the Pagan Irish at an early period. The mortuary urns, the numerous enamelled beads and other ornaments, the fusion of colors, the extraordinary skill displayed in blending them so as to produce designs in relief, lead one to imagine, until he examines carefully, that he is only admiring some very exquisite ancient cameos of Etruria.

It may be urged that the peculiar spiral decoration, exhibited in many instances, is essentially a Celtic characteristic, and that it is well displayed on the carved monumental slabs of our Irish pyramids at New Grange and its vicinity. This inference points to a pre-Milesian origin. We have no means of ascertaining whether they were manufactured in Ireland or acquired by barter or plunder from an unknown Eastern source. English writers allege that bottle and window glass only were manufactured in Great Britain for the first time in the reign of Queen Elizabeth, and that the latter was only used, with few exceptions, in palaces and churches. Surely, if a knowledge of making colored glass existed in Ireland in early Christian times, such a production could not well have escaped the observation of the monkish scribes, whether Celtic or Saxon. An Eastern people, and a highly civilized one too, were alone capable of producing such perfect forms and beautiful designs. The stained glass presented to the Academy by the Dean of Clannacnoise (Dr. Butler), from the primitive monastery of Trim, existing at the close of the twelfth century, was imported probably from South Europe, but the exquisite bead of white enamel, with the pale blue spiral lines passing around it, discovered at same locality, with gold and silver brooches, may be more ancient.

Royal Purple and other Dyes.—Not a few clergymen, as well as laymen, contend that the knowledge of dyeing textile material, which the ancient Irish undoubtedly possessed, may have been acquired with the lost arts from the scattered tribes of Israel. The process of colouring was known to them apparently before this separation

took place, but there is every reason to suppose the Irish people learned the secret from their neighbors at a very early period.

The mortars, or stone vats used for dyeing, cut from the rocks near ancient Tyre, were discovered by Dr. Wilde half a century ago. He noticed fragments of a small murex (*M trunculus*) cemented together, lying at the bottom of the caldrons and heaps of the same shell close by. Pliny, the Roman naturalist, who witnessed the process of dyeing, has left us an interesting account of it. But the shell which he calls a *purpura* (purple), was a murex not a *buccinum*. The true *purpura* produces a crimson dye. The difference in the appearance of both is exceedingly slight. Woodward and other conchologists held quite recently the same view as Pliny respecting a *purpura*.

The royal Tyrian dye, Pliny states, owed its rich color also partly to another mollusc, a species of *patella* (limpet), perhaps the blue so common on the shores of the Adriatic. If the purple sea snail, it would be difficult to understand how such an accomplished naturalist could have confounded *Ianthina fragilis*, a free floating shell, with the stationary one attached to rocks and unlike it in every respect. The snail shell is so exceedingly thin it is not likely even a fragment would have remained in the dye pots, whereas the *patellidæ* are of considerable thickness, and must have been easily recognized in the conglomerate.

Referring to an extract from Montague's "*Testacea Britannica*," and also to a tradition that the Phœnicians obtained their colors from South England and Ireland, Dr. Wilde gives us the result of some experiments he made with regard to extracting coloring matter from *testacea*: "The animal used was *buccinum lapillus*, and afterwards *turbo clathrus*, tons weight of which may be collected on the rocks at Howth and Malahide. The fluid will be found in a receptacle in a sulcus, behind the neck, of worm-like appearance. On applying it to silk, woollen or cotton texture, in a few seconds it assumes a straw color, then light green—margin becoming pink; red deepens into vivid purple, which washing increases in lustre and intensity. It must be exposed, however, to solar light. It is an animal indigo, containing a mordant in itself. Mineral acids affect it; the color fades at death (unlike cochineal), and grows fainter if the animal is kept long out of its natural element." Walker, in enumerating the colors used by the ancient Irish in remote ages,

remarks: "There is a beautiful crimson obtainable from the periwinkle and a species of limpet," and Plancus asserts, "The turbo clathrus yields the Syrian purple.

Dress, Ancient Celts.—Although the woollen manufacture of Ireland was well known and duly appreciated at the beginning of the thirteenth century, and we have conclusive evidence of its fabrication long before then, we really know but little regarding the costume itself of the various classes. I have no doubt the illuminated MSS. represent approximately, not only the color but the shape of the dress as it appeared to the respective scribes. A human body, in remarkable preservation, clad in deer-skin tunic, was discovered in 1821 in a peat-bog at Gallagher, Galway, the head, legs and feet uncovered. It was replaced, exhumed some years after, and deposited in the Dublin Society in 1829; the teeth, hair long and dark, and beard were perfect; a portion of the dress now in Dublin was submitted for microscopical examination to Professor Queckett, but he was unable to determine whether it was made from the hide of the extinct elk or not. A skin cap of dark fur, otter I think, is or rather was, in a gallery of the museum; it belongs to Mr. Walker's collection. No doubt even long after textile fabrics were in general use leather or deer-skin shirts would have been worn by swineherds and hunters. In the Western Islands off Connaught, the inhabitants wear moccasins yet of untanned hide, fastened in sandal fashion; they readily adapt themselves to the shape of the foot when they become hard and firm; they are better suited for cliff-climbing and far more comfortable to the wearer than an ordinary shoe. The hair is on the outside; they are in all respects like the description given of the ten thousand pairs of brogues left behind by the Scottish army, when by an extraordinary forced march they baffled the pursuit of King Edward III., leaving their worn-out foot-gear as the only trophy of the inglorious expedition. (See Planche's History of British Costume.) Many of the shoes and half-boots in the Irish collection are handsomely ornamented, especially the tan ones; some are stitched with gut, others with woollen thread, and later with flax or hemp. In some instances the buskins were found attached to the tight-fitting trews (trousers) as in the case of the body of the man discovered in the bog at Killery, Sligo; he was dressed in woollen costume. The material itself was used for the purpose probably by the primitive colonists, but we have no authentic foundation for the opinion.

The figures in the Book of Kells, an illuminated MS. (vellum), supposed to date from the sixth century, are generally believed to afford us the earliest representation of Celtic costume of certain classes of this period. A foot soldier, clad in a green tunic, light blue and red trews, armed with steel-headed spear and round shield, appears as if kneeling to receive cavalry. A subsequent page of the same work displays horsemen riding on horses covered with yellow trappings or coverlets; the cloaks or mantles are green also (the national color), but neither saddle nor arms are represented in the folio; so they do not offer us much assistance in endeavouring to ascertain whether they are intended to display mounted warriors or civilians of the age—in the absence of weapons, perhaps, the latter. In the vellum MS., called the Book of Ballymote, A. D. 1396, the dress of the figures is a close-fitting tunic fastened at least in one instance with a belt. There are not many representations of any but ecclesiastical costumes on sculptured monuments or shrines.

In the Book of Rights we read of the tributes paid by the several states or petty kingdoms. This valuable work, translated by Dr. O'Donovan, is now accessible, and may be considered a reliable authority on costume at a period before the Norman invasion. We there find mention made of the hooded cloaks, speckled with white borders, red, blue and green, trimmed with purple—purple of four points—with golden borders. The seann, or mantle, a white woollen loose shirt, Dr. O'Donovan thinks was used over armour. The Chief of Cinel Eanna was entitled to receive, among other tributes, five mantles and five coats of mail; the King of Tulach Og fifty mantles and fifty coats of mail, the seanns of deep purple in this instance. O'More, taken prisoner by the Earl of Ormond in A. D. 1600, is represented as wearing a short red cloak fringed at the neck, the conical Phrygian cap and tight trews.

The illuminated copy of Giraldus presents a portrait of Dermot MacMurrough; it agrees exactly with the description given in our native annals, and may be deemed quite authentic. He bears the double-handed battle axe, an unusual weapon at that time. The dress of the middle classes of England in the time of King Edward III. was a tunic with tight sleeves, tight pantaloons, short boots; precisely similar to that worn by the King of Leinster. It is quite possible he may have received and adopted the garb presented by his liege lord, in acknowledging the feudal supremacy of the

Norman monarch. I feel inclined to question if it can be proved to be the usual costume of a Provincial King of the time stated.

The dress of the higher order of the native Irish of the fifteenth century, save the conical cap of sheepskin, which fell to pieces when exposed to the air, is well displayed by a photograph taken from the garments themselves. The costume of an Irish chief of the century succeeding is supposed to be represented on a chimney-piece in the old castle of Dunkerron, near Kenmare; the O'Sullivan More wears a tunic belted at the waist, his cap a Glengarry bonnet with a twisted border and feather. The late W. Smith O'Brien obtained a cap of woven texture; it was found in a Kerry bog some ten feet deep, at the foot of a large tree; the gold band which was attached is absent now, and the present colour is probably due to the bog's tanning process. A woman's dress of woollen cloth, found in Shinrone bog, is in extraordinary preservation, and from its singular shape seems to have been lying there for about 500 years.

The curious fresco on the wall of Knockmay, Tuam, painted by O'Eddichan for O'Kelly, A. D. 1400, represents the dress of an Irish archer of the period; one is bare-headed, the other wears the conical Phrygian cap, a short green tunic and braccæ, fitting closely to the figure; the arrows carried in the belt loose.

The costume of Manus O'Donnell, A. D. 1542, before he surrendered his native title for the Earldom of Tyconnel, is described by the Lord Deputy Sentleger in a State paper yet existing:—"It consisted of a coat of crimson velvet, with twenty or thirty pairs of golden aiglets; over that a great double cloak of crimson satin bordered with black velvet, and in his bonnet a feather set full of aiglets of gold, so he was more richly dressed than any other Irishman."

In the great battle of Clontarf, fought on Good Friday, A. D. 1014, we have not only the scalds of the Scandinavian poets of the time, acknowledging their defeat, but such records as remain unquestioned, preserved by our monkish historians as well. No unprejudiced person can deny that both bear the impress of truth. The ringed and scaled mail of the Northern Vikings is accurately described. The Irish leader, Prince Murrugh, is called Kerthialfadr in the Danish accounts, which precisely agrees with that recorded in "the four masters," respecting his hewing his way to the Ostmen's standard, and cutting down two bearers in succession with his battle

axe. Geraldus Cambrensis, tutor and secretary to Prince John, has left us the following account of the Irish weapons:—"These terrible battle axes were wielded in one hand, and thus descended from a greater height and with greater velocity. Neither the crested helmet could defend the head, nor the iron folds of the armour the body—whence it has happened in our own times, that the whole thigh of a soldier, though cased in well-tempered mail, has been lopped off at a single blow, the limb falling at one side of the horse, the expiring body on the other. Besides these broad-axes, well steeled, they (the Irish) use short lances and darts, and are dexterous beyond other nations in slinging stones in battle, when other weapons fail them."

Harris Ware adds:—"Their swords were ponderous, of great length, and edged only on one side."

War Trumpets, Hunting Horns.—We have a large number of brass or bronze trumpets (corns), and clarions (stocs). The Buabhall of Vallancy, probably, was the great brazen war trumpet used by the commander only in a final rally or when he considered a supreme effort necessary to ensure victory. Geraldus Cambrensis alludes to it I think. The magnificent one in the Irish Museum, $8\frac{1}{2}$ feet in length, is the finest yet discovered, and you may perceive from the extract I lately received from Dublin how admirably suited it was for sending the leaders' instructions to the most distant point of the battlefield.

In 1750 fourteen bronze horns were found between Mallow and Cork; some of them came into Bishop Pocock's possession and were sold in London. Three were figured and described by Smith in his History of Cork. The locality where some at least were discovered I am perfectly acquainted with—Mourne Abbey. It was the scene of a sanguinary fight in King Henry the Eighth's time, between McCarthy, Prince of Desmond, and the Norman Earl of the same name. The latter was defeated with great slaughter. I always considered a few of the carved trumpets in question may have been flung aside when the bearers were escaping over the bogs or mosses after their defeat. Trumpets closely resembling them have been found in England. See the rare work in our museum, kindly presented by one of our members.

While we regret that the early Monks have apparently suppressed much information respecting Pagan Ireland, we must

acknowledge on the other hand that they left behind them illuminated and other manuscripts of the greatest importance. Italy, Switzerland, Germany and England possess Irish MSS. of marvellous beauty; one now in Milan dates from the sixth century and is of priceless value.

The strongest testimony of the truth of the bardic annals is recorded by a scientific Frenchman in his work "The Verification of Dates." He points out how an Irish monk relates eclipses of the sun as having taken place long before the introduction of Christianity into Ireland. In "The Annals of Innisfallen" he found the following entries:—A. D. 445, a solar eclipse in ninth hour. On testing this he ascertained a solar eclipse visible North-west Europe, July 28th at 5½ p. m. same date. Again, A. D., 664 (Irish MS.) darkness ninth hour (May); a total eclipse of the sun took place, visible to Europe, Africa, at 3½ p. m. 1st May of that year.

In the "Etruria Celtica" Sir William Beetham mentions that Orosius, a writer of the fifth century states that a pharos or fire tower was, according to tradition in his time, erected on the coast of Celtiberian Galicia as a guide to ships coming from Britain by Hercules. The Milesian bards claim that their forefathers sailed from Tuir Breogan, Galicia. That seems confirmatory, but they may only have followed the same course as their Phœnician predecessors, by whom the original Pharos of Bregia was erected. This granted, the circumstance leads to such a conclusion. It is expressly admitted that the Aryan tribe or tribes, which subjugated the Dananns, were a rude, warlike people, inferior as regards civilization, but superior in courage; that they possessed some knowledge of astronomy, navigation and other things is evident. It is difficult to see how, engaged in incessant warfare in pre-Christian times, they could have acquired the skill to manufacture various articles with which they are credited. Take for instance, the silver shields at Airtge Ross (Silver Wood) on the River Nore, B. C. 1383; the coins struck at the same place 881 B. C.; the goblets and brooches plated with gold at Foharta (the Liffey), the ranks distinguished by seven named colors in garments (tartans), in the reign of Tiernmas, B. C. 1620; the four-horsed chariots B. C. 1024. It is very singular that while the early chronicles give us accounts of the inauguration of various Irish kings there is no reference to a crown having been used for the ceremony. This circumstance led Wilde and others to conclude that the beautiful golden diadems, some or

namented with precious stones, now in Dublin, may have belonged to statues of the Virgin. I am inclined to acquiesce in this view generally. I am not fully satisfied respecting all. In the fresco painted for O'Kelly, of Hymany, A. D. 1400, Knockmay Abbey, the Royal personage there represented wears a crown. Donough, son to Brian Boruma, is said to have taken the Irish crown to Rome after his defeat by his nephew.

What is more natural than to suppose that through barter and intercourse they had acquired a certain knowledge of navigation from the Sidonian traders? Admitting that the traditions of the bards are very often rather mixed and conflicting, for all that it seems to me there underlies an historical page we are not justified in rejecting. I understand that both German and French antiquarians are now investigating the matter.

In alluding to Celtic dwellings I omitted to mention the artificial caves of North-east Ireland. Some are natural ones, but subsequently improved or enlarged apparently. The subterranean ones, at least in some cases, are probably the underground passages of ancient raths which have been levelled and ploughed over. I failed also to point out that bronze needles were used by the inhabitants of Ireland long before the useful article was introduced by a Negro into England in the reign of Queen Mary. The gold-adorned shield or corselet (found near Lismore), which was purchased by a Cork goldsmith for £600, I presume was melted down. The golden helmet from Tipperary, which Walker states was offered for sale in Dublin, very likely shared the same fate. Note that the famous Durham book now in the British Museum, date A. D. 698, although executed by Saxon monks, taught by St. Aiden, is Irish as regards design. It came from Lindisfarne.

HAMILTON ASSOCIATION.

Recent Donations to the Museum.

REPORT OF THE CURATOR, 1890-91.

- Specimens of Asbestos from the Township of Elzevir, County of Hastings. E. Furlong.
- Fossil Sponges from Tennessee. Dr. Head.
- Specimen of Mica. T. C. Mewburn.
- Silver-plated medal of the Hamilton Carnival of 1890, and a bronze medal of the International Exhibition at Philadelphia, 1876. J. Russell.
- Two specimens of petrified coral from the Township of Kepple; Indian clay pipe; bone tally and bone needles. D. J. Campbell.
- Three handsome stands for museum cases, and gun carriage for old Hudson Bay Co. swivel gun; a quantity of copper coins, and a piece of gum-like amber found on the coast of Zanzibar. The late S. Symons.
- Photographs of Stratford-on-Avon and colored chromos of Her Majesty the Queen and the Prince of Wales. J. A. Barr.
- A fine specimen of fossil from Collingwood. Master Valentine Boyd, Toronto.
- A piece of rock obtained by Dr. Rae within the Arctic Circle, and a specimen of lapis lazuli. R. Russell.
- A piece of mummy cloth from the Royal Egyptian Tombs. B. E. Charlton.

- Meteorite stone, found on a farm near Sarnia. Donated by George N. Matheson, Collector of Customs, Sarnia, through T. C. Mewburn.
- Two bolts and a piece of the steel plate of the "Great Eastern" steamship. The Ontario Rolling Mills Co., per Samuel Briggs.
- Fine specimens of Polyzoa, from the Pacific coast. Professor Wright, Los Angeles, California.
- Glass cases of butterflies and insects, three wasps' nests, horse crab, a specimen of *Amblystoma Carolina*, and a fine entomological collection (loaned). J. Alston Moffat.
- Specimens of *Eozoona Canadense* and other fossils. J. F. Whiteaves, of Ottawa.
- Quantity of Wampum found in and near Hamilton and Waterdown. Colonel Grant, R. Bull and Mr. Allison.
- Two large star-fish, one sea horse (*Hippocampus*), cup sponges, and specimens of Algae, mounted, all from Nassau. T. H. Stinson.
- A horned lizard from Texas. Mr. Blachford.
- Specimen of the vegetable ivory nut from which buttons are largely made. J. Bickle.
- A case of English butterflies. H. Myles.
- Specimen of "Candi pine gum" from Auckland, N. Z., used in making ornaments and varnish. Mrs. Birnie.
- Specimens of lead in its various stages, from the crude ore to the pure metal—from the "Doe-run" lead mines of Missouri. W. D. Long.
- Specimens of Peacock Copper Ore, native Copper, Manganese Iron and Iron Ore, from Western Virginia. G. H. Meakins.
- A young alligator from Bermuda. Mrs. R. D. Cowan.

A piece of Cleopatra's Needle, which scaled off from the effect of change of climate, after being set up in New York. (A. E. Walker.

Fine specimens of fossil ferns from the coal measures, New Brunswick. Adam Brown.

The freedom of the city of London, granted to James Sees, 6th November, 1798; freedom of the city of London, granted to James Wm Sees, 3rd Oct., 1870, and certificate of discharge of James Sees from bankruptcy, dated 13th Oct., in the 54th year of the reign of George the 3rd, and signed by Lord Eldon. J. Bickle.

ALEXANDER GAVILLER,

Curator.

May 14th, 1891.



Report of the Council

OF THE HAMILTON ASSOCIATION.

Read at the Annual Meeting, held May 14th, 1891.

The session just closing has been, on the whole, a successful one, whether we consider the work done or the attendance of members.

The interest in the Association is on the increase, as evidenced by the large accession of new members during the session—no less than forty having been received, which is the largest number elected in any one session during the past history of the Association. The anticipations cherished by us in entering upon our new premises have been fully realized. The number of active members now on the roll is about one hundred and fifty.

During the year seven general meetings have been held, at which the following papers have been read and discussed, viz. :

- November 13th, 1890—Address, on "The Early History of Hamilton and its Neighborhood," by the President, B. E. Charlton ;
- December 11th—"The Surface Geology of the County of Lincoln and Neighboring Counties," by D. F. H. Wilkins, B. A., of Beamsville ;
- January 8th, 1891—"Egypt, with some account of the Book of the Dead," illustrated by the British Museum *fac-simile* of the papyrus of Ani, by H. B. Witton ;
- February 11th—"Connecting Links," by H. B. Small, of Ottawa ;
- March 12th—"Flutes of the time of Moses," by J. E. P. Aldous, B. A. ;
- April 9th—"Electricity as a Source of Light and Heat," by J. T. Crawford, B. A. ;
- May 14th—"Botanical Jottings," by A. Alexander.

In addition to these meetings the various sections have kept up their meetings during the year. Reports of the work done therein will be reported by the secretaries of these sections, and our respected Treasurer will tell us about the finances.

Your Council have had the matter of a "field day" before them, and desire to recommend, if the necessary arrangements

can be made, that a day be spent in the Jubilee Park at Niagara Falls on Saturday, the 13th of June next.

At the annual meeting of the Royal Society of Canada, held in Ottawa last year, our Association was ably represented by H. B. Small, Esq., of Ottawa. This year our friend Mr. Thomas McIlwraith has consented to be our delegate to that learned body at its forthcoming meeting at Montreal. Your Council feel that the Association will be most worthily represented by Mr. McIlwraith, and that he will give a good account of himself and of us.

We cannot close this report without referring to the loss we have sustained in the removal from the city of our friend Mr. Moffat, who has been so long connected with this Association, and has done so much to sustain its character and standing. Mr. Moffat is now the Curator of the Entomological Museum in London, and we ask that he be elected an honorary member of the Association.

We also regret to find that Mr. Hanham, the Secretary of the Biological Section, has removed to the city of Brantford. Mr. Hanham has really added a new department to that section, not hitherto thought of, viz., that of Conchology. His industrious collection and study of the land and fresh water shells of this neighborhood is well-known to all of us. Not only has he introduced us to a new department of Biology, but he has made several additions of new species to the Canadian list of shells. We ask that he be made a corresponding member of the Association.

We have also lost a warm and generous friend of the Association in the somewhat sudden death of Mr. Samuel Symons. His valuable collection of models of British war vessels, as also the handsome stands for the cases of our museum, as well as the platform table and President's chair, and various other articles of furniture in our museum testify not only to his taste, but also to his generosity and kindly feeling toward us.

We conclude this report by expressing the hope that the members will do their utmost to observe and note facts in their various departments during the summer recess, so that material may be at hand for the section work of the coming session.

All of which is respectfully submitted.

B. E. CHARLTON, *President.*
A. ALEXANDER, *Secretary.*

HAMILTON ASSOCIATION.

Financial Statement

For year ending May 1st, 1891.

RECEIPTS.

Balance from 1890.....	\$276 74	
Government grant.....	400 00	
Members' subscriptions.....	160 00	
		<u>\$836 74</u>

EXPENDITURE.

Rent and lighting.....	\$177 55	
Printing Proceedings and notices.....	174 30	
Stationery and postages.....	42 30	
Insurance.....	11 88	
Commission on collecting, and caretaker.....	24 80	
Moving the museum furniture and specimens, and incidentals.....	62 85	
		<u>493 68</u>
Balance in bank.....	\$343 06	

RICHARD BULL,
Treasurer.

We have examined cash book and vouchers, and find them correct.

H. P. BONNY, }
A. T. NEILL, } *Auditors.*

Hamilton, 14th May, 1891.

LIST OF MEMBERS
OF THE
HAMILTON ASSOCIATION.

HONORARY.

- 1881 Grant, Lt.-Col. C. C., Hamilton.
 1882 Macoun, John, M. A., Ottawa.
 1885 Dawson, Sir J. Wm., F. R. S., F. G. S., F. R. S. C., Montreal.
 1885 Fleming, Sanford, C. E., C. M. G., Ottawa.
 1885 Wilson, Sir Daniel, LL. D., F. R. S. E., Toronto.
 1885 Farmer, William, C. E., New York.
 1885 Ormiston, Rev. William, D. D., Pasadena, Cal.
 1885 Rae, John, M. D., F. R. G. S., LL. D., London, Eng.
 1885 Small, H. B., Ottawa.
 1885 Hamilton, Mrs. B. E., Hamilton.
 1887 Dece, Robert, M. D., New York.
 1887 Keefer, Thos. C., C. E., Ottawa.
 1890 Burgess, T. J. W., M. D., F. R. S. C., Montreal.
 1891 Moffat, J. Alston, London.

CORRESPONDING.

- 1870 Wright, Prof. W. P., M. A., Los Angeles, California.
 1871 Seath, John, M. A., Toronto.
 1881 Clark, Chas. K., M. D., Kingston.
 1881 VanWagner, P. S., Stoney Creek.
 1881 Spencer, J. W., B. Sc., Ph. D., F. G. S., Savannah, Ga.
 1882 Lawson, A. C., M. A., California.
 1884 Bull, Rev. Geo. A., M. A., Niagara Falls South.
 1885 Frood, T., Sudbury.
 1889 Yates, Wm., Hatchley.
 1889 Wilkins, D. F. H., B. A., Bac. App. Sci., Beamsville.
 1889 Kennedy, Wm., Austin, Tex.
 1891 Hanham, A. W., Quebec.

LIFE.

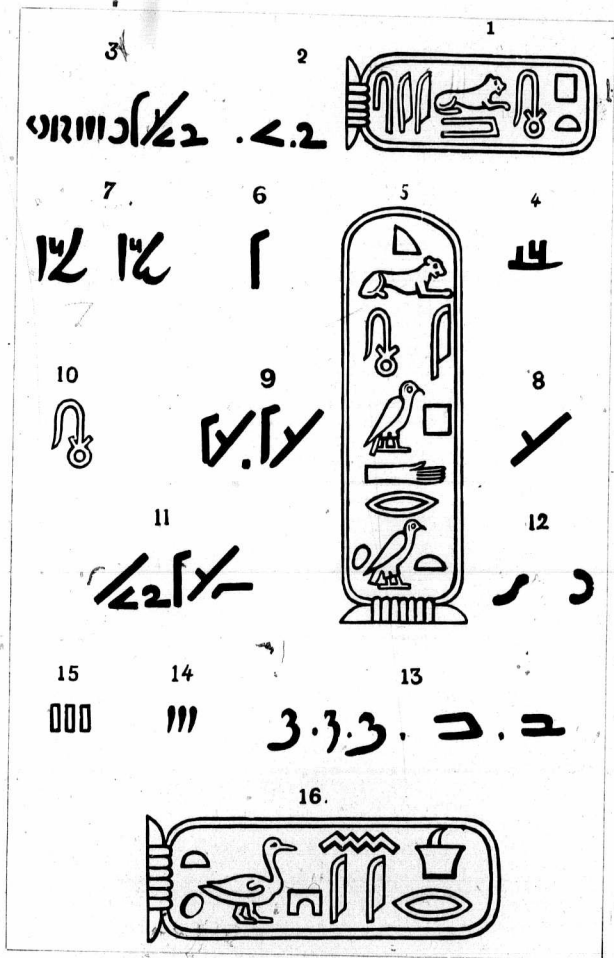
- 1885 Proudfoot, Hon. Wm., Q. C., Toronto.

ORDINARY.

- 1891 Aldous, J. E. P., B. A.
 1872 Alexander, A., F. S. Sc.
 1888 Baker, C. O.
 1885 Baker, Hugh C.
 1880 Ballard, W. H., M. A.
 1880 Barr, J. A.
 1881 Barton, G. M.
 1891 Birkenthal, Rev. H., Ph.D
 1880 Black, Geo.
 1890 Bonny, H. P.
 1881 Boustead Wm.
 1881 Bowman, Wm.
 1880 Briggs, Samuel
 1857 Brown, Adam
 1891 Brown, O. J., M. A.
 1885 Buchanan, W. W.
 1857 Bull, Richard
 1880 Burns, Rev. A., D. D.,
 LL D
 1891 Burns, J. M.
 1889 Campbell, D. J.
 1890 Cape, John
 1891 Chapman, J. R.
 1880 Charlton, B. E.
 1891 Cheyne, John P., Com-
 mander R. N.
 1884 Childs, W. A., M. A.
 1890 Clark, D., D. D. S.
 1890 Cloke, J. G.
 1887 Colquhoun, E. A.
 1891 Crawford, J. T., B. A.
 1880 Cummings, James
 1872 Dickson, George, M. A.
 1880 Dillabough, E. H., M. D.
 1890 Elliott, W. H., Ph. B
 1881 Evans, J. DeV.
 1881 Fearman, F. W.
 1882 Ferres, James
 1890 Finch, C. S.
 1880 Findlay, W. F.
 1880 Fletcher. Rev. D. H., D.D.
 1880 Forbes, A. F.
 1891 Foster, F. G.
 1880 Foster, W. C
 1880 Gaviller, Alex.
 1882 Gaviller, E. A., M. D.
 1883 Gibson, Hon. J. M., M.A.,
 LL. B.
 1888 Grant, A. R
 1887 Green, Joseph
 1883 Grossman, Julius
 1888 Galbraith W. S.
 1887 Hancock, Wm.
 1882 Harris, W. J.
 1891 Heming, A. H.
 1889 Herald, Joseph
 1887 Hobson, Thos.
 1890 Holden, Mrs. J. Rose
 1887 Ireland, S. J.
 1882 Laidlaw, Rev. R. J., D. D.
 1890 Lancefield, R. T.
 1884 Lee, Lyman, B. A.
 1890 Lees, Thomas
 1857 Leggat, Matthew
 1890 Leslie, G. M.
 1880 Leslie, James, M. D.
 1880 Littlehales, Thomas
 1891 Locheed, L. T., B. A.
 1887 Logie, W. A., B. A.
 1880 Lyle, Samuel, B. D.
 1891 McClemon, Wm. M.
 1891 McCullough, C. R.
 1857 McIlwraith, Thos.
 1890 McInnes, Hon. Donald
 1884 McLaren, Henry
 1890 McLaughlin, J. F., B. A.

- | | |
|------------------------------|--------------------------------|
| 1880 Macdonald, J. D., M. D. | 1890 Roach, George |
| 1857 Malloch, A. E., M. D. | 1880 Robertson, Chas., M. A. |
| 1890 Marshall, Wm. | 1882 Robinson, W. A. |
| 1886 Martin, Edward, Q. C. | 1887 Sanford, Hon. W. E. |
| 1891 Mewburn, Thos. C. | 1890 Schofield, W. H., B. A. |
| 1887 Mills, Geo. H. | 1880 Scriven, P. L. |
| 1886 Milne, Alex. | 1891 Sinclair, S. B., M. A. |
| 1887 Moore, A. H. | 1885 Smart, Wm. L. |
| 1890 Moore, Chas. | 1890 Staunton, F. H. Lynch |
| 1890 Moore, Henry E. | 1890 Staunton, Geo. Lynch |
| 1891 Morgan, S. A., B. A. | 1890 Stratton, A. W., B. A. |
| 1886 Morgan, W. S. | 1881 Tuckett, Geo. E. |
| 1887 Morris, Thos., jr. | 1880 Turnbull, William |
| 1890 Morrison, J. J. | 1891 Turner, J. B., B. A. |
| 1883 Murton, J. W. | 1881 Vernon, Elias, M. D. |
| 1870 Mullin, John A., M. D. | 1887 Walker, A. E. |
| 1880 Neill, A. T. | 1888 Williams, C. J. |
| 1887 Nelligan, J. B. | 1881 Williams, J. M. |
| 1885 Plant John | 1891 Witton, J. G., B. A. |
| 1891 Rastrick, E. L. | 1857 Witton, H. B. |
| 1891 Rastrick, F. J. | 1885 Witton, H. B., Jr., B. A. |
| 1881 Reynolds, T. W., M. D. | 1884 Young, Wm. |

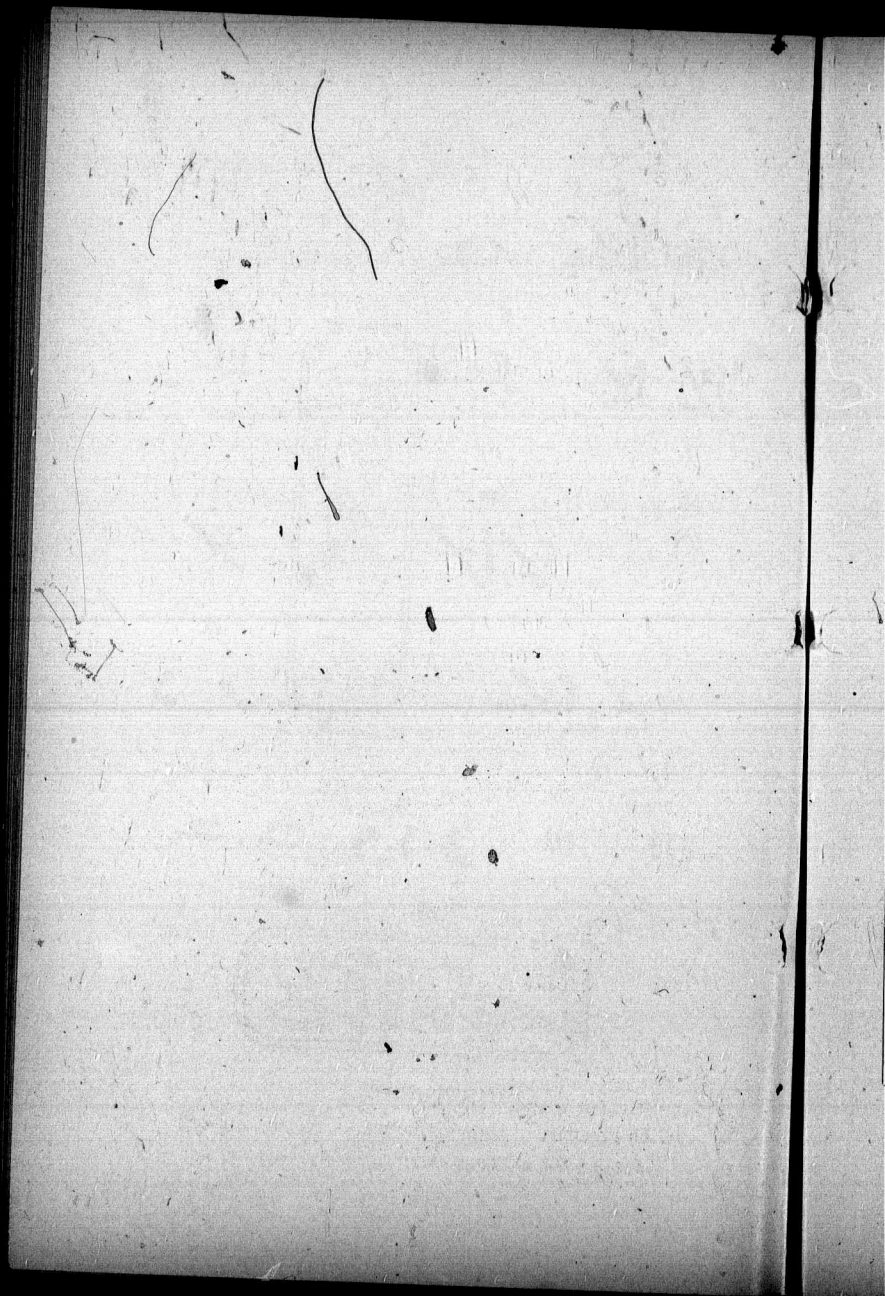



















CARTOUCHES.

1. OF PTOLEMY. 5. OF CLEOPATRA. 16. OF BERENICE.

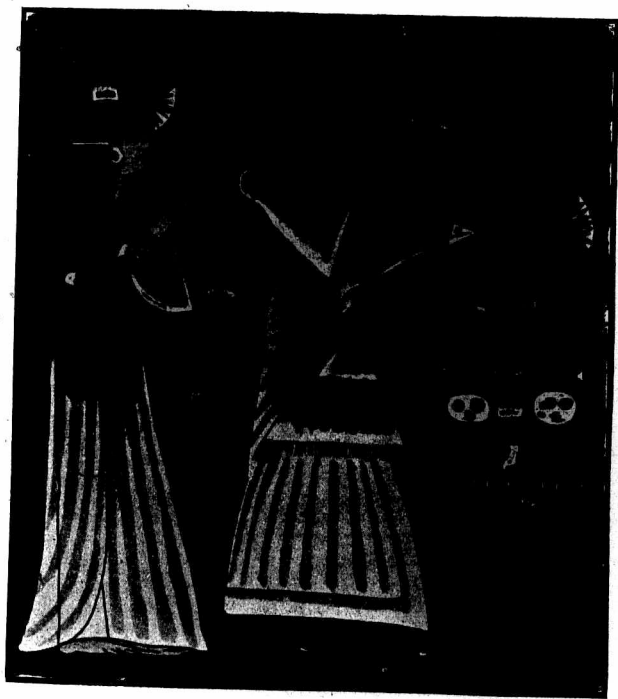
(The first plate in Champollion's "Systeme Hieroglyphique.")



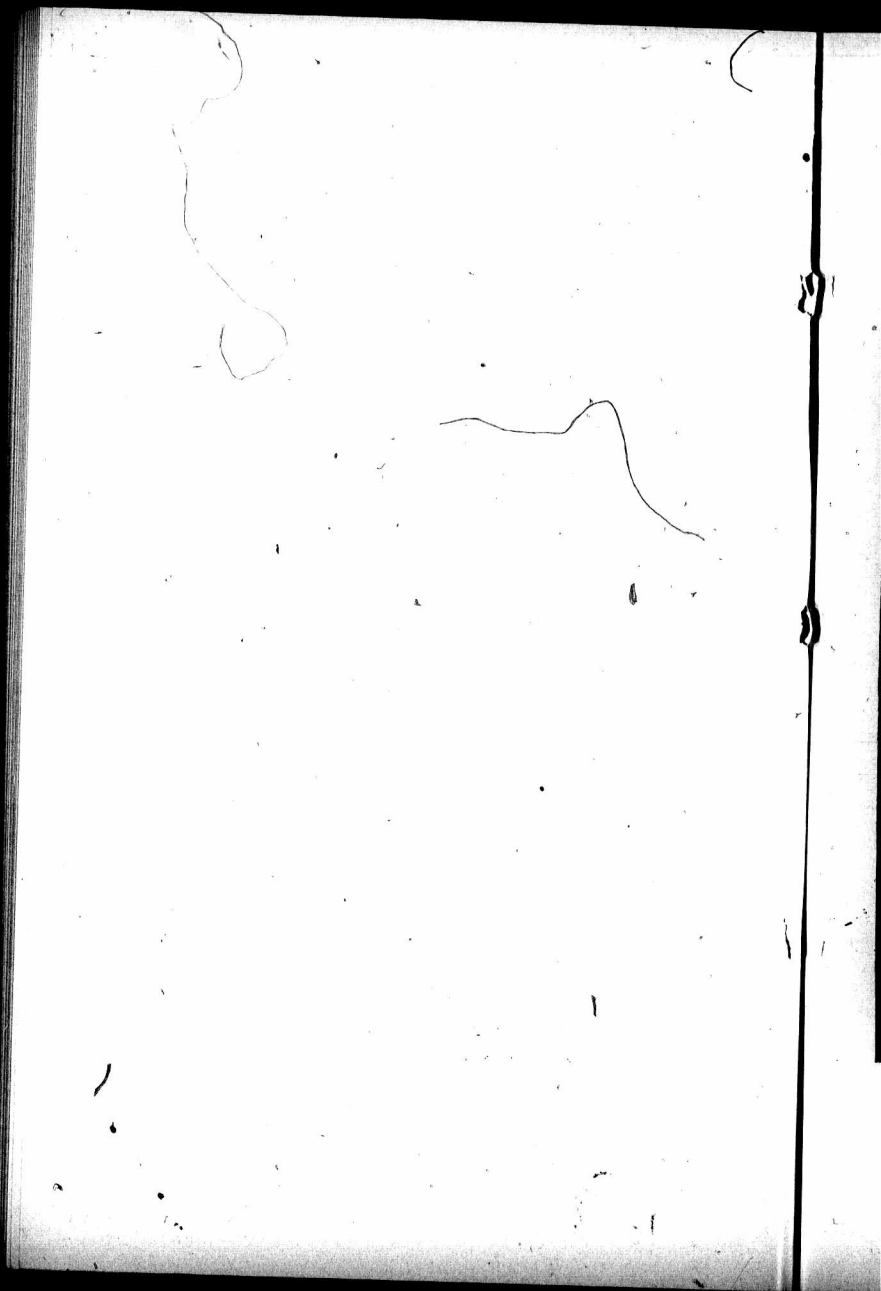
	<i>Signes Hieroglyphiques.</i>	<i>Valeur selon Mr. Young.</i>	<i>Valeur selon mon Alphabet.</i>
1		BIR	B
2		E	R
3		I	I, È, AI
4		N	N
5		<i>inutile</i>	K
6		KE, KEN	S
7		MA	M
8		OLE	L
9		P	P
10		<i>inutile</i>	Ô, OU
11		OS, OSH	S
12		T	T
13		OU,	KH, SCH
14		F	F, V
15		ENE	T

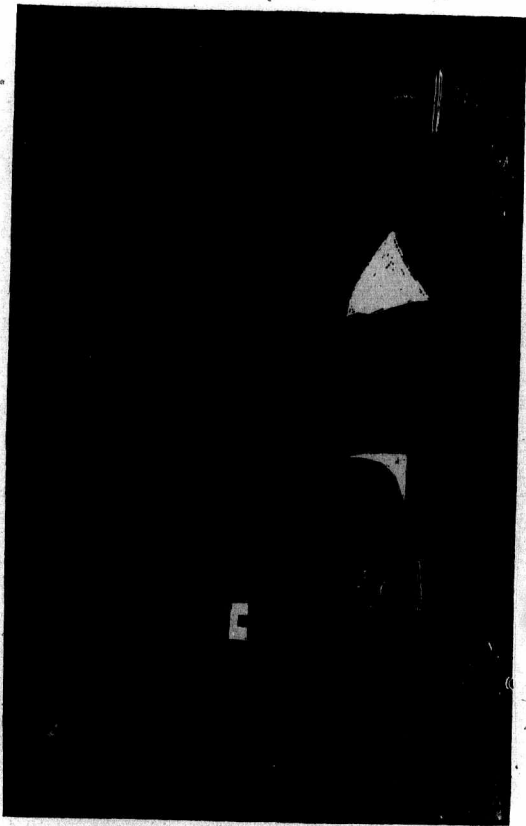
PHONETIC VALUES OF THE HIEROGLYPHS.

(From Champollion.)



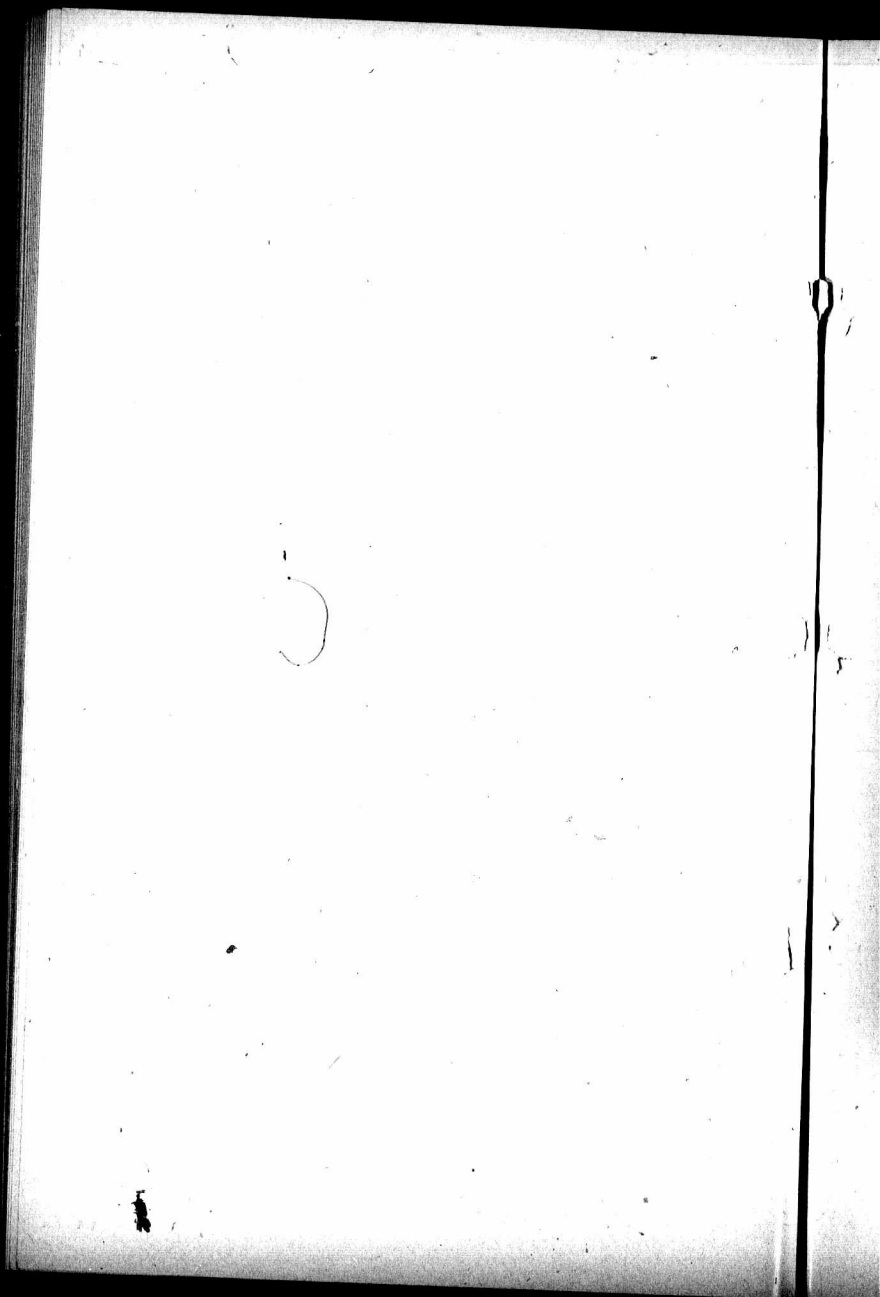
ANI AND HIS WIFE
BEFORE A TABLE OF OFFERINGS.
(From the British Museum fac simile.)

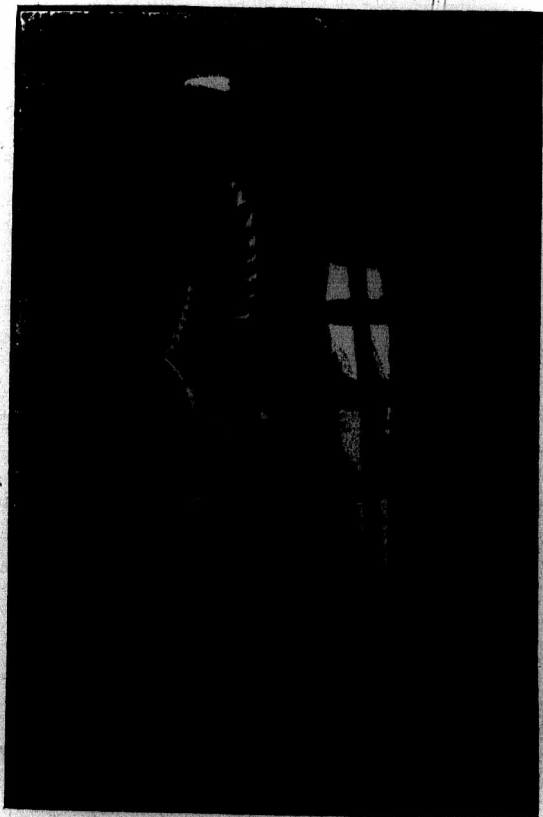




THE WEIGHING OF THE SOUL

BY ANUBIS AGAINST LAW SYMBOLIZED BY A FEATHER.
(From the *British Museum fac simile.*)





THE SOUL OF ANI

VISITING HIS MUMMIFIED BODY.

(From the *British Museum fac simile.*)