JOURNAL AND PROCEEDINGS

—OF THE—

Hamilton Association

1886-7 AND 1887-8.

PART IV

CONTENTS.

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

PRINTED FOR THE HAMILTON ASSOCIATION BY THE SPECTATOR PRINTING COMPANY.

1888.

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EDITED BY THE RECORDING SECRETARY.

PART 4.

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PRINTED FOR THE HAMILTON ASSOCIATION BY THE
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1888.

HAMILTON ASSOCIATION.

(For the Cultivation of Literature, Science and Art.)

OFFICERS FOR 1886-7.

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ARCADE BUILDING, JAMES ST. NORTH, HAMILTON.

NOTICE.

THE HAMILTON ASSOCIATION was instituted on 2nd November, 1857, and continued its regular meetings to the close of the year 1860. During the period between 1861 and 1871 the meetings were held at irregular intervals, the office bearers of 1860 holding office in the meantime. During the years 1871, 2, 3, 4 and 5 the Association was more active in its work, regular meetings being held. An interregnum of four years ensued from 1875 to 1880, during which time the Council met at stated intervals. From 1880 to the present time the Association has been in active operation, during which period, in addition to the regular monthly meetings, special meetings have been held under the direction of the Council, the Annual Meeting held in May, 1888, being the one hundred and thirty-ninth meeting of the Association.

The Association was incorporated in 1883.

MEMBERS OF COUNCIL.

1857—Judge Logie; Geo. Lowe Reid, C. E.; A. Baird; C. Freeland.

1858—Judge Logie; C. Freeland; Rev. D. Inglis, D.D.; Adam Brown; C. Robb.

1859—Rev. D. Inglis, D.D.; Adam Brown; Judge Logie; C. Freeland; R. Bull.

1860—J. B. Hurlburt, M.A., L.L.D.; C. Freeland; Judge Logie; R. Bull; Wm. Boultbee; 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. Leggatt; I. B. McQuesten, M.A.; A. Alexander; Rev. A. Burns, M.A., L.L.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; Jas. R. Leslie, M.D.; P. L. Scriven; Wm. Milne; C. S. Chittenden.

OFFICE-BEARERS.

	President.	1st Vice-Pres.	2nd Vice-Pres.	Cor. Sec.	Rec. Sec.	Treas.	Libr and Cur.
1857	Rev. W. Ormiston, D. D.	John Rae, M.D....	J. B. Hurlburt, M. A, L.L.D.	T. C. Keefer, C. E.	Dr. Craigie....	W. H. Park...	A. Harvey.
1858	John Rae, M. D ...	Rev. W. Ormiston, D. D.	J. B. Hurlburt, M. A., L.L.D.	T. C. Keefer, C. E.	Dr. Craigie....	W. H. Park...	A. Harvey.
1859	Rev. W. Ormiston, D. D.	J. B. Hurlburt, M. A., L.L.D.	Chas. Robb.....	T. C. Keefer, C. E.	Dr. Craigie....	W. H. Park...	A. Harvey.
1860	Rev. W. Inglis, D.D.	T. McIlwraith.....	Rev. W. Ormiston, D. D.	Dr. Craigie....	Wm. Craigie...	W. H. Park...	Chas. Robb
1861	Rev. W. Ormiston, D. D.	J. B. Hurlburt, M. A., L.L.D.	Rev. W. Inglis, D. D.	Dr. Craigie....	Wm. Craigie...	W H. Park...	T. McIlwraith.
1871	W. Proudfoot.....	Judge Logie.....	R. Bull.....	J. M. Buchan, M A.	I.B. McQuesten M. A.	W. G. Crawford	T. McIlwraith.
1872	Judge Logie.....	H. B. Witton, M.D.	R. Bull.....	J. M. Buchan, M. A.	I. B. McQuesten M. A	W G Crawford	T. McIlwraith.
1873	H. B. Witton, M. P.	J. M. Buchan, M.A.	A. T. Freed.....	Geo. Dickson, M. A.	Geo. Dickson, M. A.	R. Bull.....	T. McIlwraith.
1874	H. B. Witton, M. P.	J. M. Buchan, M. A.	T. Freed.....	Geo. Dickson, M. A.	Geo. Dickson. M. A.	R. Bull.....	T. McIlwraith.
1875	H. B. Witton.....	J. M. Buchan, M A.	W. H. Mills.....	Geo. Dickson. M. A.	Geo. Dickson, M. A.	A Macallum, M A.	T. McIlwraith.
1880	T. McIlwraith.....	Rev. W. P. Wright, M. A.	H. B. Witton.....	R. B. Hare, Ph. D.	Geo. Dickson, M. A.	R. Bull.....	A. T. Freed.
1881	J. D. McDonald, M. D.	R. B. Hare, Ph. D.	B. E. Charlton.....	Geo. Dickson, M. A.	A. Robinson M A.	R. Bull.....	W. H. Ballard, M. A.
1882	J. D. McDonald, M. D.	B. E. Charlton.....	J. A. Mullin, M. D.	Geo. Dickson, M. A.	Wm. Kennedy.	R. Bull.....	W. H. Ballard, M. A.
1883	J. D. McDonald,	B. E. Charlton.....	H. B Witton.....	Geo. Dickson	Wm. Kennedy.	R. Bull	

						R. Bull.....	W. H. Ballard, M. A.
1883	J. D. McDonald, M. D.	B. E. Charlton.....	H. B Witton.....	Geo. Dickson, M. A.	Wm. Kennedy.	R. Bull.....	W. H. Ballard, M. A.
1884	J. D. McDonald, M. D.	H. B. Witton.....	Rev. C. H. Mockridge, D. D.	Geo. Dickson, M. A.	A. Alexander..	R. Bull.....	Wm Turnbull.
1885	Rev. C. H. Mockridge, M A., D.D.	Rev. S Lyle.....	W. Kennedy	Geo. Dickson, M. A.	A. Alexander..	R. Bull	A. Gaviller.
1886	Rev. C. H. Mockridge, M A., D D.	Rev. S. Lyle.....	Matthew Leggat...	Geo. Dickson, M. A.	A. Alexander, F. S. Sc	R Bull.....	A. Gaviller.
1887	Rev. S. Lyle, B.D..	B. E Charlton.....	W. A Child, M. A.	H. B. Witton, B. A.	A. Alexander, F. S. Sc	R Bull.....	A. Gaviller.
1888	Rev. S. Lyle, B.D..	B. E Charlton.....	W. Kennedy	H. B. Witton, B A.	A. Alexander, F. S. Sc.	R Bull.....	A. Gaviller.

LIST OF MEMBERS.

—OF THE—

HAMILTON ASSOCIATION.

ELECTED.

1872 Alexander, A, F. S. Sc. President of the Horticultural Society.
1880 Anderson, J. N., M. D., Burlington.
1882 Anderson, James, M. D., late Resident Physician, Hamilton Hospital.
1882 Armour, Robert, C. E.
~~1882 Allan, Richard.~~
1886 Ambrose, R. W.
1885 Baker, Hugh C.
1880 Balfour, James, Architect, Hannah St. W.
1880 Ballard, W. H., M. A., Inspector of Schools, 231 King St. West.
1888 Baker, Chas. O.
1880 Barr, John A., Druggist, cor. York and McNab Sts.
1885 Barrett, T. P., Toronto.
1881 Barton, G. M., Barrister, Dundas.
1881 Boustead, W., Machinist.
1881 Bowman, Wm., Wholesale Hardware Merchant, 56 Hunter St. West.
1857 Brown, Adam, Wholesale Grocer, 13 Herkimer St. West.
1884 Brown, W. E., Cashier, Brown, Balfour & Co., 36 Jackson St. West.
~~1883 William Bruce.~~
1880 Black, George, Manager G. N. W. Telegraph Co.

1885 Buchanan, W. W., editor.
1857 Bull, Richard, Treasurer Hamilton Association, 14 Hunter St. East.
1880 Burns, Rev. A., M. A., L. L. D., D. D., President Hamilton Wesleyan Female College.
1887 Burgess, T. J. W., M. D., F. R. S. C.
1880 Briggs, S., Superintendent Hart Emery Wheel Co.
1880 ~~Campbell, P. S., M. A., Principal Collegiate Institute.~~
1887 ~~Chisholm, James, B. A.~~
1886 ~~Cockburn, T. W. L., M. D.~~
1887 Colquohoun, E. A. banker.
1880 Cummings, Jas. Collector of Taxes, Ex-Chairman Board of Education, City Hall.
1880 ~~Chittenden, C. S., D. D. S.,~~ 69 Bay St. South.
1880 Charlton, B. E., President Hamilton Vinegar Works Co., 58 John North.
1885 ~~Chapman, Chas., Herkimer St.~~
1884 Childs, W. A, M. A.
1880 Clark, J. A., Druggist, Jackson St. West.
~~1884 Carmichael, Rev. Hartley, B. A.~~
1872 Dickson, Geo., M. A., Principal, Upper Canada College
1880 Dillabough, E. H., M. D., 18 Gore St.
1882 Dalley, F. F., Druggist, 99 James Street North.
1881 Evans, J. DeVille.
1882 ~~Edwards, W. A., Architect.~~
1887 ~~Farmer, T. D. J., B. C. L.~~
1888 ~~Fairchild R. M., M. D~~
1870 ~~Freed, A. T., Editor Spectator.~~
1886 ~~Forneret, Rev. George, M. A.~~
1880 Forbes, A F., Stock Broker.
1880 Fletcher, Rev. D. H., 58 McNab St. South.
1880 Foster, W. C., Artist.
1881 Fearman, F. W., Chairman Board of Education, 58 Stinson St.
1880 Findlay, W. F., Accountant.
1882 Ferres, James, Hardware.
~~1886 Fraser, Donald.~~
1885 ~~Garland, Louis, Druggist,~~ King St. East.
1880 Gaviller, Alex., 21 Herkimer St.
1882 Gaviller, E. A., M. D.

1887 Green, Joseph.
1883 Crossman, Julius, Music, 22 West Avenue South.
1883 Gibson, J. M., M. A., LL. B., M. P. P., Lt. Col., Barrister, 102 Main St. West.
~~1886 Geiger, E. A.~~
1888 Galbraith, W. S.
1887 Grant, Alexander A.
1886 Goering, William.
~~1888 Hanham, A. Thos.~~
1887 Hobson A. Thos.
1880 Husband, G. E., M. D., 75 Main St. West.
1882 Hoodless, John, Furniture Manufacturer, 51 King St. West.
1882 Hemming, G. E. Barton, City P. O.
1882 Harris, W. J., 14 Market Sq.
1883 Hillyer, E. S., M. D., 9 Main St. East.
1882 Kennedy, Wm.
1886 Kitson, E. E., Barrister.
1882 King, F. W.
1886 Land, Allan.
1880 Lemon, Charles, Barrister, Charles St.
1880 Leitch, John, Central Iron Works.
1880 Lyle, Rev. S., B. D., 20 Jackson St. West.
1880 Littler, John.
1880 Littlehales, Thos., Manager and Engineer, Hamilton Gas Light Co.
1880 Leslie, Jas., M. D., 37 Main St. West.
1857 Leggatt, M., Wholesale Hardware, 5 Duke St.
1884 Lee, Lyman, Law Student.
1882 Laidlaw, Rev. R. J., 85 Hughson St. South.
1884 Lafferty, James, M. D.
1887 Logie, W. A., B. A.
1886 Martin, Edward, Q. C.
1887 Moore, Alex. H., Banker.
1880 Muir, John, M. A., Barrister, Deputy Judge, 37 Duke St.
1880 Moffat, J. Alston, Member of the Council of the Entomological Society of Canada.
1880 Moodie, John. 16 King St. West.
1881 Mockridge, Rev. C. H., M. A. D. D., Rector Christ Church.
1887 Mills, Geo. H., Barrister.

1887 Morris, Thos.
1886 Morgan, W. S.
1857 Malloch, A. E., M. D., 70 James St. South, Examiner in Surgery, Toronto University.
1882 Munro, A., Com. Traveler, City.
1870 Mullen, J. A, M. D., Ex-President of the Dominion Medical and Surgical Society, 124 James St. North.
1886 Milne, Alexander, Builder.
1885 Mills, F. H.
1886 Miller, Rev. A. E.
1870 Milne, Wm., Wine Merchant, Wentworth St. North.
1883 Murton, J. W., Coal Merchant, East Hamilton.
1884 Mason, J. J., 63 Hunter St. West.
1884 Murton, E. C., East Hamilton.
1837 McIlwraith, Thomas, Superintendent for Ontario of the Ornithological Society of N. America, Cairn Brae, City.
1886 McKeand, George.
1886 MacKelcan, H. A., Barrister.
1884 McLaren, Henry, James St. South.
1880 McPhie, Donald, Sanitary Engineer, 57 East Ave. South.
1880 Macdonald, John, D. M. D., Ex-President Ontario Medical Association, 10 Duke St.
1884 McRae, Colin.
1887 Nelligan, J. B., Assessor.
1880 Neill, A. T., Secretary, Geological Section, HAMILTON ASSOCiation, Canada Life Chambers.
1885 Papps, G. S., Barrister.
1885 Plant, John, Wood Merchant.
1882 Powis, Alfred, Commission Merchant, Concession St.
1883 Pearson, John, Accountant.
1886 Rattray, Marie L.
1880 Robertson, C., M. A., Classical Master, Collegiate Institute.
1886 Ross, George, B. A.
1881 Ross, A. M., Painter, 68 Colborne St.
1881 Reynolds, T. W., M. D.
1880 Ryall, I., M. D., Physician Board of Health, 71 Main St East.
1872 Roseburgh, J. W., M. D., 52 James St. South.
1887 Roberts, Albert, U. S. Consul.

1882 Robinson, W. A., 6 Hannah St. East, Hamilton.
1883 Robertson, H. H., Barrister, Rannoch Lodge.
1885 Scott, C. S.
1880 Sutherland, Angus, Grocer.
1880 Scriven, P. L., Engraver, 111 Jackson St. West.
1885 Smart, W. Lynn.
1882 Smith, Wm., 74 Catharine St. North.
1887 Sanford, Hon. W. E.
1883 Slater, S., Treasurer Landed Banking and Loan Co.
1880 Thomson, John, Chief Appraiser, H. M. Customs, Cannon St. East.
1880 Turnbull, W., City Assessor, Librarian, Hamilton Association, 10 Wilson St.
1881 Tuckett, Geo. E., King St. West.
1881 Tuckett, Geo. T.
Vernon, Elias, M. D., James St. South.
1886 Ward, Rev. Robt., M. D., LL. D.
1857 Witton, H. B., H. M. Inspector of Canals, 12 Murray St. West.
1885 Witton, H. B. jr., M. A.
1887 Whipple, Vernon B.
1881 Williams, J. M., jr.
1888 Williams, C. J.
1884 Young, Wm., 45 Jackson St. West.

CORRESPONDING MEMBERS.

1881 Clark, Chas. K., M. D., Rockford Asylum, Kingston.
1881 Van Wagner, P. S., J. P., Stoney Creek.
1884 Bull, Rev. George A., M. A., ~~Boston~~.
1882 Lawson, A., M. A., ~~Geological Survey of Canada~~,
1881 Spencer, J. W., Ba. Sc., Ph. D., F. G. S., ~~Columbia, Mo., U. S.~~
1870 Wright, Prof. W. P., M. A. California.
1871 Seath, John, M. A., High School Inspector, ~~St. Catharines~~.
1885 Frood, T., Kincardine, Ont.

HONORARY MEMBERS.

1881 Grant, Lt-Col, John St. South.
1882 Macoun, John, M. A., Government Botanist and Naturalist, Geological Survey of Dominion of Canada.

1885 Dawson, Sir J. William, F. R. S., F. G. S., F. R. S. C., Principal McGill College, Montreal.
1885 Sanford, Fleming, C. E., C. M. G., Ottawa.
1885 Wilson, Sir D, LL. D., Principal, University of Toronto.
1885 Farmer, William, Engineer, New York.
1885 Ormiston, Rev. Wm., D. D., New York.
1885 Rae, John.
1885 Hurlburt, J. B., M. A., L.L. D., Ottawa.
1886 Small, H. B., Ottawa.
1886 Charlton, Mrs. B. E.
1887 Keefer, Thomas C., C. E., Ottawa.

LIFE MEMBER.

1885 Proudfoot, Vice-Chancellor, Toronto.

ABSTRACT OF MINUTES

OF THE

HAMILTON ASSOCIATION

SESSION 1886-87.

FIRST MEETING—Thursday, 11th November, 1886.

Rev. Dr. Mockridge in the chair.

The minutes of the previous meeting were read and approved.

The Secretary reported that the tender of A. Lawson & Co. for the printing of the proceedings of 1885 6, being the lowest, had been accepted, and that one hundred pages of the work were in type.

It was also announced that the government grant of $400 had been received.

The Corresponding Secretary reported that so many papers had been promised for the coming session that fortnightly meetings would be warranted.

The matter was left with the Council.

The Librarian and Curator reported the receipt of a large number of books and pamphlets from various learned societies in the old world and from the States.

The President strongly urged the desirability of increasing the library by the addition of valuable books as far as the funds of the Association would allow, and recommended the purchase of the "Narrative History of America."

The matter was left in the hands of the Council.

Dr. Mockridge then read his Inaugural Address, taking as his motto, "Man and Brute."

After the delivery of the address, Dr. Mockridge expressed a wish that, though contrary to usage, the contents of his paper

should be discussed, when Messrs. H. B. Witton, A. F. Forbes, W. Kennedy, Dr. Cockburn, G. M. Barton, Dr. Mullen and Rev. S. Lyle spoke on the subject.

It was announced that Dr. Macdonald would read the next paper on Thursday, the 25th November, the subject being "Our Cold Climate, and the Duties and Necessities it lays upon us as regards Healthy Bodies."

The meeting then adjourned.

SECOND MEETING—Thursday, 25th November, 1886.

Rev. Dr. Mockridge in the chair.

The minutes of the previous meeting were read and confirmed

The following gentlemen were duly elected, viz.: Rev. George Forneret, M. A.; George Ross, B. A.; Alexander Milne, builder; T. W. Cockburn, M. D.

Mr. William Glyndon then read a very interesting paper on "The Alexandrian Museum—Its Rise, Decline, and Fall."

A very spirited discussion followed, in which Messrs. Forbes, Child, Witton, Littlehales, Charlton, Gaviller, and the Rev. George Forneret took part.

Some of the speakers thought that the burning of this immense library was not an unmixed evil, as it stimulated research, while others thought that science, but especially History, had suffered a great loss.

The meeting then adjourned.

THIRD MEETING—9th December, 1886.

The President, Dr. Mockridge, in the chair.

The minutes of the previous meeting were read and approved.

Messrs. W. F. McGiverin, Donald Fraser and John E. Tuckett were elected members of the Association.

The Corresponding Secretary announced the receipt of *The Canadian Entomologist*, Transactions of the Manchester Zoological Society, 1886-7, Bulletin of Harvard Museum of Zoology; Transactions of the Royal Society; Annual Report of the Department of Mines of New South Wales.

The paper written by Dr. Macdonald, who was unable to be present, was read by Mr. Witton, the Corresponding Secretary. The paper was entitled "Our cold climate, and the duties and necessities it lays upon us in relation to the public health."

The paper gave rise to an instructive discussion, taken part in by Messrs. Chittenden, Forbes, Alexander, Witton, Dr. Cockburn, Revs. S. Lyle and G. Forneret, and others.

The meeting then adjourned.

FOURTH MEETING—January 13th, 1887.

Rev. Samuel Lyle, B. D., First Vice-President, presided.

The minutes of the previous meeting were read and approved.

The Corresponding Secretary reported the receipt of several reports from various learned societies.

The Curator reported having received a large number of specimens of native woods, handsomely dressed and polished to show the grain, from Messrs. Hoodless & Son, L. D. Sawyer & Co., and Messrs. Flatt & Bradley.

A glass case to contain the specimen of the Ornithorhynchus was also presented by Mr. Gaviller, the Curator.

A very cordial vote of thanks was passed to these donors for their valuable gifts to the Museum.

Mr. Child then read a paper on "Political Centralization in France." The essayist very clearly showed how the idea of political unity had arisen centuries ago, and been fostered ever since.

It was announced that the next paper would be "The Chinese, our latest neighbors."

The meeting then adjourned.

FIFTH MEETING—Thursday, 27th January, 1887.

Dr. Mockridge presided.

Minutes were read and approved.

The Council recommended the discontinuance of all the reviews and magazines which have been laid on the table for the last two years, with the exception of the Popular Science Monthly and the Scientific American Supplement.

The Association confirmed this recommendation.

Mr. Barton then read a paper, entitled "The Chinese, our latest neighbors."

Remarks were made on the paper by Messrs. Cockburn, Briggs, Witton, and others.

The meeting then adjourned.

SIXTH MEETING—Thursday, 10th February, 1887.

The President in the chair.

The minutes of the previous meeting were read and confirmed.

The following were unanimously elected members of the Association: John S. Ireland, Principal of the Art School, Thomas Hobson, and Miss Hendrie.

It was announced that the Journal and Proceedings of the Association for 1885-6, including "The Birds of Ontario," by Mr. McIlwraith, was now ready for distribution.

Rev. George Forneret read an excellent paper on "The Half-Breeds of the Northwest."

The meeting then adjourned.

SEVENTH MEETING—Thursday, 3rd March, 1887.

The President in the chair.

The minutes of the previous meeting were approved.

There being no other business, Dr. Hillyer read a paper on "The Revolution of 1688." The paper dealt exhaustively with the causes and consequences of the Revolution.

The meeting then adjourned.

EIGHTH MEETING—Thursday, 11th March, 1887.

The President in the chair.

Minutes read and approved.

Mr. Thomas Morris, merchant, was elected a member of the Association.

Mr. Witton called attention to a paper recently read in New York on Transcontinental Railways, in which the writer, an American, asserted that the Canadian Pacific stood at the head of the railways stretching from the Atlantic to the Pacific, whether its roadbed or the country through which it passed was considered. The great wealth contained in the Rocky mountains was pointed out.

The researches of Dr. Dollinger in microscopy, especially in relation to the monads, was also spoken of by Mr. Witton.

In the absence of Dr. Dee, the Corresponding Secretary read a paper on "The Early History of the Iroquois."

The paper was a valuable one, Dr. Dee being an able authority on this branch of the Indian family.

Dr Dee was elected an honorary member of the Association.

On motion, a Committee, consisting of Messrs. William Kennedy (convener), B. E. Charlton, F. W. Fearman, William Milne and William Glyndon, was appointed to collect all available information relating to Indian history, as also all relics and curiosities which in any way would throw light on the manners and customs of the aboriginal tribes of this continent, especially of the country around our city.

The meeting then adjourned.

NINTH MEETING—Thursday, 24th March, 1887.

Dr. Mockridge in the chair.

The minutes of the previous meeting were read and confirmed.

T. C. Keefer, civil engineer, of Ottawa, was elected an honorary member of the Association.

Mr. Moffat, read a valuable and interesting paper on "The Development of Insects." A lively conversation followed, in which Messrs. Scriven, Witton, Forneret, and others took part.

The meeting then adjourned.

TENTH MEETING, Thursday, 7th April, 1887.

The Rev. Samuel Lyle, D. D., in the chair.

The minutes of the previous meeting were read and confirmed.

A valuable donation of 60 maps or coast charts, of the northern and northwestern lakes, published by the war department of the United States was received from Adam Brown, Esq., M. P., for which a hearty vote of thanks was passed.

A letter was read from Vice-Chancellor Proudfoot containing a cheque for $20 for the funds of the Association, and asking to be made a life member.

By resolution his request was granted, and he was made a life member of the Association.

A cordial vote of thanks for his handsome donation was also passed.

Geo. H. Mills, barrister, and E. A. Colquhoun, bank manager, were elected members of the Association.

Mr. Wm. Milne then read his paper on "The Public's Treatment of Crime and Criminals." Mr. Milne strongly urged the need for such a treatment of the criminal classes as would create and foster a hope for a better future.

A discussion followed, taken part in by many members.

The meeting then adjourned.

ELEVENTH MEETING—Thursday, 28th April, 1887.

Dr. Mockridge presiding.

The minutes of the previous meeting were read and confirmed.

Several of the members present made strong representations of the need the Association had for a library of technical scientific books.

H. B. Witton, Jr., B. A., read a clever paper on "An Introduction to the Greek Drama."

Mr. Witton promised to continue the subject in a subsequent paper.

Albert Roberts, United States Consul for Hamilton, was elected a member of the Association.

The meeting then adjourned.

TWELFTH MEETING—12th May, 1887.

Rev. Samuel Lyle, B. D., presiding.

The minutes of the previous meeting were read and approved.

T. D. J. Farmer, B. C. L., Hon. W. E. Sanford and Joseph Green were elected members of the Association.

The question of holding a field day during the summer was discussed, and the general feeling being in favor of such a meeting, the time and place were left with the Council to fix and announce.

The meeting was then resolved into the annual meeting.

The minutes of the previous annual meeting being read and confirmed, the Secretary gave a brief verbal report of the year's work.

The Treasurer, Mr. Bull, read the financial statements, showing a balance in hand of $70.33.

The election of officers for the Session 1887-8 resulted as follows:

President,	Rev. Samuel Lyle, B. D.
1st Vice-President,	B. E. Charlton.
2nd "	W. A. Child, M. A.
Corresponding Secretary,	H. B. Witton, B. A.
Recording Secretary,	A. Alexander, F. S. Sc.
Treasurer,	Richard Bull.
Curator and Librarian,	Alexander Gaviller.

COUNCIL—J. Alston Moffat, William Milne, James Leslie, M. D., P. L. Scriven and C. S. Chittenden.

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

SESSION 1887-88.

FIRST MEETING—Thursday, 10th November, 1887.

The President, Rev. S. Lyle, B. D., presiding.

The minutes of the previous meeting were read and approved.

The Secretary gave a brief report of the business transacted during the recess, especially referring to the successful meeting held on the third Saturday of September in the Dundas ravine.

Reference was also made to the fact that Adam Brown, Esq., M. P., had acted as our delegate at the annual meeting of the Royal Society of Canada, held at Ottawa on the 25th May last.

The Corresponding Secretary reported the receipt of a large number of publications, consisting of reports and proceedings of learned and scientific societies from all parts of the world, while Mr.

Gaviller the Curator, announced various contributions to the museum, among the principal of which was the handsome collection of curiosities and natural objects given by Mrs. Charlton.

There was also a fine specimen of the head of a Rocky Mountain sheep, presented by F. E. Kilvert, Esq, Collector of Customs. Two volumes of maps and charts, published more than one hundred years ago, given by Mr. J. H. Killey, the sword of the sword fish from Mr. Thos. Burrows, buffalo horns from Mr. L. H. Hendry, and a very fine specimen of native copper from Mr. H. Symonds. A number of smaller contributions were also reported.

On motion the best thanks of the Association were voted unanimously to these donors.

The President, Rev. Samuel Lyle, B. D., then delivered his Inaugural Address, choosing for his subject "Evolution." The history of this hypothesis was traced during the past two centuries, and while it was admitted that the study of Evolution had aided the progress of true science, and had brought out very clearly the essential oneness of the animal and vegetable kingdoms it was pointed out that there was an unbridged chasm between man and the highest form of ape. And the moral sense in man was referred to as a distinguishing mark placing man far above the lower creation.

Mr. Moffat introduced the question of the re-organization of the sections, with the hope that some active work would be done by them, and moved that the following be the sections and the chairmen of the same:

SECTION A.—Mathematics, Mechanics, Physics, Meteorology and Astronomy. Chairman—Mr. A. Gaviller.

SECTION B.—Chemistry and Mineralogy. Chairman—Dr. Chittenden

SECTION C.—Geology and Palæontology. Chairman—Mr. A. T. Neill.

SECTION D.—Biology, comprehending Botany, Zoology and Entomology. Chairman—Mr. Thos. McIlwraith.

SECTION E.—Medical and Sanitary Science. Chairman—Dr. Leslie.

SECTION F.—Geography and Ethnology. Chairman—Mr. A. F. Forbes.

SECTION G.—Literature and the Fine Arts. Chairman—Mr. B. E. Charlton.

This arrangement was carried. The meeting then adjourned.

SECOND MEETING—8th December, 1887.

The President in the chair.

The minutes of the previous meeting were read and approved.

Dr. Reynolds, the Secretary of the biological section, reported the organization of the section with Mr. McIlwraith as Chairman and himself as Secretary, and also that the first regular meeting had been held, at which Mr. Moffat had read a paper.

T. W. J. Burgess, M. D., and J. B. Nelligan were elected members of the Association.

Mr. Witton then read a paper on "The Mahabharata," the great epic poem of the Hindoos. The paper, which was a very able one, sketched the plan of the poem, and showed that it sung at great length the story of great deeds of popular interest and national importance. It was pointed out that this great poem, extending to no less than 220,000 lines, with a supplement of 16,374 couplets, reflecting in its numerous characters every phase of Hindoo life; and further, that its religious and philosophical parts made it valuable as setting forth the faith and morals still held by the vast population of British India.

Several members expressed their high estimate of the paper, and the meeting adjourned.

THIRD MEETING—26th January, 1888.

The Rev. Samuel Lyle in the chair.

The minutes of the previous meeting were read and confirmed.

Messrs. W. A. Logie, B. A., Alexander H. Moore, banker, Vernon B. Whipple and Alexander R. Grant were duly elected members of the Association.

Dr. Reynolds reported the meetings of the biological section.

Mr. Forbes reported that the geographical section had had a meeting.

Dr. Mockridge then read "Some Notes on the Waverly Novels." The notes were arranged in the order of the historical period covered by the story. The notes this evening began with "Count Robert, of Paris," and ended with "Old Mortality." Dr. Mockridge promised to read the notes on the remaining volumes on a future occasion.

After remarks by various members the meeting adjourned.

FOURTH MEETING—9th February, 1888.

Rev. Samuel Lyle, presiding.

Minutes read and confirmed.

R. M. Fairchild, M. D., and A H. Hanham were elected members of the Association.

On motion the Secretary was instructed to send a letter to the widow of the late Professor Asa Gray, the eminent botanist, and that Dr. Burgess be associated with him in preparing a resolution expressive of our high sense of the eminent services her late husband rendered to science in general, and to botany in particular.

The following is the resolution prepared:

"*Whereas*, This Association has heard with deep regret of the death of Dr. Asa Gray, of Cambridge, Mass.:

Resolved, That as a mark of our respect to his memory there be transmitted to his family a record of our profound grief at such a calamity to the botanical world; that in his life he furnished a shining example of devotion to science and thoroughness of investigation, which will always command our admiration and respect, and that though of another nationality, we cherish and revere his memory, inseparably interwoven, not only with American botany, but with the development of botanical science itself."

In the absence of Mr. William Kennedy, his paper "Some Notes on Primitive Man," was read by the Corresponding Secretary. A very high antiquity was claimed for man.

The meeting then adjourned.

FIFTH MEETING—8th March, 1888.

Mr. W. A. Robinson in the absence of the President occupied the chair.

The minutes of the previous meeting were read and approved.

A letter from Mrs. Gray, widow of Dr. Gray, acknowledging receipt of resolution passed at the last meeting and expressing her thanks for the same.

Dr. Burgess also read from the Transactions of the "Torrey Club," of New York, a reference to the same resolution.

The thanks of the Association were voted to Mrs. Nelson Mills for a specimen of "Singing Sand."

Mr. Gaviller then gave an interesting and instructive series of illustrations of atmospheric pressure with his valuable apparatus.

The meeting then adjourned.

SIXTH MEETING—Thursday, 19th April, 1888

The President in the chair.

The minutes of the previous meeting were read and approved.

On motion, a hearty vote of thanks was passed to Mr. Symmonds for his handsome and valuable contribution to the Museum of a number of beautiful models of British ships of war, made to scale.

Dr. Reynolds reported the work done in the Biological Section.

A large number of publications were reported as having been received from Messrs. Brown and McKay, the city members, and others.

The matter of appointing a delegate to the forthcoming meeting of the Royal Society of Canada, was left with the Council.

Mr. Witton, Senior, read a very interesting paper on the "Paston Letters."

Dr. Burgess and Messrs. Barton, Chittenden, and the President, with others, joined in the after discussion.

SEVENTH MEETING—10th May, 1888.

The President in the chair.

The minutes of the previous meeting confirmed.

The Corresponding Secretary reported as having received a valuable contribution to the museum, consisting of an original letter by Benjamin Franklin, written by him from London in 1771. It is the gift of Mr. A. McLean, through Mr. William Bruce, to the Association.

Dr. Burgess then read an able and very practical paper on "How Best to Study Botany." It was very clearly shown how the student could best begin and continue to pursue the study of this beautiful science until he or she had a considerable collection of the native flora of their district. The method of finding the name, and

the drying and preserving and mounting of the specimens were so set forth that all felt that they could at once begin.

Messrs. Alexander, Witton, Forbes, Ireland and others spoke to the subject.

The meeting then adjourned.

EIGHTH MEETING—Thursday, 17th May, 1888.

ANNUAL MEETING.

The President, Rev. Samuel Lyle, B. D., in the chair.

The minutes of the previous meeting were read and confirmed.

On motion it was resolved to add the subject of History to Section F.

The Rev. R. G. Boville, B. D., Rev. W. J. Dey, M. A., and C. O. Baker were elected members of the Association.

The Secretary read a brief report of the year's proceedings.

The Treasurer's report was read, which showed a balance of $63.53 in hand.

Mr. Gaviller, as Curator and Librarian, gave a report of additions to the library and museum during the past session, and Dr. Reynolds laid on the table the report of the Biological Section.

All these reports will be found in another place in this issue of the Proceedings.

The election of officers was then proceeded with, resulting as follows:

President, Rev. Samuel Lyle, B. D.
1st Vice-President, Dr. T. J. W. Burgess.
2nd Vice-President, W. A. Child, M. A.
Corresponding Secretary, H. B. Witton, B. A.
Recording Secretary, A. Alexander, F. S. Sc.
Treasurer, Richard Bull.
Curator and Librarian, Alexander Gaviller.
Council—J. Alston Moffatt, Dr. T. W. Reynolds, S. J. Ireland, B. E. Charlton, William Kennedy.

It was announced that a special section for Historical Study had been formed and would commence its meetings in September, and also that Mr. William Gibson, of Beamsville, had invited the Association to visit his quarries at that place during the summer.

After votes of thanks to the executive officers the Association adjourned to meet on the second Thursday of November.

HAMILTON ASSOCIATION.

SESSION 1887-88.

HOW TO STUDY BOTANY.

BY DR. T. J. W. BURGESS.

Read before the Association, 10th of May, 1888.

MR. PRESIDENT, LADIES, AND GENTLEMEN :—It is with feelings of pleasure mingled with fear that I find myself, for the first time, occupying a position as essayist before a general meeting of this Association. To feel that I have been considered worthy of being selected for such a task is an undoubted pleasure, but with that pleasure comes the haunting fear, that I may not be able to do credit to those who have so complimented me. An address, at such a meeting, is always looked forward to as an important event, and not unreasonably so, since the very fact of the speaker's selection should indicate ability to handle his subject in a suitable manner. Much more so is this the case when, as in the present instance, that speaker has had thrust upon him, most undeservedly I am afraid, the credit of being a specialist in the science selected for his discourse. True, if a penchant for that wonderfully fascinating study Botany, if an honest love for nature and nature's works constitute a specialist, I am one; but that I am especially well up in a knowledge of plant-life, especially well able to communicate what little knowledge I do possess to others, is open to grave doubt. I can assure you, however, that I appreciate the confidence shown in me, and will simply offer my hearty thanks for the honor conferred on me.

Botany is that branch of science, or of natural history, which comprehends everything relating to the Vegetable Kingdom. It embraces every scientific enquiry that can be made respecting plants; their nature, their kind, the laws which govern them, their distribu-

tion, and their economic uses. The science is divided into Physiological or Biological Botany, and Systematic Botany, the former dealing with plants in respect to their structure and functions, the latter in respect to their names and classification. Forming as it does, the foundation of the science, the study of plants should begin with Physiological Botany. But first a few words as to the value of botany as a training for the mind.

The highest and most important object of all human science should be mental improvement, and the study of natural history, in particular field-work, when properly pursued, is assuredly adapted to strengthen, discipline, and develop the mental powers. It robs the mind of contracted ideas, and teaches us to take close as well as comprehensive views of objects, and argue from facts not from fancies. Though the study of nature in any of her forms is calculated to bring about these results, none of the natural sciences is as good for beginners as botany, the materials being everywhere abundant and inexpensive. To the average student, plants, possessing life, are more interesting than minerals, while animals, though affording the most striking marks of designing wisdom, cannot be dissected and examined without painful emotions.

One of the most apparent of the many advantages to be gained by the study of botany is that it systematizes the mind, by imprinting on it and establishing habits of order and exactness. It thus gives all the benefits of mathematics or logic without the drudgery which debars so many from pursuing the study of these sciences. System is essential not only in science, but in conducting any kind of business and in the most trivial affairs of every-day life, thus the very logical and systematic arrangement prevailing in botanical science cannot but induce in the mind a habit and love of order, which, when once established, will operate in even the minutest concerns. The methodical habits of thought, by which alone plants can be properly examined, must necessarily be inculcated, and will prove invaluable in any vocation of life. Nor is it essential that the study (to be of use as a training for the mind) should be carried to any great length—we cannot all hope to be Grays or Darwins—the elements of the science alone are sufficient as a means for the practice of this training to habits of methodical thought.

The taking of notes in a neat and systematic way, by which

alone the results of examinations and discoveries can be recorded in a manner ready for reference, begets a concise style and an accurate use of exact words; while in the very collecting of material to form an herbarium the faculty of observation is cultivated and developed, and the power to discriminate between species, thus to appreciate minute differences, is obtained. Most important of all things to the botanist are these faculties of observation and comparison. Many persons have a natural acuteness in perceiving details of structure and in generalizing results, while others are very obtuse in such respects. Yet, in all, these powers can be cultivated and strengthened, and herein lies one of the great educational uses of botany, that it trains us to see and to think.

But in addition to the direct benefits to be gained by the study of botany, there are others of a more general nature, and man's great aim in life being the pursuit of happiness, I would place first the added pleasure it gives to life. To one not trained to an inquisitive appreciation of Dame Nature how comparatively few are the beauties she displays.

> "A primrose by the river's brim
> A yellow primrose is to him,
> And it is *nothing* more."

Very different is it when he has the slightest knowledge of botany. Then, in even the humblest of the vegetable creation, he can note the structure, take cognizance of the relationship borne by the several parts to each other, see the marvellous way in which each organ is adapted to serve a certain end, and in all admire and do homage to that All Wise Being at whose creative fiat all things first were made.

Last but by no means least of the advantages to be mentioned is, that the pursuit of the science, leading to exercise in the open air, is conducive to health and cheerfulness. Botany is not a sedentary study, which can be followed in the house, but one the love of which compels its devotees to seek their amusement out of doors, thus to breathe the pure air where the objects of their search are to be found; in the fields, along the winding brooks, on the mountain side, or in the cool depths of the forest. In every pursuit a certain amount of recreation and exercise is necessary for the maintenance of health, and walking is the means commonly employed to procure this. A walk taken merely as a duty is wearisome, but when indulged in

with a definite and pleasant end in view it becomes delightful. As soon as one in his rambles begins to search for and collect any special class of objects he becomes interested, and marvels how he could formerly have been blind to so much that is curious and beautiful. To those who know anything of outdoor life what a source of enjoyment it is to wander through the fields and woods. Each step brings some object of interest or some new discovery; a flower not hitherto noticed, or some familiar one showing variation from the common form; a rare bird flitting from branch to branch, or some brilliantly colored insect pursuing its erratic flight.

Of the value of botany as an economic study I shall say but little. None of you but recognize what an important part it plays in nearly all the arts and sciences. In medicine great discoveries have been made as to the value of certain plants in the cure of disease, and daily fresh discoveries are being made. Vegetables, fruits, and cereals are most important articles of diet, and great advances are to be made in the production of new varieties of these, while the study of the injuries done to them by the lower forms of vegetable life, such as fungi and rusts, presents an immense field for research.

During the past thirty years the method of teaching botany has undergone a radical change, and what is called "The New Botany" has sprung into vogue. As formerly pursued the study consisted mainly in learning from some book the names of the different kinds of roots, stems, leaves, and flowers. If plants were obtainable perhaps the scholar was made to run superficially over a few of them, and by aid of an artificial key determine their names. The terms were hard and unfamiliar and there were no specimens used to illustrate the lessons. Was it any wonder then that pupils acquired a disgust for the science? Little or no field work was attempted, and no thought was taken to promote habits of close observation, or to secure a knowledge of the mysteries of plant life. By the new system, the special design of which is the training of pupils to fit them for original work, objects are studied before books, and the student is at once set to investigating and experimenting for himself. Of this system an able exposition is to be found in a lecture, on the best method of teaching botany, delivered at a meeting of the Michigan State Teachers' Association, by Mr. W. J. Beal, Professor of Botany in the Agricultural College at Lansing. The title of the

paper, which was published in the Transactions of the 29th Annual Meeting, is "The New Botany," and it will well repay an attentive perusal. To give you an idea of the method pursued at Lansing I have made a short resume of it. Before the first lesson each pupil is furnished with, or told where to procure, some specimen for study. If it is winter, and flowers or growing plants are not to be had, each is given a branch of a tree or shrub. The examination of these is made by the pupils themselves during the usual time for preparing lessons, and for the first recitation each tells what he has discovered about his specimen, which is not in sight. If there is time each member of the class is allowed a chance to mention anything not named by any of the rest. If two members disagree on any point they are requested to bring in, the next day, after further study, all the proofs they can to sustain their different conclusions. In learning the lesson, books are not used, nor are the pupils told what they can see for themselves. An effort is made to keep them working after something which they have not yet discovered. For a second lesson the students review the first lesson,—report on a branch of a tree of another species which they have studied as before,—and notice any points of difference or of similarity. In like manner new branches are studied and new comparisons made. Time is not considered wasted in this. No real progress can be made till the pupils begin to learn to see; and to learn to see they must keep trying to form the habit from the very first; and to form the habit the study of specimens is made the main feature in the course of training. The use of technical names is not avoided, nor are these "thrust upon a student." They are learned as they are needed, a few at a time, from the teacher or a text-book. After from four to ten lessons on small branches, the following points, and many others, are brought out. Is there any definite proportion of active and dormant buds in any year? Where do branches appear? Is there any certain number of leaves in a year's growth, or any definite proportion between the length of the internodes? Is there any order as to what buds grow, and what remain dormant? etc., etc. The pupils are now ready for a book-lesson on buds, branches, and phyllotaxis, and will read it with interest and profit. In like manner any other topic, as roots, seeds, stamens, leaves, or petals is first taken up by the study of specimens. Very little stress is placed on investigating a number of chapters in the definite order as given in

a text-book. For example, it makes little difference whether a pupil begins with a study of petals or stamens, buds or roots, leaves or pistils; but it is desirable after begining any topic, not to abandon it till many of the various forms have been thoroughly studied. After a day, two, three, or more of study of specimens pertaining to one topic, comes the study of the book. Even in the shortest and most elementary course, a study of some of the specimens by all of the class precedes the study of the text. A young man of eighteen begins and pursues the same course as a child of ten, only he will progress faster and go deeper. As students advance in morphology and systematic botany, subjects for descriptive compositions, "Observation Papers," are assigned them, usually from one to three a term, of which the following will serve as examples. Each pupil studies the living plants for himself and makes his own observations, experiments, and notes, the only help afforded him being brief hints as to how to set to work intelligently. For instance,—one studies the arrangement and development of the parts of the flower with reference to its self-fertilization or fertilization by birds, insects, wind, or other means; one the vines of dodder; one the climbing of Virginia creeper; one the time of opening and closing of flowers; and so on ad infinitum. When completed the theses are read in the class-room. During five-sixths of the academic year, in which the students have daily lessons in botany, fully three-fourths of the time is given to the study of plants in some form or other, the books serving only for reference. But little time is occupied with lectures, short talks of ten, fifteen, or twenty minutes being occasionally given. In the whole course there is kept constantly in view how best to prepare students to acquire information for themselves with readiness and accuracy, in other words, they are trained more than they are taught.

I have been thus lengthy in my abstract of Professor Beal's paper as it most plainly sets forth the modern method of teaching botany. This, or some modification of it, is the system now most in repute, and wisely so. I agree with him fully, that the great object in teaching botany should be, to put students in the way of becoming independent and reliable observers and experimenters, and that the method of study pursued should be primarily objective and based upon the actual examination of the appropriate material. But while agreeing with him as to the end to be attained, I am not quite in accord with his method of attaining that end. To my mind, a cer-

tain, though slight, amount of knowledge gained by the old system is necessary before much can be accomplished by the new, and I would prefer, if teaching, to first of all give my pupils some idea of what plants are, how they grow, the nature of their structure, and the number of their parts. This to be done in a short series (five or six) of familiar talks, made as simple as possible, with each point illustrated by drawings, models, dried specimens, or, best of all, freshly gathered plants. Without some faint idea of plant life, to plunge a pupil headlong into the depths of the study, were to me like setting him to solve some abstruse mathematical problem prior to his learning the meaning of addition and subtraction. Mr. Beal, too, in his paper, whatever he may do in practice, makes no mention of a point which I deem of vital importance, viz., that every student in botany, from almost his very entry on the subject, should be urged to start and taught how to make an herbarium, or collection of plants, for himself. Field-work is of the greatest importance in promoting familiarity with habitats, and in solving most of the problems of plant-life, and to induce pupils to engage actively in field-work there is nothing equal to starting them to form an herbarium, for in no other way can such an interest be excited. In my experience, young people can best be stimulated to take an interest in any branch of study by giving them something to do in connection with it. Some striking examples of this have fallen under my observation in Philately, the modern rage for postage-stamp collecting. I have known those, to whom the study of geography was most irksome, led to take great interest in it by encouraging them to form a stamp collection. The questions naturally arising in their minds, on the obtaining of a stamp from any special country as to the whereabouts of that country, led to a desire for more extensive knowledge of it, and thus was laid the foundation of a love for geographical study. Nor is the interest excited, through collecting, in the general study of any science, confined alone to the young, students of all ages yield to its fascination and are thus led, often insensibly, to pry deeper into its mysteries. But it is not alone in the excitement of an interest in the study of botany that the value of an herbarium lies. The ultimate end of any scientific study being the mastery of all that can be learned concerning it, the formation of a collection of plants in a manner most convenient for reference is a necessary part of the science of botany.

But enough has been said to give you an idea of the general principles on which botany is now usually taught in colleges and schools. Let me next devote myself to telling you what I consider the best way for you to enter upon the study. The first step is to procure a text-book on structural botany. It matters little what this is. Gray's "How Plants Grow," Wood's "Object Lessons in Botany," Spotton's "Elements of Structural Botany," or Gray's "Lessons in Botany:"—any of them will answer, but for choice I prefer Gray's "Lessons." It is not too complicated and yet is extensive enough except for advanced students, who wish to devote themselves specially to the study. To such I would recommend Gray's "Structural," and Goodale's "Physiological Botany," Sach's "Text-Book of Botany," or Bessy's "Botany for High-Schools and Colleges." A work on systematic botany is also essential and the choice is large, though I know of none better than Gray's "Manual of the Botany of the Northern United States," which covers our Ontario Flora. I would advise any one purchasing to get the "Lessons" and "Manual" bound together. In this shape the books are not only cheaper but more handy, and we have in combination excellent works on both departments of botany, structural and systematic, no small desideratum to the beginner, who, in naming plants by the latter, will from time to time meet with unfamiliar terms for the meaning of which he will require to refer to the former. Spotton's systematic manual, "The Commonly Occuring Wild Plants of Canada," is a Canadian work and very good, but it is too meagre. Working with it, one runs the risk of occasionally spending long and patient labor trying to name a plant, only to fail because it is not mentioned, and I know no experience more likely to disgust the beginner than this. More extensive systematic works are Torrey and Gray's "Flora of North America," and Gray's "Synoptical Flora of North America."

A text-book secured, comes what is generally looked upon as a rather dry part of the science, viz., the reading of it. Many words are met with which are strange and difficult to remember, but let me say that the labor of learning technical terms is usually much over-estimated; with practice they soon become quite familiar, while the discipline taught the mind in acquiring them is worth all it costs. There is no royal road to solving the problems of nature any more than there is to deciphering the mysteries of mathematics or

metaphysics, but at each step the way becomes easier till at last what was a wearisome task becomes a pleasant and absorbing recreation. The so-called drudgery is greatly lessened if the reading be pursued in a proper manner, and especially if the reader has before him the proper material to illustrate the more important points in each topic as it is taken up. He, who has some older botanical head to advise him what material to provide beforehand for each chapter, is greatly blessed, but, whether he has specimens to examine or only the plates in his text-book to guide him, I would strenuously advise him to make no effort to commit all the terms he meets to memory. Let him try to read slowly and understandingly, but let him bear in mind that the object of this primary reading is only to get a general notion of plants and their parts, and to learn the meaning of a few of the most material technical terms, so as to be able to start collecting and naming plants for himself. Thus, in the first reading, he will gain an idea of the life history of a plant, and discover that as a rule a miniature plantlet, the embryo, exists ready formed in the seed. If now this seed, say that of the maple, be placed in the ground and allowed to germinate, the miniature plantlet will soon be seen to develop in two opposite directions; downward into a root or descending axis, and upward into a stem or ascending axis. The stem as it reaches the surface of the ground will be seen to bear a pair of narrow green leaves, the seed-leaves or cotyledons. Soon between these seed-leaves will appear a little bud, which shoots upward into a second joint bearing another pair of leaves, which, however, differ in shape from the first pair and resemble those of the maple as usually seen. Later, a third joint shoots up from the summit of the second, bearing a third pair of leaves, and so on until the plant likeness of the seed becomes a fully developed tree. The three organs, root, stem, and leaves, which existed in the embryo in a rudimentary state, are called the fundamental organs or organs of vegetation, because they have for their object the development and nutrition of the plant; while all the parts which succeed the leaves, such as the flower and its organs, are only modifications of them designed for a special purpose, and are called the organs of reproduction, since on them depends the increase of the plant in numbers, or the continuance of the species.

Proceeding onward with his reading he will obtain some general knowledge of the various sorts and forms of these two sets of organs.

For instance, regarding the organs of vegetation, he will learn the meaning of the terms annual, biennial, and perennial as applied to roots,—of herbaceous, shrubby, and arborescent as applied to terrestrial stems, and rhizome, tuber, and bulb to subterranean ones; he will remember the parts of the leaf, blade, petiole or leaf-stalk, and stipules, and the distinction between netted-veined and parallel-veined, simple and compound leaves; and he will discover that leaves are named, from their general outline, linear, lanceolate, ovate, cordate, etc., from their apex, acute, obtuse, truncate, etc., and, from the degree of their division, entire, serrate, dentate, incised, cleft, and divided, which last makes the leaf really a compound one. About the organs of reproduction he will learn the distinction between a raceme and a corymb, an umbel and a spike as applied to the inflorescence; will note that the parts of the individual flower are of two sorts, protecting organs and essential organs, the former consisting of the calyx formed of the sepals and the corolla formed of the petals, the latter of the stamens and pistils. He will also understand the meaning of and perhaps remember some of the names applied to different kinds of flowers, as complete when it has calyx, corolla, stamens and pistils, and incomplete if any of these organs, as they may be, are missing; perfect when it has both stamens and pistils, and imperfect when either of these is wanting; staminate when it possesses only stamens, and pistillate when only pistils; polypetalous when it has both calyx and corolla and all the petals are distinct, monopetalous when with the same organs the petals are all united, and apetalous when either calyx or corolla, or both, are absent; regular when all the sepals, all the petals, all the stamens, and all the pistils are alike, and irregular when any or all of them are unlike.

Having thus obtained some knowledge of the various sorts and forms of plants and their parts, the student will next, from his text-book, learn something of vegetable fabric, and get an insight into the life of plants and the mode in which they do the work of vegetation. He will discover that all plants possessing leaf-green (chlorophyll) as the pigment which gives the green color to the leaf is called, possess also the power of assimilation, that is of making starch and similar organic compounds out of inorganic elements, such as water and carbonic acid; which transformation, briefly speaking, is thus effected. The plant through its roots, by the process known as osmose, takes in, dissolved in water, various compounds

containing carbon, oxygen, hydrogen, nitrogen, potassium, and other materials. The pressure exerted by the liquid as it comes into the roots, together with the attraction exerted by a constant process of evaporation from the leaves, causes the "sap," which is the plant food, to rise, and gives us what is known as the plant circulation. When, by this osmotic action, the sap finally reaches the leaves, it, in conjunction with carbonic acid derived from the air, is converted, in the chlorophyll grains under the influence of sunlight, into organic materials, which pass into a whitish granular liquid called protoplasm, and are used in "growth," that is in the building of new cells to form plant tissue. Assimilation takes place only in sunlight, but growth goes on most rapidly at night. In the former process oxygen is set free and given off through the leaf-pores or stomata, but in the latter air is taken in through the stomata, and, as its oxygen is used up, carbonic acid gas is given off. It will thus be seen as tersely put by Mr. L. H. Bailey, Jr.,—"If the leaves are the lungs of the plant because they breathe, they are more emphatically the stomachs of the plant because they assimilate and digest."

It is now in order for the student to learn something of classification, as it is by this means he is enabled to analyze and recognize by name the plants with which he meets, thus to avail himself of all that has been recorded concerning them by botanists before him.

To the ordinary observer plants differ so much from one another that he can see no points of resemblance which could connect them naturally. For example, what likeness is there between the common strawberry and the mountain ash? Yet both belong to the rose family. Notwithstanding this great external dissimilarity, the botanist can readily point out in both, characters which at once stamp them as closely akin. The points which determine the relationship of plants are not confined to any one part of them; they may exist in the roots, leaves, flowers, or fruits, but the natural system now in use aims to bring together those which most closely resemble each other in all these particulars, laying especial stress on the flowers and fruit. In this respect it differs from the Linnæan and all other artificial systems, which took up a certain set of organs and based kindredship on those alone.

The means by which a plant reproduces itself and is prevented from becoming extinct is evidently its most important and essential

part, and it is on this, the fruit, that the vegetable kingdom is primarily divided, viz., into flowerless or cryptogamous plants, such as ferns, mosses and fungi, and flowering or phænogamous plants, such as herbs, shrubs and trees. The former reproduce themselves by means of spores, which are commonly simple minute cells and contain no embryo; the latter by seeds, which are embryo plantlets enclosed in an integument. The greater part of the flowerless plants, which are by far the most numerous, are as yet very imperfectly understood, and, on account of this imperfect knowledge as well as the fact that their study, which often requires the use of a good microscope, is very difficult, we will exclude them from our consideration. Confining ourselves then to flowering plants, we find that increase in diameter forms the first basis of division. There are two general methods in which this increase takes place. In the one case, the woody tissue is scattered as separate threads throughout the whole stem, and the increase in diameter is by the interspersion of new woody threads which stretch its surface; while in the other case, the woody tissue is all collected so as to form a layer between a central cellular part, the pith, and an outer cellular part, the bark, and the increase in diameter is by the addition of new layers of wood beneath the bark. The former class of plants, which includes our grasses, sedges and lilies, is called endogenous or "inside-growing;" while the latter, which includes all our northern trees and shrubs and most of our herbs, is known as exogenous or "outside-growing." In Canada the endogens are all herbs with the single exception of Smilax, but in warm climates they are largely represented by the palms. It is not, however, only the manner of growth that separates these two great divisions of flowering plants; marked distinctions exist in the seeds, flowers and leaves. The seeds of endogens contain but one seed-leaf or cotyledon, while those of exogens have two or more, the former are therefore said to be monocotyledenous, the latter dicotyledenous; the parts of the flower in endogens are usually in threes or multiples of three, while in exogens they are never in threes, but usually in fives or multiples of five; the leaves of endogens generally have the veins running parallel to the midrib, that is they are parallel-veined, while those of exogens are netted-veined. Excluding the endogens, which form only twenty-one of the one hundred and twenty-eight orders given in Gray's "Manual," we find that the exogens are subdivided into three

divisions based upon the character of the protecting organs or floral envelopes; viz., Polypetalæ, which have both calyx and corolla, and the petals not united with each other; Monopetalæ or Gamopetalæ, which have also both calyx and corolla, but the latter is composed of more or less united petals; and Apetalæ, which have no corolla, the floral envelopes being in a single series, or sometimes wanting altogether. The pine family (Coniferæ) belongs to the exogens, but as it forms part of a group represented in Canada only by itself, it is not included in either of these three divisions. Each of the divisions is again divided into natural orders or "families," which in turn are composed of genera, made up of species. The orders are large groups of closely related genera, while the genera are assemblages of species, which have a general similarity of fruit, flowers, leaves, and habit. The families and genera are so numerous, and so generally only distinguishable by a combination of marks that the points on which they are founded must be sought for in your text-book; the orders in the analytical key at the beginning of the work, the genera in the work itself at the beginning of the orders. To give you a more comprehensive view of it, the system of classification may be thus tabulated.

- Vegetable Kingdom
  - Cryptogams
  - Phænogams
    - Endogens—Orders—Genera—Species.
    - Exogens (Exclusive of Coniferæ.)
      - Polypetalæ—Orders–Gen.–Spe.
      - Gamopetalæ–Orders–Gen.–Spe.
      - Apetalæ—Orders—Gen.—Spe.

To illustrate the method of applying the system of classification to the naming of plants, let us suppose the student to have found the wild strawberry, which is now in flower, and that it is unknown to him. He sees that it is a flowering plant and must first determine whether it is endogenous or exogenous. The netted-veined leaves and the fact that the parts of the flower are in fives show it to be the latter. It is evidently not a pine, so that it must belong to the polypetalæ, gamopetalæ, or apetalæ. Both calyx and corolla are present so that it cannot be to the last, and the petals being all distinct it must be to the first. Turning now to the analytical key we find polypetalous exogens to be divided into three classes, marked A., B., and C., according to the number and position of the stamens. In A. the stamens are more than twice as many as the petals; in B.

they are of the same number as the petals and opposite them; and in C. they are not more than twice as many as the petals, and when of the same number are alternate with them. Our plant has the stamens numerous and so must come under the first class. This section, A., has two subordinate headings marked 1 and 2; the former includes species with the calyx entirely free from the ovary, the latter those where it is more or less coherent. The calyx being evidently free, the plant we are examining must belong to No. 1. This has several divisions regulated by the pistils, and by careful comparison of the plant with the key we find that it falls under the one headed, "Pistils more than one, separate and not enclosed in the receptacle." This division is again split up according to the point of insertion of the stamens, and the specimen having them fixed on the calyx clearly belongs to the order Rosaceæ. Turning now to this order we find it to be made up of three suborders, and a very little consideration will show us that the name we are looking for must be in suborder II, known as Rosaceæ proper. In this class there are three tribes formed chiefly on the number of pistils, and they being numerous our plant is certainly in the third. Reviewing the genera composing this tribe we soon settle that it can be only a Fragaria, and so pass on to this genus, which we see is made up of three species. By comparing our specimen with the characters of each of these we decide, and rightly so, that it must be Fragaria Virginiana.

This analysis, or naming, of plants, I have no doubt, seems very tedious and difficult to most of you, but, believe me, such is not really the case. After a few analysis the primary steps can be passed rapidly over, and I will guarantee that any one who will conscientiously study out twenty or twenty-five good examples will afterwards experience little difficulty in naming most of our flowering plants. Be not discouraged at the slow progress you will at first make; each successful analysis will facilitate the next, and very soon it will become so that when you have worked out one species of a genus you will be likely to know others when you see them, and even when plants of a different genus of the same family are met with, you will, ere long, generally be able to recognize their order at a glance from the family likeness. A capital practice for the beginner is to work out, in the manner I have indicated, a few plants with whose names he is already familiar. Success in these attempts

will naturally inspire confidence in the determination of plants previously unknown.

By his initial reading over of his text-book the student has got some knowledge of plants and plant-life, as well as an insight into the manner in which their names are determined. He is like the race-horse to which the jockey has just given a preliminary canter that he may "feel his legs" preparatory for his true task, the race, which lies before him. The knowledge he has gained is slight I grant you, but he is not quite in the dark. A foundation has been laid upon which it now becomes his duty to raise a creditable superstructure; a superstructure, the first step toward which should be the commencement of an herbarium, which, however, should be subservient to, or a co-partner with, the highest aim in botanical science, the elucidation of the mysteries of plant-life. Laying such stress as I do on the formation of a collection as an aid to further study, let me for a little call your attention to the advantages to be derived from having one, and the best appliances and methods for accomplishing this.

The use of an herbarium is, in general terms, to have constantly on hand material for study in any class of plants, for, by soaking them in water, dried specimens can be studied almost as easily as fresh. In no other way can we see simultaneously specimens of neighboring species, different states of the same species, and specimens of a species from different localities; and some of the brightest theories on the distribution of plants have been worked out by the aid of the "hortus siccus" or herbarium. The nomenclature and classification of objects can be best acquired by the constant handling of them, and the price of a good herbarium is incessant vigilance in warding off the attacks of insect pests. But in this vigilance what a throng of pleasant memories is perpetually being called up; the time and the locality, the surroundings, and, if you were not alone when gathered, your companions. Each specimen represents so much information, and the very mention of its name will recall to mind associations connected with its study. These results from the possession of an herbarium have been so beautifully set forth by Professor Bailey of Brown University, that I cannot refrain from quoting his words on the subject. "In looking them over one sees not alone the specimens themselves, but the locality in which they

were gathered. Many an incident of his life, the memory of which has long since become dormant, will be re-awakened as by an enchanter's wand. He will thread the forest paths gay with flowers; he will pause in imagination for the nooning by some fern-laced spring; he will climb the mountain ravine where the blood-root and orchis bloom; or wander, full of speechless yearning, by the ocean shore. Not only do the natural scenes return thus vividly, but the faces of friends who enjoyed the occasion with him. He is once more seated, may be, by a little lake on the mountain, in a garden of alpine flowers. Cool streams flow by him, and he picks the tart fruit of the cowberry. The world lies mapped at his feet, and the infinite heaven is above him. He hears the merry jest and ringing laughter, and his heart becomes gay with the thought of those old-time rambles."

A collector's outfit, which will answer all ordinary purposes, is cheap, and most of it can be got or made at home. It consists of a botanical box or vasculum; a plant-press or portfolio; a pocket lens; a trowel; a sharp jack-knife; and a note book. The clothing worn in collecting should be strong, as one often has to make their way through a tangle of thorny bushes, and old, so that no nervousness at fear of spoiling it may be excited. For foot wear stout shoes are generally recommended, but I prefer the oldest and easiest pair I have, with plenty of holes in them. One occasionally has to wade through a swamp where the water comes above the tops of any ordinary boot, and it is much better that it should run out freely as fast as it enters, than to have to sit down, take off and empty one's shoes, or continue to walk with the water sogging about in them.

The vasculum, which is most useful for holding specimens that are to be examined fresh, is of tin, and varies greatly in shape. The form usually adopted is that of a compressed cylinder, with a lid opening for nearly the whole length of one side. It is generally about 18 or 20 inches long, and has a light strap to throw over the shoulder. Any easily portable box will answer the purpose, but of late years I have entirely abandoned the vasculum, putting my specimens directly into the press, and carrying in my pocket an old newspaper or two, in which, previously dampening it, I loosely wrap up any plant that I wish to make special examination of.

Plant-presses or portfolios are of various kinds. The one that I use, and which has done good service from Cape Breton to

British Columbia, is made of quarter inch basswood strengthened by four cleats, and is 18 inches long by 11½ inches wide. The straps are provided with a cross piece, like a shawl-strap, which prevents them becoming separated when the press is open, and also serves for a handle to carry it by. If desired, a shoulder strap can also be attached. Wire presses and those of lattice wood-work are highly recommended by some, the advantages claimed being lightness and a free escape of moisture. In wet weather, however, the ordinary form has the great merit of keeping one's paper dry. For an excursion the press should contain a good supply of specimen sheets and driers with one or two pieces of mill-board or thin deal, all of them a little smaller than the press. Any thin, cheap paper will answer for specimen sheets. What is known as printing paper is the kind I ordinarily use. For driers a special paper is manufactured, but it is expensive, and I substitute "filter paper," which is obtainable at most druggists. Blotting paper of any kind will do, and, if economy be an object, old newspapers can be made to serve. Some of the finest and most beautiful specimens I have ever seen were turned out from newspapers alone. The object is to have a medium that will quickly absorb moisture and as quickly part with it again. The mill-boards or deals are to keep apart the damp papers containing the plants and the dry unused ones. I also usually carry in my press a few sheets of cotton-batting to lay over ripe fruits, such as strawberries or raspberries, to prevent their receiving too much pressure and so getting crushed out of shape.

A pocket lens should always accompany the collector, and should not be of too high power. A very powerful lens, while magnifying greatly, inconveniently narrows the field of vision and shortens the focus. An instrument of an inch to an inch and a half focal distance is to be preferred for field work. For ordinary house-work a focussing lens with legs is very useful, or better still, the "Botanist's Microscope," the price of which is about $2. It is provided with a couple of needles mounted in handles and a pair of tweezers for dissecting purposes. To save expense its glass can be carried in the pocket as a field lens. For advanced work on the Cryptogams and for physiological botany, one of the many good microscopes now offered for sale will be necessary.

The trowel, which is used for taking up plants by the root, is generally replaced by a strong knife, as being more portable. A stout table-knife sharpened at the point will answer every purpose.

A sharp pocket knife cannot be dispensed with in trimming woody specimens, slicing tubers and stems, etc.

The note book is an object of prime importance and should be of such a shape as to be readily carried in the pocket. It should have a place for a pencil and a pocket to hold some slips of paper for field-labels. In this book should be jotted down any observations one cannot trust to memory, e. g., the color of flowers, the height of plants, the character of the soil in which they grow, the association of particular plants or insects, etc., etc. Unless the collector takes field-notes he will run the risk of letting important observations escape him, and he cannot too soon learn to make them in a concise, systematic, and legible way, never mixing up conjectures with actually observed facts. Everyone is prone to get into a hurried way of making notes, under the idea that they are for his own use only, and that he will readily recollect the rest of the facts omitted at the time. This is a great mistake and one that the student must carefully guard against. Notes are not often required immediately after being made, because every circumstance connected with the subject is fresh in the memory. But it frequently happens that a long time after, weeks, months or years, in pursuing some branch of study, the exact facts then observed are required; and I know nothing more disappointing than, on turning to one's note-book for the record of some experiment or observations, to find that at the time, trusting to memory, some of the details had been omitted.

In collecting, when a number of plants of which specimens are desired are discovered, the first thing is to make a judicious selection. To be really valuable the specimens in a collection should be as perfect and characteristic as possible, so that any one referring to it can learn full particulars about each species. A perfect specimen comprises all that is necessary for complete botanical investigation; leaves (both mature and immature, cauline and radical) flowers and fruit. Specimens can often be secured showing both flowers and fruit on the same plant, or fruit may be found on more advanced plants at the same time. If not in fruit it must be collected in this condition later in the season. The same rule applies to the obtaining of specimens with different leaves, or leaves in different stages, and it may require several seasons to make a complete specimen. The plant should be so arranged as to be no larger when dried than can be readily mounted on the herbarium paper.

Of small herbs, the whole plant, root and all, should be taken, but in every case enough of the root should be collected to show whether the plant is annual, biennial or perennial. Large plants may be doubled into a V or N shape. Thick stems, roots, bulbs or tubers can be divided and thinned down. The name of the plant if known, but always the locality and date, should be written on a field-label and put with the specimen into the press. A specimen of unknown date and locality loses much of its value and interest. My method of using the plant-press is this; having picked a specimen or specimens I open my press and on the blank side lay a couple of driers, on these a specimen sheet, and on this a plant followed by a drier. This process is continued, alternating plants and driers, till all I have gathered are in. On the last drier I put one of my thin boards, and on this my dry papers, close my press, and start on the search for fresh objects of interest. In the case of very delicate plants, as many ferns, a specimen sheet should be placed above as well as beneath the specimen, in which sheets it remains until perfectly dry. The object of the double specimen sheet, which is not necessary with ordinary plants, is to prevent the delicate leaves from doubling up or becoming displaced in changing the driers. Care should be taken to display the specimens neatly, if possible showing both sides of the flowers and leaves, though in some cases it is easier to spread out the leaves and remove creases after a night's pressure has somewhat subdued their elasticity. Morning is the best time to collect most flowering plants, as many close their blossoms by noon, but those that open in the evening, Vespertine flowers, should be gathered at that time.

The actual pressing and drying of specimens is done at home in the ordinary field press or a similar but stouter one. A couple of pieces of inch board will answer every purpose. The pressure is made by screws, straps or weights, the latter being preferable, as under them the press follows the shrinkage of the plants. Half a dozen bricks, tied together with a cord strong enough to lift them by, makes a capital weight. Specimens should be put into the drying press as soon as possible after gathering, but often on returning from an excursion one is too tired to care for more labor, and I commonly leave mine in the field press until next morning, nor do I find them suffer any harm from so doing. The thin sheets (specimen sheets) containing the plants are transferred to fresh driers, heated in

the sunlight or by a stove, and remember always, *the hotter they are the better*. Be careful to place the specimens in such a way that one part of the bundle is not materially thicker than the other, by placing them on alternate sides, or putting in wads of paper if necessary. Plants dry best in small piles, and for dividing up a package if too large, or for separating the lots put into the drying press on different days, use thin deals like those taken out in collecting. When transferring to the home press be careful to remove all folds of the leaves and petals, and arrange the specimen as naturally as possible. The elasticity so troublesome in many plants when first gathered, will have in great measure disappeared, and the parts will stay as arranged. Some very succulent plants, and others with rigid leaves, such as stone-crops and pines, dry better if plunged for a moment into boiling water ere being put into the drying press. Every day, or at first even twice a day, the plants in their specimen sheets are to be shifted into fresh hot driers, the moist ones taken off being spread out to dry in the sun or by a fire, that they may take their turn again at the next shifting. The more frequently the plants are changed the better will they retain their color. After the first three or four days the changes need only be made every other day until the specimens are thoroughly dry and no longer moist or cold to the touch. The drying usually occupies from a week to ten days, but varies according to the succulency of the plants, the state of the weather, the frequency of the changes, and the degree of heat of the driers. The most convenient place for changing plants if it can be managed is a table beside a good hot range or stove, the top of which is free for use. If a damp drier be laid flat on the hot metal, steam at once begins to rise from it, and the moment it ceases to do so the paper is dry; leave it yet for a second until it becomes so hot as to be barely touchable with the naked hand, then lay it quickly on a specimen previously moved from the damp pile, and continue thus until the whole lot is changed. This plan is invaluable when driers are scarce, as sometimes happens on a botanizing trip, for by it the same driers, no matter how wet, can be used again immediately. A plan adopted by myself a few years ago, while collecting in Nova Scotia, might be mentioned as worthy of remembrance should any of you ever be placed in similar circumstances. Though not to be recommended for common use, as the specimens fall short of those obtained by the ordinary method, yet, if so situated that an abun-

dance of driers is not obtainable, or if the weather be so foggy and wet that they cannot be properly dried, it will be found of great practical value. On the trip referred to a large number of specimens had been collected, but so bad was the weather from rain and sea fogs that there was great danger of losing them all. Under these circumstances the thought came to me to take advantage of occasional glimpses of sunshine in the following way; each sheet of specimens was placed between two driers, which were spread in a single layer on the floor of an open balcony exposed to the sun. Pieces of board, logs, or bark placed in the sun would of course answer the same purpose. Small stones placed on the corners of the sheets prevented the wind disturbing them, and no pressure was used except the weight of the single drier covering them. An hour of good sunshine served to fully cure most plants. The plan is only applicable to specimens previously somewhat wilted in the press, as the leaves of fresh or insufficiently wilted ones curled up in the absence of pressure.

A collector's work does not cease when his specimens are dried. Plants are subject to the attacks of insects and it is therefore necessary to poison them in some way. The best protection is corrosive sublimate dissolved in alcohol, which is applied lightly to the specimens with a soft brush. It should be done as soon as the plants are dried, care being taken afterwards to leave them spread out until the alcohol has evaporated. The formula I use is:

Corrosive sublimate, . . .	1½ drachms.
Carbolic acid, ...	1½ drachms.
Alcohol, ...	12 ounces.

All the work hitherto done, the collecting, drying and poisoning, is but the preparation for the formation of an herbarium, the specimens in which should be fastened on half sheets of stiff white paper, either by slips of gummed paper or by glue applied to the backs of the specimens themselves. For a few cents a supply of white gummed paper, sufficient to last for years, can be purchased at any printing establishment. A narrow slip of this is cut off, moistened with the tongue, and placed over the part of the plant to be fixed down. The advantage of this process over actually glueing the specimens to the paper is, that in case the plant has to be removed for examination or any other purpose these slips can be easily lifted.

In mounting plants care must be exercised to keep the pile forming each genus and order as nearly level as possible by scattering the specimens over the sheets instead of placing them all exactly in the centre. If the plants are small put some at the top of a sheet, some at the bottom; some at the right side and some on the left, occasionally, in the case of large specimens, reversing them, so as to have the thick stems and roots at the top. In no case should more than one species be put on the same sheet, but, if small, two or more specimens of the same species may be so placed. The sheets for the herbarium should all be exactly the same size, which size is a matter of personal choice. I would, however, advise anyone starting a collection to adopt what is known as the standard size, from its being the one used in the public herbaria of the United States. This size, 16½ x 11½ inches, experience has determined to be the best. The advantage in adopting it lies in the fact that specimens are now generally made with a view to being mounted on such, and when any other is selected, in exchanging, plants not suitable in size are often received. My own sheets, I am sorry to say, are smaller than this, being only 15½ x 10 inches, but my collection was started and had grown to such a size before this standard was adopted that to change it all would have entailed great labor and expense, so I have considered it advisable to continue as I began. The Linnæan herbarium is on paper of the common foolscap type, but this is much too small. The generic and specific name of the plant, the name of the botanist who bestowed it, the habitat, place where collected, date of collection, and name of collector should be placed at the lower right hand corner of each sheet, either written on the sheet itself or on a label attached there, the latter being the usual and better plan. These labels vary according to taste, but the points desirable of observance are clear type, neatness and simplicity. They should not be too large nor yet too small. The late Dr. Gray recommended one 2 x 4 inches. At the top of the label is usually printed the word Herbarium, followed by one's own name, and in sending away a specimen to anyone, there should be written on the label, which must invariably accompany it, in front of this word, the Latin prefix ex or its English equivalent from, to show who was the sender. On receiving a specimen the accompanying label should always be mounted with it. My own practice when given a specimen is to put the donor's label in the customary place

and my own name, of which I keep a supply on gummed paper, at the lower left hand corner. Some attach their labels permanently with paste or by having them printed on gummed paper, but I prefer to merely fasten them lightly at the sides, thus allowing their removal should it ever be necessary to transfer the specimen to another sheet. All the sheets containing plants of the same genus are placed in genus covers, which are full sheets of stout, colored paper, that when doubled measure about a quarter of an inch more in width than the herbarium sheets. The name of the genus is written at the bottom of the genus cover, either in the middle or at the left hand corner, or sets of printed genus labels can be purchased cheaply and one of these pasted on instead. For convenience in reference the names of the contained species may be written in pencil on the genus cover, the reason for using a pencil being that this list is liable to constant change. The various genera are arranged systematically, or for greater convenience alphabetically, under the order to which they belong, and laid flat in large pigeon-hole compartments in a closed cabinet, or else placed in portfolios, which stand upright like books in a bookcase, with the names of the contained orders lettered on the back, or on a tag attached to the portfolio. The herbarium is made complete by a list or catalogue of the plants it contains, by referring to which one can at any moment tell what species are represented.

Having thus described the method of collecting and preserving specimens, let us briefly consider what may be called the second step in the study of botany, viz., excursions; the first, as already stated, being a preparatory reading over of the text book. The object of collecting excursions should be threefold: 1st, to cultivate habits of observation and secure knowledge of habitats and the growing appearances of plants; 2nd, to gather specimens for the herbarium; 3rd, to secure material to work on during a second and more thorough study of structural botany. Each division of the text-book should now be taken up and studied until the subject-matter is firmly fixed in the mind, the requisite material for the complete illustration of each chapter by actual observation being gathered on an excursion prior to commencing it. Even in the winter season excursions should not be entirely abandoned; the true naturalist can always find something to admire and much useful work can be done

in observing the trunks, branches and buds of trees and shrubs. Winter is, however, the time pre-eminently fitted for herbarium work, preserving, mounting, labelling, cataloguing, and, if the necessary appliances are obtainable, laboratory work with the microscope.

The best place to begin collecting is where you live. Be your abode where it may there are surely some plant rarities near it, and the first goal to struggle for is a thorough knowledge of the resources of your own vicinity. When you have made a special study of the plants there you may easily extend your researches. If on your excursions you can have the company of some older botanist so much the better, since from him you can get the names of the plants you gather and the prominent characters on which the naming is founded. I would, however, strongly advise you always to take home one or two unnamed specimens, on which to practice analysis, for it is only by such practice you can ever become so familiar with the orders as to be able to, pretty nearly, locate strange ones at a glance. The accumulation of a mass of unnamed plants is to be avoided, lest a pleasant task become a wearisome labor, inspiring only disgust. Make it a rule to get your specimens named as soon as possible. If you have no one near to whom you can show them, enter into correspondence with some botanist and arrange with him to name the packets you may send him from time to time. You need not fear that your letter asking the favor will be unanswered. The wonderful spirit of fellowship, comradeship if I may call it so, existing among scientists, and evinced by their willingness to lend a helping hand to even the humblest votary, is to me one of the greatest charms in scientific pursuits. But here a word of warning,—never send scraps of plants to be named, for though a good botanist can often identify them, it is unfair to ask him. His time is too valuable to be spent in guessing riddles. Courtesy also demands that in all correspondence the seeker after information should enclose stamps for return postage. In collecting a specimen for yourself, if it be at all rare, always, if possible, gather duplicates to be used in exchange. Under no consideration, however, obliterate a rare species from any locality, and do not even make its whereabouts known to any except true lovers of the science. There are vandals, who, through mere vanity, would not hesitate to destroy the last survivor of a species; nor would they do it only unthinkingly. From the duplicates of the best things around you a large

variety of plants can be got by exchange, and the pleasure and profit in making a collection is largely due to the intercourse thus brought about with those of kindred tastes. Nor is this confined to those in your own country; it is often necessary to have certain specimens from other regions, and you are thus brought into correspondence with scientists in all parts of the world. Let your specimens be well made, and never send away a poor one unless it be of something very rare. A man soon becomes known by his exchanges, and if his specimens are poor he is made the subject of much unpleasant criticism and will in time be avoided by all good collectors. Always preserve the choicest specimen collected for your own herbarium, but after this send the best you have to the first correspondent who asks for it. Keep even a fragment of any species not represented in your collection until you get a better, but of your duplicates destroy any too poor to send away. Do not hoard up duplicates. The man who studies science for science's sake would sooner give away every specimen for nothing than allow them to remain buried like a miser's gold. Make sure that all plants you send out are correctly named, and notify your correspondent whether they are poisoned or not. Never promise a plant unless you actually have it or are positively certain of being able to get it, and keep a catalogue of your duplicates that you may be prepared at all times to answer a brother collector who applies for anything.

The last stage in botanical study, and the one to which all others should be only stepping-stones, is the working out of some of the many unsolved problems of plant life by independent and intelligent observation and experiment. The breadth of the field for exploration by original observation is immense, as comparatively little is known of the laws governing many of the phenomena of plants. For example, little is known of the hosts of some of our parasitic plants, and in some cases it is even disputed whether certain plants, commonly considered such, are parasites at all; though all plants move more or less, we possess scanty knowledge of the nature of this movement in many of them, and still less of its object; we know that cross-fertilization is generally necessary for the production of perfect seed, but in many cases we do not know the particular agents that perform the work; we are aware that cleistogene flowers produce pods far more fruitful than the ordinary blossoms, but we know almost

nothing about the proportion of the kinds, or why a plant should be provided with two sorts of blossoms. There are many other points just as vague, hints as to which may be found in such works as Darwin's "Climbing Plants," Bailey's "Talks Afield," Prentiss' "Mode of Distribution of Plants," and Kerner's "Flowers and their Unbidden Guests." Enough, however, has been said to show that the way to discoveries new to science is open to even the youngest student. There is practically no limit to the papers that could be prepared by any of you for this or similar societies; papers both interesting and useful; papers of value to the scientific world at large; papers that any of our scientific journals would be only too glad to find room for. And here, in conclusion, I would say, that if within his means, and they are very cheap, no student of botany should neglect to take at least one of the periodicals devoted to the science. The "Bulletin of the Torrey Botanical Club," the "Botanical Gazette," and the "American Naturalist," are among the best. The first two are devoted entirely to botany, the last takes up other sciences as well.

If I have trespassed too much on your time, or wearied you with my effort to give an idea of how I think botany can best be studied, I pray you pardon me. Each of you who takes up this beautiful science will, I have no doubt, see modifications that you may think might be advantageously made in the method suggested. Should it be so by all means adopt them; the method employed is of little importance provided only it brings about the great aim and end of the study, which is to learn to observe and compare. Do this honestly and you cannot fail to become lovers of nature, and, being lovers of nature, better and happier men and women, men and women in some degree approaching that illustrious scientist of whom was said;—

"And Nature, the old nurse, took
The child upon her knee,
Saying: 'Here is a story-book
Thy Father has written for thee.'

"'Come, wander with me,' she said,
'Into regions yet untrod;
And read what is still unread
the manuscripts of God.'

"And he wandered away and away
With Nature, the dear old nurse,
Who sang to him night and day
The rhymes of the universe.

"And whenever the way seemed long,
Or his heart began to fail,
She would sing a more wonderful song,
Or tell a more marvellous tale."

EARLY HISTORY OF THE IROQUOIS.

BY DR. DEE.

(A Paper read before the Hamilton Association.)

The Iroquois achieved for themselves a more remarkable civil organization and acquired a higher degree of influence than any other race of Indian lineage excepting those of Mexico and Peru. In the drama of European colonization they stood for nearly two centuries with an unshaken front against the devastations of war, the blighting influence of foreign intercourse, and the still more fatal encroachments of a restless and advancing border population. Under their federal system, the Iroquois flourished in independence and capable of self protection long after the aborigines of New England and Virginia had surrendered their jurisdiction and fallen into the condition of dependent nations, and they now stand forth upon the canvas of Indian history, prominent alike for the wisdom of their civil institutions, their sagacity in the administration of the League, and their courage in its defence. When their power and sovereignty finally passed away, it was through the events of peaceful intercourse gradually leading to this result, rather than conquest or forcible subjugation. They fell under the giant embrace of civilization, victims of the successful warfare of intelligent social life upon the obstacles of nature, and in a struggle which they were fated to witness as passive and silent spectators. There is no connected history of the rise, progress and decline of this Indian league.

At the era of Dutch discovery (1609), the Iroquois were found in possession of the same territories between the Hudson and the Genesee rivers upon which they afterwards continued to reside until near the close of the eighteenth century. At that time the five nations into which they had become subdivided entered into a

league; but its formation was subsequent to their establishment in the territories out of which the State of New York has since been erected.

Their remote origin and their history anterior to the discovery, are both enshrouded in obscurity. Tradition interposes its feeble light to extricate from the confusion which time wrought, some of the leading events which preceded and marked their political organization. It informs us that prior to the Adirondacks, a branch of the Algonquin race, then in possession of the whole country north of that river, the Iroquois were but one nation and few in number. From the Adirondacks they learned the art of husbandry, and while associated with them, became innured to the hardships of the chase and the warpath. After they had multiplied in numbers and improved by experience, they made an attempt to acquire the independent possession of the country they occupied, but having been in the struggle overpowered and vanquished by the Adirondacks, they were compelled to retire from the country to escape extermination. The period of their migration from the north cannot now be ascertained. Tradition informs us that having ascended the St. Lawrence to Lake Ontario and coasted along its eastern shore to the mouth of the Oswego River, they entered through this the central parts of New York. Their first settlements, they believe, were located upon the Seneca River, where for a time they dwelt together. At a subsequent day they divided into bands and spread about to found new villages. One, crossing over to the Mohawk, established itself at Ga-ne-ga-ha-ga, below Utica, and afterwards became the Mohawk nation. For some years the Oneidas and Onondagas were one nation, but one part of it having become established at Ga-no-a-lo-hale, east of the Oneida lake, in time became independent, while the other planting themselves in the Onondaga Valley and on the hills adjacent became a separate nation. In like manner, the Cayugas and Senecas were long united, and resided upon the Seneca River; but one band of them having located themselves upon the east bank of the Cayuga Lake, grew up in time into a distinct nation, while the residue, penetrating into the interior of Western New York, finally settled at the head of Canandaigua Lake and there formed the nucleus of the Seneca nation.

The Onondagas have a legend that they sprang out of the ground on the banks of the Oswego river; and the Senecas have

a similar legend that they sprang from the ground at Nun-da-wa-o at the head of Canandaigua Lake.

These several bands were at first obliged to contend with the various tribes whom they found in possession of the country. After their expulsion, the interests and pursuits of the five nations not only became distinct, but the severance was followed by a gradual alienation, finally resulting in a state of open warfare, which continued for an unknown period.

The project of a league originated with the Onondagas, among whom it was first suggested as a means to enable them more effectually to resist the pressure of contiguous nations. The epoch of its establishment cannot be decisively ascertained, although the circumstances attending its formation are still preserved with great minuteness. These traditions all refer to the northern shore of the Onondaga Lake as the place where the Iroquois chiefs assembled in general congress, to agree upon the terms and principles of the compact by which their future destinies were to be linked together.

It is evident from their traditionary history, which is entitled to considerable credit, that they long occupied the country before their necessities or increase of numbers, made the league a possible or desirable consummation.

In relation to the period of its origin, there are some circumstances connected with their first intercourse with Europeans, tending to show that it had subsisted about a century at the era of Dutch discovery; on the other hand their traditions indicate a period far more remote.

After the formation of the League, the Iroquois rose rapidly into power and influence. It gave them additional strength, a constant increase of numbers, and a firmer establishment, through their more ample means for self protection and foreign conquest. One of the first results of their federal system was a universal spirit of aggression, a thirst for military glory and political aggrandisement, which made the forests of America resound with human conflicts from New England to the Mississippi and from the northern confines of the great lakes to the Tennessee and the hills of Carolina. Unrecorded except by tradition is the narrative of the achievements of this gifted and progressive race, who raised themselves through the vicissitudes of incessant strife to a general and acknowledged supremacy over these boundless territories.

Without considering the terrible and ferocious characteristics of Indian warfare, it must be admitted that the empire which they reared over Indian nations furnishes no slight evidence of their hardihood, courage and sagacity.

With the first consciousness of rising power they turned their long cherished resentment upon the Adirondacks, who had oppressed them in their infancy as a nation, and had expelled them from their country in the first struggle for supremacy. This war raged for a long time with increasing animosity, and was continued for nearly fifty years after the commencement of French occupation, until the ancient Adirondacks were almost totally extirpated. At the era of French discovery (1535) the latter nation appears to have been dispossessed of their original country, and driven down the St. Lawrence as far as Quebec. When Jacques Cartier first ascended this river in 1535 the country about Quebec was in the possession of a people speaking the Algonquin language, doubtless the Adirondacks, while the site of Montreal was occupied by a nation speaking the Huron language, of which the language of the Iroquois is a branch. After the permanent occupation of Canada by the French in 1607 the Adirondacks became their allies, but the protection of the former was insufficient to shield them against the hostile visitation of their hereditary enemy.

A new era commenced with the Iroquois upon the establishment of the Dutch trading post at Orange, now Albany, in 1615. At this time the Iroquois had grown up into a powerful and populous confederacy, had conquered several of the surrounding nations, and were rapidly advancing to a general supremacy in the north-eastern section of the continent.

No Indian race east of the Mississippi had reached such a position of authority or influence or were bound together by such enduring institutions. Firmly established upon the territory of New York and above the danger of displacement from adjacent nations, they had already entered upon that career of conquest which they afterwards prosecuted with such signal success.

Friendly relations were established between the Iroquois and the Dutch, which continued without interruption until the latter surrendered their possessions upon the Hudson to the English, in 1664. During this period a trade sprang up between them in furs, which the Iroquois exchanged for European fabrics, but more especially

for firearms, in the use of which they afterwards became so expert. The English, in turn, cultivated the same relations of friendship which had been commenced with them by the Dutch. A "covenant chain" was established between them, which the Iroquois, with singular fidelity, preserved unbroken, until the independence of the American States terminated the jurisdiction of the British over the country.

It was otherwise, however, with the French. From the first to the last they encountered the uncompromising and inveterate enmity of the League.

As early as 1609, Champlain, having ascended through the lake which now bears his name into Lake George, accompanied by the Adirondacks, fell in with a party of the Mohawks numbering about two hundred, and an engagement ensued between them on the western shore of the lake. This was the first battle between the Iroquois and the Europeans, and the first time the former heard the sound of firearms, by the marvellous power of which they were then easily vanquished.

The French having allied themselves with the Adirondacks and Hurons, given them arms and assistance, and incited them against the Iroquois, a spirit of hatred was aroused against them, which never ceased to burn until the final subjugation of Canada by the British in 1760.

Besides their alliance with their ancient enemies, the French were more inclined to resort to intimidation in their intercourse with the Iroquois than to conciliation and forbearance. In addition to these errors of policy, was the deep and abiding interest taken by the latter in the country about Montreal, which in ancient times had been the home of their fathers, which had been the theatre of their first military success, and which they had long continued to hold by the slender tenure of Indian conquest. As the rival colonies of France and Great Britain were for many years nearly equally balanced, the enmity and power of the Hodenosaunee (which name the Iroquois took after the formation of the League, and which signifies "the people of the long house") were sufficient to turn the scale against the former.

With the possession commenced not only the rapid elevation, but absolute supremacy, of the Iroquois over other Indian nations.

In 1643 they expelled the Neuter nation from the Niagara pen-

insula, and established a permanent settlement at the mouth of that river.

They nearly exterminated, in 1653, the Eries, who occupied the south side of Lake Erie, and from there east to the Genesee, and thus possessed themselves of the whole area of Western New York, and the northern part of Ohio.

About the year 1670, after they had finally completed the dispersion and subjection of the Adirondacks and Hurons, they acquired possession of the whole country between lakes Huron, Erie, and Ontario, and of the north bank of the St. Lawrence to the mouth of the Ottawa river, near Montreal. On the north shore of Lake Ontario they founded several villages, in the nature of colonial towns, to maintain possession of the conquered territory.

They also made constant inroads upon the New England Indians, who, after their partial subjection by the British, were unable to cope with the formidable Iroquois. About the year 1670 they compelled them to break up many of their settlements, and flee for safety and protection to the borders of the British plantations. The name of the Iroquois had then become a terror among Indian nations. "I have been told" (says Colden) "by old men in New England, who remember the time when the Mohawks made war on their Indians, that as soon as a single Mohawk was discovered in their country their Indians raised a cry from hill to hill, a Mohawk! a Mohawk! upon which they fled like sheep before wolves, without attempting to make the least resistance."

In 1680, the Senecas, with six hundred warriors, invaded the country of the Illinois, upon the borders of the Mississippi, while La Salle was among the latter, preparing to descend that river to the sea.

So great was the dread and consternation of the Illinois that they were inclined to abandon their villages and retire from the country to escape the fury of the conquering foe. At various times, both before and after this period, the Iroquois turned their warfare against the Cherokees upon the Tennessee, and the Catawbas in South Carolina, frequently returning from their distant expeditions with numerous captives to grace the narrative of their invasions.

All the intermediate country between the Alleghany and the Tennessee acknowledged their authority, and the latter river became their southern boundary. War parties of the League also made irruptions into the country of the Miamis, others penetrated into the

peninsula of Michigan, and still others were seen upon the distant shore of Lake Superior. The fame of their achievements resounded over the continent.

On the south-east, also, they extended their conquests. As early as 1507, Captain John Smith, the founder of Virginia, encountered a band of the Iroquois, in several canoes, upon the upper part of the Chesapeak bay, then on their way to the territories of the Powhattan confederacy.. The Shawnees, Susquehannocks, Nanticokes, Unamis, Delawares and Minsi, were vanquished one after another and reduced to the condition of dependent nations.

Even the Canarse Indians, in their sea girt home upon Long Island, found no protection against their attacks. In fact, they traversed the whole country from the St. Lawrence to the Tennessee, and from the Atlantic to the Mississippi.

For about a century, from the year 1600 to the year 1700, the Iroquois were involved in an almost uninterrupted warfare. At the close of this period, they had subdued and held in nominal subjection all the principal Indian nations occupying the territories which are now embraced in the States of New York, Delaware, Maryland, New Jersey, Pennsylvania, the northern and western parts of Virginia, Ohio, Kentucky, Northern Tennessee, Illinois, Indiana, Michigan, a portion of the New England states, and the principal part of Ontario. Over these nations the haughty and imperious Iroquois exercised a constant supervision. If any of them became involved in domestic difficulties, a delegation of chiefs went among them and restored tranquility, prescribing at the same time their future conduct. Some of these nations, like the Delawares, they prohibited from going out to war, having denationalized them by taking from them all civil powers. According to the Indian notion they were made women, and were henceforth to confine themselves to pursuits appropriate to the Indian female. Such was the general awe and fear inspired by their warlike achievements, that they dictated to Indian nations their own terms of intercourse, and insisted upon the fulfilment of their requirements.

About the year 1700 the Iroquois reached their culminating point. They had reared a colossal Indian empire, so far as its sway over the aborigines was concerned, and in comparison with any Indian power which had risen north of the Aztec monarchy.

From about the year 1640 to the year 1700 a constant warfare

was maintained between the Iroquois and the French, interrupted occasionally by negotiations and brief intervals of peace. As the former possessed both banks of the St. Lawrence, and the circuits of lakes Erie and Ontario, they intercepted the fur trade, which the French were anxious to maintain with the western nations. Upon this trade much of the prosperity of the new colony depended, for it furnished the chief article of export, and yielded the most profitable returns. But the war parties of the League ranged through these territories so constantly that it was impossible for the French to pass in safety through the lakes, or even up the St. Lawrence above Montreal. Their traders ware captured and led into captivity or to the stake, and the rich furs became the spoil of the victors.

So great was the fear of these sudden attacks that both the traders and the missionaries were obliged to ascend the Ottawa river and then cross over to the Sault Ste Marie, and the shores of Lake Superior.

For these reasons the French were extremely anxious, either to detach the Iroquois from the British and gain their alliance, or to reduce them to subjection by conquest. They tried each successively, and in both were equally defeated. The untractible and politic Iroquois were averse to the former, and too powerful for the latter.

On numerous occasions the ambassadors of the League were at Montreal and Quebec to negotiate for the adjustment of difficulties and the exchange of prisoners, in some of which negotiations the terms of a peace, or at least of an armistice, were agreed upon; but these respites from warfare were of short duration. The ravages committed upon the settlements of the French were so frequent and so devastating as to place the colony in imminent peril. But for the constant supplies from the mother country the French power in Canada would inevitably have been overthrown at different periods prior to 1700.

To retaliate for these frequent inroads and to prevent their recurrence, the country of the Iroquois was often invaded by the French. In 1665, M. Courcelles, governor of Canada, led a strong party into the country of the Mohawks, but the hardships they encountered rendered it necessary for them to return without accomplishing their purpose.

The next year, M. de Tracy, viceroy of New France, with 1200

French and 600 Indians renewed the invasion with better success. He captured Te-a-ton-ta-lo-ga, one of the principal villages of the Mohawks situated at the mouth of the Scholarie creek. Again, in 1684, M. De La Barre, then governor of Canada, entered the country of the Onondagas with about 1800 men. Having reached Hungry bay, a conference was held with a delegation of Iroquois chiefs, headed by Garangula, the celebrated Onondaga orator. After they had exchanged recriminations and mutual defiance, a species of armistice was finally agreed upon, and thus the expedition ended. In 1687, M. De Nouville, with 2000 French and 600 Indians, landed at the head of Irondequoit bay, within a few miles of the principal villages of the Senecas. After repulsing a body of 500 Senecas, he destroyed their cornfields and villages. He then took formal possession of the country in the name of France, after which the French army retired.

To retaliate for this invasion, the Iroquois, in the fall of the same year, attacked Chambly on the Sorel river. Unable to capture the fort, they ravaged the settlements adjacent and carried off a number of captives. About the same time a party of 800 attacked Frontenac, on the site of Kingston, and destroyed the establishments of the French outside the fortifications. In July of the ensuing year a band of 1200 warriors made a descent upon the island of Montreal. The first intimation the French had of impending danger was the fearful onset of the Iroquois. All who were without the fortifications were slain or taken prisoners. Their houses were burned and the whole island covered with desolation. About a thousand of the French, according to some writers, perished in this invasion or were carried into captivity. Overwhelmed by this sudden disaster, the French destroyed their forts at Niagara and Frontenac, and thus yielded the whole country west of Montreal to the possession of the Iroquois. In the winter of 1692, Count Frontenac sent a detachment of 600 French and Indians against the Mohawks. They surprised and captured three villages, took three hundred prisoners, and returned with the loss of thirty men. Again, in 1696, Count Frontenac conducted an expedition in person against the Onondagas and Oneidas with a thousand French and as many Indians. He landed at the mouth of the Oswego river. From thence he marched to the salt springs, near the site of Syracuse, and up the Onondaga valley to the principal village of the Onon-

dagas. He found it, as usual, deserted, although fortified with palisades and supplied with stores of corn. The village was then burned, and the growing corn, which was found in great abundance in the fields adjacent, was cut down with the sabre. A detachment was then sent against the Oneidas under M. De Vaudreuil, by whom their fields were laid waste, after which the French army returned to Canada. This was the last French invasion of the territories of the Iroquois. A general peace soon followed, and continued without interruption until the war of 1755.

From the commencement of English intercourse with the Iroquois, down to the independence of the American States, the covenant of friendship between them remained unbroken. The importance of conciliating this powerful confederacy was fully appreciated by the colonial authorities. Unwearied pains were taken by them to secure and retain their favor and confidence. Each successive governor announced his arrival to the Sachems of the League, and invited them to meet him in council at an early day to renew the "covenant chain." Each new alliance was cemented by presents and mutual professions of kindness. An intercourse sprang up between them in matters of trade, and in public affairs, which continued to increase until councils with the Iroquois became nearly as frequent as the sessions of the provincial legislature.

The Tuscaroras, upon their expulsion from North Carolina, in 1712, turned to the north, and sought the protection of the Ho-de-no-sau-nee, on the ground of common origin. That they were originally descended from the same stock is sufficiently evinced by their language. They were admitted into the League as the sixth nation, and were ever afterwards regarded as a constituent member of the confederacy, although never admitted to a full equality. After this event the Iroquois were known under the name of the "Six Nations."

A portion of the Oneida territory was assigned to them, lying upon the Unadilla river on the east and the Chenango on the west. The Oneidas, as the original owners of this tract, were made a party, with the Tuscaroras, to the treaty of Fort Herkimer, in 1785, by which it was ceded to the State. The Tuscaroras were partially scattered among the other nations, although they continued to preserve their nationality. At a subsequent period, the Senecas gave them a tract of land on the Niagara river, where they afterwards

removed, and their descendents still occupy a reserved portion of this land near Lewiston.

It is difficult to form a correct estimate of the number of the Iroquois. La Hontan placed them at 70,000. The estimate made by Col. Coursey, at Albany, in 1677, gave them about 15,000. Bancroft estimates them, including the Tuscaroras, at 17,000. Sir William Johnson, in 1763, estimates them at about 10,000. In 1750, from various causes, they had become diminished about one half. A prominent cause of the decline of the Iroquois was the large number induced, at various times, to emigrate to the banks of the St. Lawrence under the influence of the Jesuit missionaries, and who, by placing themselves under French protection, became the enemies of their kindred and of the League.

The most successful colony of this description was that established by the Abbe Piequet on the site of Ogdensburg in 1749. The first year he constructed a fort of palisades and commenced with six Iroquois families; in the second year the number of families had increased to eighty-seven, and in the third to 396. Such was the influx from the territories of the League to the new missionary establishment that, in 1754, the number of inhabitants in their three villages, at and near the site of Ogdensburg, was estimated by the French at 3,000. This band was afterwards known as the "Praying Indians," from their conversion to Christianity.

The period of their greatest prosperity, and of their highest numbers, was evidently about the year 1650. At that time, their total population may safely be placed at 25,000. A higher estimate would be better supported by such data as the case affords than a lesser one, although the impression of later writers seems to be to the contrary.

From the close of the French war until the commencement of the American Revolution was a time of general peace. The Revolution placed the Six Nations in a position of great difficulty, as the Continental congress negotiated to secure their neutrality and the British their assistance. Their sympathies were strongly enlisted in favor of their ancient ally, with whom, for upwards of a century, they had maintained an unbroken friendship. They were thoroughly British in sentiment.

When the question of declaring for the British came before the council of sachems and chiefs, the Oneidas alone resisted the meas-

ure as unwise and inexpedient. Their opposition defeated the war measure as an act of the League. All the sachems of the League, of whom there were fifty, and in whom originally was vested the entire civil power, were required to be of "one mind" to give efficacy to their legislation. Unanimity was a fundimental law. The idea of majorities and minorities was unknown to the Iroquois.

The number of sachems was so unchangeable that upon the admission of the Tuscaroras as the sixth nation of the League, the council of sachems was unwilling to increase the number and the Tuscaroras never had a sachem who was admitted to all the privileges of a sachem of the Confederacy. The celebrated Joseph Brant was but a chief—the office of sachem being surrounded by impassable barriers against those who were without the immediate family of the sachem and tribe in which the title was hereditary.

At the close of the American Revolution, although the Oneidas had remained neutral, they fared little, if any, better than the other five nations.

TELEGRAPHIC COMMUNICATION WITH A MOVING TRAIN.

BY GEORGE BLACK, ESQ., OF THE G. N. W. TELEGRAPH CO.

This subject has attracted considerable attention lately, arising from the announcement that Edison, the wizard of Menlo Park, had solved this somewhat wonderful problem. This is not a new achievement, though accomplished by new methods. I purpose to briefly review the different methods in order, and in doing so will have to refer to the writer's own efforts in this direction.

Keeping up communication with a moving train is accomplished in two ways,—first, by the train running in contact with an electric conductor; and, secondly, by *inductive* influence from conductors near the train.

The first method is the oldest. The earliest record that I have refers to a couple of patents issued in England nearly thirty years ago. The next was the joint production of Mr. Givin, of this city, and myself, in 1874. We experimented and improved our original idea, filed a caveat in Canada, and applied for an American patent in 1876. Naturally thinking we were the pioneers in this department, we claimed the complete device as broadly as possible, but were confronted with the English patents referred to. A visit to Washington, in November, 1876, enabled me to examine copies of these patents and so modify our claims as not to conflict. Fortunately the patents had expired, so that we could use what we could not claim. The examiner, however, was absent from duty, and his assistant did not wish to act in his absence, so that the changes could not then be made, and time elapsing, the patent was declared abandoned through no fault of ours.

The device was exhibited to W. K. Muir, Esq., then General Manager of the Canada Southern Railway Co., at St. Thomas, who was greatly interested in the arrangement, and offered facilities for an actual test on that road. The principal idea was to suspend a

wire close to the railway track, in such a manner that a projecting arm extending above and out from the side of a locomotive or car carrying a flanged roller would make metallic contact with the suspended wire, thence through the signalling instrument and battery to the running gear of the locomotive or car, thus completing its circuit through the rails. The wire was "open" or "insulated" at the ends of each blocked section, so that a train running in contact with this wire would receive a signal if another train intruded upon its blocked section, or if the station at either end closed the circuit. The signals would then go off automatically, meaning "danger;" both trains would receive the signal, and by a prearranged code could arrange what each should do. Open switches or drawbridges signalled "danger" to all approaching trains. Trackmen could also signal danger by simply attaching a wire to the rail and throwing the other end over the signal wire. No operator was required, as only simple danger and caution signals need be used, which the engine drivers could easily manage. In working out the details various obstacles presented themselves, but were overcome. One was the probability of trains using batteries with similar poles to the line. In such an event, two trains might collide without a warning through depending upon this signal. Again, batteries might be too weak to operate the signals at the critical moment, though apparently in good order. We succeeded in devising instruments that would respond, regardless of the polarity of batteries, and which indicated if batteries were defective.

About this time, Sir David Salomons, of England, patented his arrangement, which was arranged for a double-track road, with trains running only in one direction on each line of rail. He employed a third light rail between the other two, and a wire brush under the locomotive kept instruments in contract with the extra rail, completing his circuit through the outer rails. A clockwork mechanism sent a current to line for a certain number of seconds, then placed the instruments in position to receive a signal for the same length of time. This was a more expensive arrangement than the one just described, and, in our opinion, not so well adapted for the purpose. Several other similar devices were subsequently patented, but nothing of real merit has come to my notice.

With the advent of the telephone and transmitter, and especially the magneto signal, it occurred to us that our signal could be modi-

fied to use a telephone instead of a telegraph instrument, and thus enable trainmen and railway officials to speak while in motion. The signal would go off in the usual manner, and then verbal arrangements could be made. This identical arrangement was patented about two years ago by a couple of men connected with the Michigan Central Railway. Our arrangements were as fully adopted as if they had been supplied with our drawings and specifications. This is not surprising, as several parties connected with the C. S. railway were fully aware of the mechanical details, and the telephone added got over all the electrical difficulties; but it is not remarkable for several inventors to bring out the same device simultaneously, or reinvent what has already been brought out. A certain want is felt; several parties endeavor to supply the want, and at last two produce the same contrivance.

For perfect protection of trains from collision, I cannot imagine a better arrangement. A block section of rail of one or two miles, according to the traffic, absolutely secured for a train. Should a second train trespass upon this section, from any cause whatever, both trains would receive a danger signal. A train started in error could be arrested and brought back. We also used a device whereby a person at a station could *feel* if the section was clear without signalling the train.

THE INDUCTION METHODS.

We now turn to the second method of signalling, namely by "induction." It is difficult to describe induction briefly, but it may be understood by the attraction a magnet has for iron or steel in proximity to it. The magnet *induces* magnetism in the iron or steel, and if they are free to move they will be attracted towards each other. A wire with an electric current flowing through it, *induces* an electric current in another wire in its vicinity.

You are all familiar with the foreign sounds heard in telephones. These are chiefly caused by induction. A telegraph operator listening at a telephone, can easily read dispatches transmitted over neighboring wires. Taking advantage of these principles, Lucius S. Phelps, of New York, perfected his system and made it public early in 1885. He fitted up twelve miles of the New York and New Haven railroad, between Harlem River and New Rochelle Junction, and its operation was pronounced to be all that Phelps claimed for

it, telegrams passing to and from the moving train as rapidly as between fixed stations. The system may be briefly described as follows:—A copper wire is enclosed in a grooved board or trench between the rails; this wire forms the conductor, and is attached to the instruments at the depots. A coil of wires enclosed in a tube passes up over a car and down underneath, immediately over the wire between the rails and about seven inches from it. This coil is attached to the instruments and battery in the car, in a similar manner to that at the station. The act of transmitting actuates a vibrator or "buzzer," which induces a rapid humming sound in the receiving instrument, at the stations, a telephone, and in the train, a specially devised telegraph receiver. This receiver though delicate enough to receive the hum of the vibrator through an air space, is not influenced by the motion of the train. This instrument works a telegraph sounder in the usual manner. Phelps has also adopted an overhead wire instead of that between the rails, and has secured it as a telephone signal for speaking instead of telegraphing.

EDISON'S SYSTEM.

We now come to Edison's system, called by some the "air telegraph." It, like that just described, depends upon the influence one conductor has upon another.

Mr. Wm. Wiley Smith, of Tennessee, observing the influence a telegraph wire had upon a telephone wire, secured a patent which forms the basis of this system. Mr. E. T. Gilliland and Mr. Edison afterwards took hold of it and brought the system to its present state of perfection. The instruments consist of an induction coil, with a vibrator or buzzer actuated by four or five cells of battery, a Morse transmitting key, and a pair of receiving telephones, made light and fitted upon the operator's ears, so as to exclude all external sounds and enable him to hear to the best advantage. One leading wire is attached to the the metalic roof of the car, and several car roofs are connected together, presenting a large metallic surface to the inductive influence of the telegraph wires. The other wire connects with the rails through the wheels and axles of the car. The station instruments are similar to those in the car, but are attached to three or more telegraph wires by means of *condensers*, and also with the earth or rail to complete the circuit. The space between the wires and the train is *jumped* over by the signals in some manner, so that

a signal sent along the wires influences the receiving instruments on the train and vice versa. This system has also been subjected to very severe practical tests, and its operation pronounced most satisfactory.

By employing condensers, Edison makes use of the ordinary telegraph wires, which carry their usual traffic while his induction signals are passing over the same wires. By using several wires he presents a larger metallic surface to the inductive influence of the train, and thereby secures greater success. He noticed that while the ordinary Morse signals could be heard through a certain distance in a neighboring wire, that very rapid signals or vibrations could be heard still further, so that the buzz of the induction coil passes through the air quite a distance between the conducting wires and and the railway train, the comparatively slower Morse signals failing to reach that distance. He claims that these rapid pulsations actually are conducted through the air—that air, though an insulator for ordinary electric signals, is a conductor for signals of very short duration. Others contend that the action of the condenser or Leyden jar is a sufficient explanation—namely, an inductive influence passing between two metallic surfaces from a charged to an uncharged surface, with an insulating substance (or air space) between, which may be a sheet of mica or paraffined paper in the case of the condenser, or an air space, or Edison's train.

The difference between the Phelps and Edison systems is slight, the former costing more to install; Edison using the wires already in use, while Phelps requires a special wire. Both use telephone receivers and buzzers controlled by Morse keys as transmitters. Phelps' system was publicly tested a year before Edison's, but Smith's patent may antedate Phelps'.

I pointed out the use of condensers in 1878 for the purpose of simultaneously telephoning over telegraph wires, and also for bridging around telegraph instruments to preserve an unbroken path for this purpose, as Edison now uses them; but Varley, of England, used the condenser for telegraph purposes at a still earlier date. The buzz telegraph, also, was in use between Toronto and Hamilton in 1877 and 1878, by Dr. Rosebrugh, of Toronto. The use of the rails and running gear of the train to complete the circuit was known and used at a much earlier date, so that the only original part in these two systems is in observing and taking advantage of the

great distance over which induced signals could be transmitted. Mr. W. L. Silvey, of Cincinnati, claims to have worked and patented this idea in 1883, having telegraphed between wires 200 feet apa[illegible]

As to the value of these systems, the first described, keeping contact with a wire simply for train protection, is the best for railway purposes. It does not require an operator on each train, and each train is automatically signalled if there is danger. The Phelps and Edison systems are, no doubt, the best for commercial purposes, enabling passengers to send and receive their telegrams while *en route* as easily as at home.

THE PUBLIC TREATMENT OF CRIME AND CRIMINALS.

BY WILLIAM MILNE, ESQ.

(*A Paper read before the Hamilton Association, 7th April, 1887.*)

"A general definition is that crime, in its legal, as opposed to its moral or ethical sense, is an act done in violation of those duties for the breach of which the law has provided that the offender, in addition to repairing, if it be possible, the injury done to the individual, shall make satisfaction to the community. A private wrong, or civil injury, on the other hand, is an infringement on the rights of an individual merely, for which compensation to him is held, in law, to be a complete atonement." (Steven's Com IV, P. 77.)

From this definition, which is that generally adopted by lawyers, it is obvious that legal criminality is not a permanent characteristic attaching to an action, but one fixed upon it arbitrarily, from considerations of expediency. Without changing its moral character, the same action may be, and very often is, a crime in one country or in one generation, and no crime in another country or a succeeding generation. Malice or evil intention, however, is in all cases, essential to the character of crime, for though there may be an immoral act which it is inexpedient to punish as a crime, it never can be expedient to punish as a crime what is not an immoral act.

Anterior to all regulations for the punishment or suppression of wrongs by an exercise of public authority, there was, as is generally agreed, a time when injuries found redress only through the resentment and retaliation of the injured party or his kin. The progress of society from this rude sort of vindicative justice, toward approved systems of criminal law, presents some suggestive examples of the devious paths through which communities were led to the recognition of truths which appear to us elementary.

In order to secure an accurate conception of the early growth of the legal system, it may be well to premise that the criminal law, which, with a substantial uniformity of cardinal ideas, now prevails

in all civilized states, is well defined as "that branch of juridical law treating of those wrongs which the government notices as injurious to the public, and punishes by what is called a criminal proceeding in its own name."

If it is desired to ascertain the point at which public authority began to supercede private revenge in the punishment of wrong-doers, it is worthy of observation that instances abound of tribes among whom the only offences punishable by public authority are treason and its cognates, such as cowardice and desertion. Indeed, we can scarcely imagine a phase of society but treason, if committed, would be so punished.

The institution of government for military purposes involved the immediate rise of those branches of criminal jurisprudence which have for their objects respectively, to preserve the government and to secure the efficient discharge of its military functions. It may be said with perfect accuracy, that every criminal law has for its object either to preserve the existence of government or to secure the adequate discharge of its functions. Many acts, involving no moral delinquency, are declared crimes, others, of an immoral nature, are not. There are many of the American Indian tribes among whom the exercise of public authority for the protection of person or property is unknown, who yet, in times of war, organize a temporary government by the election of a military chieftain, whose powers, within their limited sphere, are absolute, and are rigorously exercised in the punishment of cowardice, desertion and military insubordination. This is the extent of their criminal law. It is, therefore, in this class of offences that criminal law must have had an early but meager origin under the military confederations to which the most primitive societies intuitively resort. It might be supposed that communities thus familiarized with the punishment of crime by public authority would rapidly develop a criminal jurisprudence, by the simple and direct process of adding, from time to time, new crimes to their catalogue of offences. But it will be observed that in none of these cases does the concerted action against the offenders proceed upon the notion that it is the function of government to protect its citizens against crimes. It is induced in each case simply by a widely prevailing feeling of personal resentment or fear. The tardy growth of criminal law is to be ascribed to their ignorance of what the functions of government were.

The sporadic and personally revengeful punishments throw little if any light on the development of the law of crimes.

The most important, interesting and difficult in the history of criminal jurisprudence, by which society abandoned its original assumption that acts of violence or fraud between individuals are purely private grievances to be redressed by private remedies, and charged government with the function of protecting its citizens from such wrongs, through proceedings conducted and punishment administered in its own name.

The secret of that movement and the influence by which its progress was shaped can be gathered only from study of the antecedent practice of private retaliation. For both by its weakness and its strength the system exercised a controlling influence over the development of the new. It was at once the chief inducement to the change and the chief obstacle to its accomplishment. In so far as public authority assumes by penal remedies to protect individuals from the criminal acts of one another, it was first called into existence, not by ordinary wrong-doing, but by an effort to restrain the abuses and excesses of retaliation as a remedial system. Its subseqent extension, so as to displace the avenger and assume the punishment of wrong-doers generally, was an after thought. Thus the movement had its origin in a desire rather to mitigate the punishments than to insure or increase them. The tenacity with which the avenger adhered to his right of redress, and the difficulty of controling him in the exercise of this right, are further attested by the character of the expedients by which it was sought to fortify measures aiming at his restraint.

When, by the demoralizing prevalence of feuds, society was first awakened to the necessity for taking measures to investigate or suppress them, it is undoubtedly true that even if there had been a general willingness to abandon private revenge in favor of public prosecutions, the men of that period were incapable of either conceiving or executing so comprehensive a remedial scheme.

Thus Moses, though the Israelites were, in his day, quite familiar with the public prosecution of crimes, some of which were entirely withdrawn from the domain of private retaliation, found it still necessary to recognize the blood-avenger's right personally to pursue and slay without form of law the willful murderer: "the avenger of blood shall slay the murderer; when he meeteth him he shall slay him."

But, as under the most primitive codes of honor, so among the early Israelites the principle of blood avengement was so malignant as to require retaliation even against the involuntary man-slayer. The instrument of death, whither man or beast, the avenger was in honor equally bound to destroy, without reference to the malicious or accidental character of the homicidal act.

The flagrant injustice of punishing with death the involuntary acts void of moral guilt, was in the Mosaic age probably as manifest to a large number of the Israelites as to Moses himself; yet so deeply rooted was the practice in the traditions of the people, that the great law-giver dismissed as impractable the idea of abolishing it. His scheme for ameliorating the hardships of both the willful murderer and the involuntary homicide by the designation of cities of refuge within the limits or vicinity of which they could find protection from the avenger, the former until he should have opportunity to prove his innocence, and the latter until the occurrence of some event with which his final discharge from liability could be plausibly linked, bears witness upon its face to the difficulty he anticipated in its enforcement.

That his plan might be fortified by religious reverence and sacred associations, he provided for the selection of the cities of refuge from among the cities of the Levites, and dated the freedom of the excusable homicide from the death of the high priest. "The law essayed its earliest exercises in reconcilement." At a time when murder was merely a private wrong, of which government took no cognizance, and the right of retaliation was thought too sacred for government to deny, the public interested itself only by discouraging revenge through the agency of public opinion, and by inviting and recommending pecuniary compositions with wrong-doers at rates which were usually fixed by law or custom, without, however, assuming to coerce either party to a settlement. Later, the law, in order to avert feuds, declared it a crime to refuse to offer or accept pecuniary compensation. Government, while it had not yet undertaken to prevent or punish ordinary murders or larcenies, had been driven to apply itself to the suppression of feuds; and the withholding or rejecting of composition money, tending to defeat its efficient discharge of that function, had the properties of a true crime, and was promptly recognized and punished as such.

Sir Henry Main traces the widely discrepant penalties under

consideration to a tendency, on the part of early administration of justice, to "similate" the probable acts of persons engaged in a private quarrel. "It is curious to observe," he says, "how completely the men of primitive times were persuaded that the impulses of the injured persons were the proper measure of the vengeance he was entitled to exact, and how literally they imitated the probable rise and fall of his passions in fixing the scale of punishment."

While King Alfred, anticipating the age in which he lived, and probably inspired by the example of Moses, denounced against wilful murders the punishment of death, his law was a dead letter, and remained unexecuted during his own reign and those of several of his successors. Then people preferred to redress their own grievances.

Mohamed, in the Koran, adheres to the law of personal retaliation for bloodshed. He councils forgiveness or compositions on the part of the aggrieved persons.

The process of enforcing these and other limitations upon parties at feud, resulted in developing and illustrating the idea of regulating by criminal laws the conduct of citizens toward one another, and thereby paved the way for the subsequent more general application of the same principles.

There was another class of measures which tended to the same end, by serving especially to mature a judicial machinery, and to familiarize the people with its operation. Next to its total abolition, the most effective remedy for evils of blood-avengements was to forbid its exercise until the accused person should have had an opportunity to submit the question of his guilt to investigation in court. For the time employed in the trial, and the protection afforded by it, a reasonable compensation, called "Freedom" by the Germans, was usually paid by the accused to the judge or king.

It is not difficult to understand how impositions of this sort, exacted at first for time consumed and protection afforded by the state for the accused, might readily adopt themselves to, and even assist in the development of criminal law, by gradually assuming the character of fines for the offences charged. Another line of progress of importance in some societies, consisted in a gradual enlargement of the classes of offences in which the king or state was supposed to have such an immediate interest as to justify a claim to a part of the composition money. Thus an injury to the person or property of

any of the king's household, retainers, officers, or agents, was early construed to be an injury to himself. So, likewise, with wrongs committed against a guest of the king, or persons of a household by whom he was entertained; or violence committed in the immediate presence, or in his castle, and afterward in the city or province where he was residing, or under other circumstances, which, within the slowly expanding ideas of the subject, could be construed as involving an offence against the king's person and dignity. It is an observation of an historical writer, that in every branch of knowledge, example has preceded precept. So it was in the early history of criminal law. To a very great extent, it was practised before the theory was conceived, or its first principles formulated. It was only after its judicial machinery had been developed by such random or diverse considerations, and for such special purposes as those heretofore enumerated.

We have a system of penal laws for the protection of individual rights and the conservation of society by punishing prescribed offences; and the general notion is, that this system is coeval with government, and was originally instituted essentially in the present form and for its present purpose. This, however, is a great mistake. Government arose in tribal antagonisms, was a militant organization against external foes, and recognized no crimes except such as treason, cowardice, desertion, or such acts as injured itself. There was at first not the slightest idea of protecting citizens against crime by punishing private offences. Government had no internal police or judicial processes, and the rule of punishment was that of private personal vengeance. Society, as a consequence, was torn by internal feuds and bloody violence, and was ruled by the spirit of retaliation and revenge. We have had a glimpse of the extent and atrocity and tenacity of this system, and how criminal laws arose out of the necessity of regulating the excesses of malignant blood-avengement.

The criminal history of society has a grave significance as interpreting the spirit by which crime is still treated. For, although government has abolished retaliation, and itself assumes the prerogative of punishing crime, it has not outgrown the vindictive passions of the barbarous past. In the prison treatment of criminals we still see survivals of the old savage feeling of vengeance that has not yet died out of the community. By the abolition of torture we have conceded that criminals have rights, but no conception of the cor-

relative right of the criminal and of society is allowed to determine the kind and degree of punishment.

What but the spirit of vengeance is it in society which prevents the convict from having all the sympathy of treatment and chance of self-help and amendment that are consistent with his detention in prison as a measure of public security.

In the course of social progress the vengeful feelings have been more and more constrained by the growth of humane sentiments, and their modes of exercise have been transformed, but there is plenty of room for further salutary change.

If the general notion of society was mistaken as to the origin and development of criminal law, there is still much misconception of its operation in our own time. I think it will be conceded that many hold an opinion that the administration of our criminal law is as nearly perfect as now practised as we can make it. The general understanding being that punishment represses crime; that it also affords considerable protection against wrong-doers, and to some extent reforms the criminal. The fear of punishment may to some extent deter those who never have been convicted, but the dread of punishment does not deter the criminal; this is clearly seen on looking at the number of recommitals shown by statistics. The only protection I know of is, while the criminals are confined within prison walls they are then prevented from preying upon society. We may feel certain when set at liberty they will follow their former vocation. This is not a mere matter of choice with them; they have no other means of living. It is a mistake to say they can work, for no one will employ them; we have branded the mark "*Felon*" upon them; society is therefore afraid of them; decent people will not associate with them nor allow them into their houses; they are looked upon as outcasts; they are in many ways made to feel they are such; force of circumstances compel them to return to their former haunts and modes of life.

We need not be surprised to find that our system does not reform; it was not intended nor adopted to that end. That it does not reform, I may be allowed to refer to penitentiary and prison reports. In doing so, I do not intend to present this subject in its statistical phase, but only to refer to certain items (only having the report for the year 1874 for Ontario by me, I shall use it). On page 69 we find there was committed to our common gaols, for the first

time 6348, for the second time 1371, for the third time and oftener 1192; the total number committed for that year was 9488; but to this number should be added 58 committed to the reformatory at Penetanguishene.

The avowed object of this institution now, is for reclaiming boys and young lads who are either orphans or children of dissipated, good-for-nothing parents. When, for some petty offence, a number of those are sent to this institution, for periods varying from two to five years, no doubt, the intention being to provide them with a comfortable home, instruct them in some useful trade, and the several branches of a secular education, and to train them to habits of industry and orderly conduct, also to impart sound moral and religious instruction, so that when their several sentences expired they might be returned to society without the "felon's" mark upon them, they being able and willing to work for their living, fitted in every way to become useful and respected members of the community. How well this institution performs the functions of a reformatory may be learned from the report, page 58: "Carrying out the ideas suggested by the act to which it owes its existence, the institution is veritably a prison for young offenders, rather than a reformatory, as at present understood in the chain or system for the reclamation of criminals. The appearance of the building is that of a prison, the interior structure is that of a prison, the discipline is that of a prison, the dress is that of convicts. The elementary principle of reformatory agency is wanting—classification; there are no means to attain that end, and the infant in years and in crime is exposed to the contaminating influence of the youth hardened in iniquity. These matters have been constantly mentioned in my reports, but have not hitherto met the consideration they deserve." In his concluding remarks the inspector says: "Of the means necesary to procure so desirable an end as is indicated in the foregoing paragraphs, little more need be said than that they would require a complete revolution of the present system, and that the Provincial reformatory should become a reformatory in fact, instead of being a prison for young offenders.

"I am satisfied that the excessive increase in the number of prisoners committed to our gaols during the past year is due, first, to a very marked increase in the sale and consumption of intoxicating liquors. Second, to the reception in our midst of a portion of

the criminal and vicious of other countries, attributable to some extent to defective *surveillance* over emigrants arriving in the Province. Third, to depression in trade and the labor market in the United States, which has resulted in the transfer of not a few of their sharpers and criminals to our soil." The report attributes the large increase in the sale and consumption of intoxicating liquors as being the chief cause of the increased number of commitments.

That intemperance is a great evil none will deny, but I am not aware that drunkenness is a greater evil than gluttony. I dissent from the belief, that intemperance, either in meats or drinks, is the chief cause of crime. Although prohibition is claimed by many as the only remedy for this evil, and a number have tried to "boom" it, yet the community does not seem willing to be dragooned into virtue; neither does it always seem clear, the motive is altogether altruistic. Too often the promoters of prohibition lack that "*suaviter in modo*," so necessary in the advocacy for measures of social reform, and they exhibit such "*fortiter in re*" when inforcing their measures where they have power, that repels the masses from accepting the measure with that degree of unanimity requisite to insure beneficent administration. It is commonly supposed that, because nearly all criminals are drunkards, therefore drunkenness is the chief cause of crime. This is a confusion of cause with effect. Crime and drunkenness go together because they are concurrent effects of the same organization. Alcoholic stimulation merely removes prudence and brings out true character without restraint or disguise. The brute who beats his wife when drunk would do so when sober if he dared or could; but what we call the sober state is with him a condition of cowardly depression and feebleness due to the reaction of intoxication. If a number of quarrelsome men assemble and drink together they finish with fighting. If a similar number of kindly disposed men drink together they overflow with generosity, profuse friendliness, and finally become absurdly affectionate. The citizen who would have subscribed a dollar to a charity before dinner will give his name for five after the "toast of the evening."

Temperance agitators fill our ears continually with wails as to how the "demon alcohol is yearly dragging down to dishonorable graves hundreds of thousands of the brightest and fairest of our land." This is supreme nonsense. With few exceptions every one who goes to perdition by the alcohol route would reach that destina-

tion by some other highway, if the alcohol line were not running. Prohibition and criminal reclamation should go hand in hand.

Crime is often imitated; it is also transmitted. Are we not constrained to accept the evidence adduced by such men as De Candolle, Ribot and Francis Galton? Must we not acknowledge that hereditary crime is an important factor, and ought to be taken cognizance of? But the mode of administering our criminal law imposes no restraint on the multiplying of this class. Can there be any doubt that, under our system, they will go on multiplying until an effective reformatory scheme is devised and put into operation?

There is another cause very prolific in propagating crime; that is, contact and association. An advocate of prison reform states that "Vice is more infectious than disease. Many maladies of the body are not communicated by contact, but there is no vice which affects the mind which is not imparted by constant association; and it would be more reasonable to put a man in a pest house to cure a headache, than to confine a young offender in a penitentiary organized on the ordinary plan." Our prison statistics show that prisoners are of all ages, from the mere child to the very aged; many committed for trifling offences, and very inadequate means provided for classification; but mere classification can have little effect in the way of reformation. Our system makes our gaols common schools for crime, and our penitentiary the graduating seminary.

But the question has often recurred to me who the others were? 1st. We have a small number of villainous, irreclaimable knaves, because their grandfathers and their fathers were criminals; they inheriting strong passions, but having feeble powers of resistance follow in the footsteps of their fathers. 2nd. There are numbers who, for the vices and cruelty of unnatural parents, have been compelled to flee from a loveless home to wander uncared for, they know not where. 3rd. If we ask for parents, from many we will be compelled to bear away a heart pained with the oft repeated response, "My parents died before I can remember," or, "when I was a child." Alas! How sure are they to be snared by the wiles of those already schooled in the acts of vice. 4th. Many there are who have received no instruction in morals. None of the "line upon line" process, so needful to habits of confirmed virtue, has been meeted out to them. 5th. Next come the crowds born to, and reared in poverty, who, from natural inability, never succeed in husbanding a

supply to meet the demands of a "rainy day." To such the dark day is sure to come. They can get no work; they must starve, or do the next worse thing, and they do it.

We then apprehend and imprison them as a punishment. Often we do far more, we inflict the severest punishment in our power; for very trifling offences we brand them "*Felons*" and thereby cast them out; we will not then allow them to live *among* us. But they will live *upon* us as parasites.

It is something solemn and touching to stand by the death-bed of a near and dear relative or friend and receive a request to convey the farewell message of love and esteem, or be intrusted with some article as a token of affection to an absent one. But I have been present frequently at scenes which I think were fully as touching. It has been often my duty to take charge of the convicts sent from here to the penitentiary, but before returning I usually had the opportunity of seeing and bidding good-bye to the new convicts, and receiving from many some message that had been forgotten to be said when parting; sometimes articles of clothing to be taken back, or other things as mementoes to friends. These acts clearly showed me they were not destitute of feeling. But before these parting interviews took place they had undergone a "metamorphosis." When last seen they were common prisoners, now they had donned the parti-colored uniforms of the establishment stamped with P. P., also their hair had been cut in the P. P. regulation fashion. Now they were "*Felon Convicts*," and seemed to feel they were doomed to be such for the remainder of their lives. I have seen some of them so overcome with emotion that they could not utter a word until they were allowed to retire and time given to regain their composure. Afflictive as are these facts they are but the beginning of the unfortunate record that constitutes the warp and woof in the lives of these unhappy criminals. That heart that bleeds not with pity at these fearful exposures and trials has never been attuned to pity. What then, it may be asked with the profoundest significance, should be the highest intent, duty or design in the inauguration of a practical system of economic action for the unfortunate criminal? Is not the grand *desideratum*, that which overshadows all else, their reformation, personal, social, and moral? To supplant their vices with virtues. What is their punishment as an end compared with this, save as it facilitates the result sought? Should not every system adopted, every department

created, every officer chosen, every duty imposed, every discipline administered, every instruction imparted, aim, as a final consideration, at the reclamation of the criminal? A late writer on this subject states: "Of all the questions by which modern society can be agitated, there is none more momentous than that of the public treatment of crime and criminals. No man can be found so stupid as to maintain that the present practice is satisfactory, and but few have undertaken to indicate anything that is really much better."

About twenty years ago, and for a period of about ten years, it was my lot to be brought into immediate and daily contact with a considerable number of all classes of criminals. I was thus led to give attention to the administration of justice. I do not assume to have made discoveries of any new facts or anything relating to criminals that has not had publicity before now; but I do think they have not obtained the attention and consideration the subject demands. After taking charge of the gaol here, I soon discovered that nearly all prisoners looked upon society as their enemy, and upon the officers in charge as the chief instrument of their punishment; only a few acknowledged their punishment was deserved, and that their own conduct had brought it upon themselves. Yet, in many cases, their life in gaol was no punishment; it was oftener a haven of rest where they recuperated, being better able to undergo a fresh debauch when liberated. I endeavored to get their opinions or reasons for supposing society, I, or any other officer, entertained feelings of animosity against them. To these questions I never got satisfactory replies. Many would blame the police; others would urge they were drunk when they committed the act, or plead they were compelled to steal or starve. Bye and bye, I began to hope I could do something in the way of reformation, and commenced an evening class for reading, spelling and ciphering, for three evenings every week, for male prisoners that chose to attend. The first evening nearly the whole attended; the second only ten came; the third evening seventeen; the class increased to between twenty and thirty. This was continued over three months; all showed a willingness to learn; I had no trouble in maintaining good order; a few made good progress. I did not attempt to give religious instruction. The sheriff was greatly pleased with the project and the promises of success, but he thought moral and religious subjects should be included. Accordingly, he found a staff of volunteer teachers to take the class

off my hands. A short time after this the secular lessons were dropped, and the two hours were devoted to religious exercises, and in this form the classes were continued as long as I had charge. I thought the teachers were earnest, painstaking people. I know that good impressions were made on a considerable number. I kept track of many of these, but I cannot say that I know of one instance that resulted in reformation. At the commencement, and for nearly three years, I had the belief that a genuine work of reclamation was being done. For many of the most hopeful I obtained employment, and to those that stood in need I gave clothing; to some tools; for others I became surety for board; in most cases I had the same to pay. I found it was a loosing business and gave it up. It became clearly evident to me that under the system thus pursued the only product was a number of whining hypocrites, that would show any amount of contrition, make any promises of reformation, when they thought such would bring them sympathy and aid. I have often heard them boast to one another how effectively they had deceived their teachers. For some time before, and a short time after I took charge, there was no work for the prisoners. The inspector said I must find work for them. The only employment I could get then, was what is known as "shot drill" (a kind of punishment adopted in some military prisons). We had no shot. We took stones, and had the prisoners carry them from one end of the yard to the other for a few hours, and then for a like number of hours carry them back again. This proved to be very satisfactory. True, it was exercise, but of a debasing kind. After a time I found other kinds of work for them; but I soon discovered that a large majority were lazy; many exceedingly awkward and very cunning. They would play all sorts of tricks when they expected to get off without detection. They were kept constantly at work nearly all the time I had charge. I found, with care, they could be made to do good work, and take an interest in it; many had a good capacity for learning; but as they all knew they had only a short time to remain, they would shirk their work when they could. This experiment in teaching and employing them in various kinds of work, conclusiyely proved to me that a very large per centage of prisoners could, with proper means and methods and care in training, be reclaimed to become useful members of society, and at a very reduced expenditure.

In order to arrive at a knowledge as to how this important work

is to be done, it is pertinent to ask a few questions. But we must first premise that we have entirely abolished punishment (unless for one crime). The words punishment, felon, convict, prisoner, are no more to be heard within these establishments. Errors or even light offences are to be looked upon as mistakes, and remedied by withholding of privileges. Where is this teaching and training to be done? The penitentiaries and some of the common gaols should be altered and modified, or extended in such ways as to adapt them for the purpose without any large expenditure of public funds, as nearly all the work required should be done by the inmates in their regular course or training. The institution should provide a considerable degree of physical comfort and contentment; the diet should be good, substantial and abundant; it should be made attractive, affording every means of enjoying innocent amusements for the hours of recreation, and, in the true sense of the word, made *home-like.* The government should be firm, though kindly, demanding regularity, tidiness, and obedience. Being separated from debasing associations, these influences alone would have great power upon the half-starved, ill-clad, and badly-treated, inducing submission to the more special measures. At the commencement, doubtless, a number will show themselves to be dull or even stupid, careless, ill-mannered and stubborn, and some incorrigible. As soon as incorrigibles are discovered, they should be at once removed to sterner and more restrictive discipline, and kept under restraint until they give ample proof of their willingness to comply with the regulations, and request to be allowed the privilege of the course of training provided. They should also be made aware that any misconduct in general would have the effect of depriving them of privileges, subjecting themselves to severer discipline and detaining them longer in custody. On the contrary, good conduct, persevering attention to their work, diligence in their studies, giving clear evidence of advancing proficiency, will procure privileges and shorten the term of their detention. Every effort and degree of improvement must be promptly recognized and rewarded, with the view to awaken and stimulate a desire for that kind of knowledge and training necessary to the true end of individual life; to impart or arouse a sense of better things that exist, and which are, with many of them, for the first time within their reach. They should be made fully aware that each would be credited with full value of all the work done by them; but against this

credit would stand a debit charged for several items, viz.: For feeding, clothing, lighting, warming, and if, through inattention to instructions or negligence, materials had been wasted, tools, machines, or other property belonging to the institution, damaged otherwise than by common tear and wear, would also be charged against the party in default.

It is an obvious necessity that prisoners will have to earn their living by one kind of labor or another; it has to be considered what course of training will best fit them to become proficient, self-reliant, original and progressive workmen, and must extend sufficiently far to prepare for the one great, common industry of citizenship, recognizing that the power to read, to write and cipher, may be destructive or helpful to good citizenship, according how it is, or is not, guided by an intelligence suffused with conscientious regard for the rights of all men. All classes of citizens ought to have the knowledge which will form a basis for intelligent sympathy and appreciation among different classes of workers, and necessary to their action at the ballot box, in order that each may recognize all as honorable and necessary essential parts of one grand industrial whole. As a means of encouraging diligence and contentment they ought to be afforded the privilege of choosing the special kind of work each had aptitude for, and was naturally inclined to follow as a means of gaining their living. The moral influence of occupation is very great, a sphere of labor, congenial and absorbing, that fully occupies one's thoughts and energies, is a strong safeguard of good conduct. And then it will be necessary to supply them with a knowledge and acquaintance with industrial materials, processes and relations. It should give such a development of physical, intellectual and artistic power as will remove as far as possible the chances of failure, and by giving a just consciousness of strength as will enable them to work always with the hope and expectation of success. The teachers must take the best physiological knowledge the age affords, and under its guidance develop a body capable of enduring all the strains and fatigues likely to be brought upon it by at least the ordinary exigencies of life. They must impart the knowledge which it is their duty to give according to the law of mental assimilation as is discovered and interpreted by the best students of mental growth, to the end that mental dyspepsia may be avoided, and that the best intellectual conditions may exist for the quick and accurate solution of the ordinary

problems of life. They must avoid the mischievous delusion that brain work is in itself, and apart from quality, a nobler or a more respectable thing than hard work. Such education may be a fatal mischief to the workman. They must give such a development of the sense of the beautiful as will enable them, not simply to enjoy the beautiful about them, but such as will give a *finesse* and finish to whatever work they undertake with honesty of purpose and pride in doing what is done well, whether it be the building of a house or the painting of a picture. Every workman should have to the largest possible degree the fine feeling of the artist, while every artist should be recognized as a working man. It should cherish an industrial disposition which leads to cheerful and even happy devotion to some chosen employment, as an avenue through which to make his contribution to the world's wealth. The scheme must recognize the true nature and place of the industrial instinct, that it is the creative instinct; one of the earliest to manifest itself. Why should not the *joy of producing*, which forms so large a part of the child's happiness, be carried forward into the industries of maturer years, deepened and enobled by a knowledge of industrial relations, by experience of the value of industrial products, and above all by the consciousness of duty done in the contribution made to human comfort and well-being? Give this instinct a proper development, join with it the best human intelligence and the best human benevolence and you have the ideal man. It is in this case of great importance to recognize, as a fundamental principle underlying the whole, that he who will not work shall not eat; still recognizing that the laborer is worthy of his hire and shall receive it. Over all this a conscience should preside that can say "ought" and "ought not" so loudly and distinctly that its commands can not go unheeded. This work can and should be all done through the ordinary subjects properly related.

There are some who, from some mistaken notions, have made objections to what they call the competition of prison labor with free labor. Are we to suppose this objection is meant to hold good both as regards quantity and quality of work? If admitting quality as a factor it then may demand some little attention. The present system pursued is to let the labor of convicts to contractors. That the products obtained by this system is inferior both as regards materials and workmanship I think there can be little doubt, and in

order to find a market this class of work has to be offered to buyers at a very low figure; the contractors being well aware of this fact, so, in order to make the most of their bargain, they aim to get quantity. I believe very little attention is paid to training the convict to become a good workman; at least I only know of two that mastered their trade sufficiently well so as to be able to get their living by working at it after being released; one at stone-cutting, the other at shoemaking. They served a period of five years each. It is the purchasers of this class of goods that become the unfortunate victims. I confess to have little sympathy for those working-men who show so much timidity in competing with prison labor. It exhibits at once a want of that conscious ability and self-reliance that is a general characteristic of all competent workmen. I think such timidity ought not to receive encouragement by giving it public consideration. Surely there can be none so stupid as to suppose those people are to be kept idle, or that their energies should be wasted in doing something that had no money value. I feel convinced that the community would scout the idea as preposterous of being taxed to keep so many of their number idle, while they were perfectly able and willing to work for their own maintenance. Whatever employment may be chosen good raw materials should be selected, and the best work possible put upon it. It should be a special instruction to those having these matters in charge to carefully avoid underselling, and free labor would have no cause to be alarmed. The grand aim is the reclamation of the criminal. We must not loose sight of the fact that he has many and great difficulties to contend against. He requires and ought to have a large measure of sympathy and encouragement extended to him to help him to overcome them. He has not only to learn something that is new to him, but it is often the case that he has the more difficult task to perform of unlearning both bad habits of life and bad methods of working. It is essential that suitable and constant employment be provided and proportioned to his capacity. It is needless to expect good results if he is to be driven as a beast to his labor. In order that his labor be congenial he ought to have choice; hence the necessity of a considerable range of various kinds of work.

We have now to select that kind of work that will fulfil these conditions, viz.: 1st. It must be a suitable instrument for educating and training the criminal to be a useful, industrious and law-abiding

citizen. 2nd. It must be of that description which is largely required in the community, that when released he may more readily find employment. 3rd. It must have a money value, so that the criminal may, by his own industry, earn sufficient to pay the cost of his maintenance while undergoing training, and to have a surplus to be handed to him when released. 4th. It must not compete injuriously with free labor. Where is this variety of work to be sought for? Looking around, we see that government requires a large amount of work of various kinds that could be as efficiently done in those institutions as by the system of contracts now adopted. 1st. All the clothing, boots and shoes, furniture, utensils, machines and implements of every description required by these establishments, as well as any extensions or repairs for their own buildings. 2nd. There is a large amount of departmental printing, making up account books, book-binding in keeping libraries in repair. 3rd. Then there is clothing, and other necessaries now supplied by the government to the police and volunteers, could be as satisfactorily done in these establishments as anywhere. 4th. The government owns and operates a railway that would afford a considerable amount of work in the building of rolling stock, and in doing all kinds of repairs to the same. So much of the above mentioned works as could be accomplished in these establishments, I believe could be withdrawn from public competition without injury to free labor. But if this plan be deemed inexpedient, there need be no apprehension of injury to free labor if other lines of industry were undertaken, provided the products were always to be of the best quality. It is the inferior products obtained by convict labor that free labor has any reason to complain of.

It must be clearly understood that in order to have reformation of the criminal, or any good work done by them, such can only be accomplished by and through those placed in charge as instructors and teachers. No matter how perfect the organization, or how well devised the regulations may be, the whole may be rendered nugatory by appointing inefficient or incompetent persons to fill so important positions, as good results can arise only through their capabilities for imparting instruction, their skill in management and devotion to duty. Though firm in demanding obedience, they should not be careless in extending sympathy. It must be admitted that persons possessing the needed qualifications are rare, and there may be

difficulty in finding them. I cannot state, as a fact, that they cannot be found. I confess I have no knowledge that they exist. Suppose they are not, this difficulty need not appall us. We have abundant evidence of far greater difficulties being surmounted. Modern society does not seem greatly surprised to hear of the most gigantic schemes projected. The one thing requisite is that these give promise of large profits on investments. If in their way to this end a mountain intervene that cannot be passed over, or it is inconvenient to go round it, then they go through it. So if a continent be in the way, they cut a waterway through it. If it be a river, they bridge it. If we ask how this has come about, we learn that such feats of skill and strength were not attempted, many were not even conceived, until there were a number of men specially trained to deal with that class of difficulties. So in other lines, if special work is to be done, as in medicine, law, teaching, or in handicraft, we have recourse to training. This class may be supplied also by training. It is not necessary to enter into details of management. Very much of the success will depend upon the capabilities of the teachers and instructors in charge. In the first stage of detention, the prisoner should be made feel sensible, from first to last, that it is only through his own exertions, accurately tested by the attainment of a certain number of marks, that he can better his condition. In this manner he works himself into different stages of progress by means of these marks, which simply and intelligibly note and measure his improvement.

I believe the system of liberating conditionally from reformatory institutions is the best safeguard for the good conduct of the party released, and at the same time affording the community the greatest measure of protection against crime. It has been well tested in Britain, Ireland and other countries, and has proved the wisdom of its adoption. This is no new thing. It has been in operation for a considerable time in many States, with various degrees of severity and varying degrees of success. It has had numerous amendments and undergone many modifications, and just as these have had a tendency to reform the criminal and raise his status, they have in that measure been successful. Generally, when offenders are liberated from these institutions now, they are given a certificate of release with the following endorsement upon it: 1st. The power of revoking or altering the license of a convict will most certainly be exercised

in case of his misconduct. 2nd. If, therefore, he wishes to retain the privilege which, by his good behaviour under penal discipline he has obtained, he must prove by his subsequent conduct that he is really worthy of Her Majesty's clemency. 3rd. To produce a forfeiture of the license it is by no means necessary that the holder should be convicted of any new offence. If he associates with notoriously bad characters, leads an idle and dissolute life, or has no visible means of obtaining an honest livelihood, etc, it will be assumed that he is about to relapse into crime, and he will be at once apprehended and committed to prison under his original sentence. The regulations for the enforcement of these conditions in Ireland are, viz.: 1st. Each convict will report himself to the Constabulary station of his locality on his arrival in the district, and subsequently on the 1st of each month. 2nd. A convict must not change his locality without notifying the same at his Constabulary station, in order that his registration may be changed to the locality to which he is about to proceed. 3rd. An infringement of these rules by the convict will cause it to be assumed that he is leading an idle and irregular life, and thereby entail a revocation of his license. In order to assist an effective supervision over this class great care is taken to have a complete registration, and every means possible is taken to insure identification, photography assists in this, and every male prisoner now entering these establishments has his photograph taken, as well as full particulars under which he is in custody, particulars as far as known of former convictions, and a complete description is taken of hair, eyes, height, age, trade or calling, where born, where friends reside, etc. A constant and systematic correspondence is kept up with governors of gaols and with the police throughout the country in order that criminals may be identified.

The education and training given in reformatory institutions would, without the assistance of conditional liberation and registration, be of themselves incomplete, so on the other hand without education and training, conditional liberation would be incomplete and unsatisfactory in its results. The system must be taken as a whole to be of value. It should be felt, that each criminal, previous to his liberation, has been invited to co-operate in his improvement, and that he has been made aware of the stringent course which will be pursued towards him after his liberation.

If it be an objection that this system would create too much espionage, I reply without hesitation, that it would only be under very faulty arrangements that such a result could ensue. Espionage is the consequence of the appearance of suspicious characters, of whom the police know but little, and imagine very much. Authentic information, accompanied by systematized and responsible police proceedings, preclude abuse. Why? Are we to show sympathy with those persons who apply the term "liberty of the subject" to the cases of "habitual offenders against the law?" The liberty of the subject, so construed, would soon become the bondage of the honest man. The idea of punishment is still retained, and offenders sentenced to definite periods of imprisonment as "punishment." They are still branded "convicts," and while this "stigma" attaches it prevents their absorption in the community. Until this be done they must ever remain a distinct class. I think this is a grievous hardship and deserves serious consideration. It is of the utmost importance to have full and accurate information of criminals and liberated offenders, and this can be had only through the police. It has been abundantly proved that this information cannot be obtained by a police system managed by a number of municipal corporations. It must be obvious to all that the police systems on this continent are notoriously defective; if such was not the case, there would be no need for calling into existence and maintaining a separate system of private detectives to undertake work that should be more speedily and effectively done by the regular force, if properly selected, organized, trained and managed from a central authority.

I have endeavored to show: 1st. That the idea of punishment ought to be abolished unless for the most heinous crimes. 2nd. That a comprehensive reformatory scheme might be introduced, yielding beneficial results to the community at a greatly reduced expenditure of money than is now required to administer punishments that only yield results that are inimical to the public weal. 3rd. That our present establishment, now used for the administration of punishment, could be modified to meet this exigency at small expense. 4th. That employment could be provided so that the products accruing from these establishments would not injuriously compete with free labor. It is pertinent to ask: What difficulty, if any, stands in the way, preventing the undertaking and of accomplishing this work? It cannot be the want of sympathy, for the

community overflows with public philanthropy, as may be witnessed by the numbers of men and women and the millions of dollars sent annually to distant countries to aid the work of reformation. It cannot be the lack of courage, for it has ever been when the community have been threatened, either by internal or external foes, there was no lack of volunteers ready to endure fatigue, encounter difficulties, or face dangers, to avert the calamity. We might expect that grand juries should take notice of this reform in their presentments. It receives no attention from the committees of corporations when they meet to examine the accounts incurred for the maintenance of the gaols. They may pass them with a grudge, but they pay the bills. This reform is not taken up by legislative bodies as claiming their attention, unless it be demanded and urged upon them by their constituents, or it may be considered by them as not affording a good election cry! It has not been taken up by prohibitionists, although intemperance is so intricately and completely involved with this subject that they cannot be properly considered apart. If we were able to enforce temperance, and thereby somewhat reduce crimes, we would intensify the remainder and render it almost impossible of detection. The press pass it by, apparently considering it to be their mission only to collect and disseminate information on such topics or subjects as the public demand of them. Whenever the public evince a desire for information, and urge a discussion of this matter, there need be no fear of the press failing to do its duty. Is it not surprising that this needed reform has not hitherto been urged from our pulpits? Is it not a fit theme? By adopting this reform, would we not be obeying the command to love our neighbors as ourselves? Would it not be doing unto others as we would they should do unto us? Let us hope the time is not distant when this reform will find an able and earnest advocate in every pulpit, and that it will form a plank in political platforms, until such time as the administration of justice in this dominion be so tempered with mercy and the spirit of forgiveness that it will open up a clear way for the unfortunate, or even the wicked, to be fitted to return as useful members of the community.

ANNUAL REPORT

—OF THE—

HAMILTON ASSOCIATION

For the Promotion of Literature, Science and Art.

(Read at the Annual Meeting, held May 17th, 1888).

The work of the Association has been vigorously carried on during the past year. Eight meetings of the General Association has been held, at which the following papers have been read and discussed, viz.:

"Evolution," by the President, Rev. Samuel Lyle, B. D.

"The Mahabaratta," by H. B. Witton, Sr.

"Notes on Primitive Man," by William Kennedy.

"Atmospheric Pressure," illustrated by experiments, by Alexander Gaviller.

"Notes on the Waverley Novels," by the Rev. C. H. Mockridge, D. D.

"How to Study Botany," by T. J. W. Burgess, M.D., F.R.S.C.

In addition to these meetings the various sections of the Association have had several meetings and done a considerable amount of original work; especially has this been the case with the Biological Section, where botany, entomology and ornothology have chiefly engaged the attention of the members of the Section. In connection with the former of these a great impetus has been given to the pursuit of this science by Dr. Burgess becoming connected with the Association and infusing the members with his enthusiasm. In entomology, one of our members, John Alston Moffat, a member of the council of the Entomological Society, has contributed a list of no less than 145 names of Lepidoptera, which he has added to the Canadian Lepidoptera. In Mr. McIlwraith, who is chairman of the

Section, we have the subject of ornithology well represented. His "Birds of Ontario," which was published in our last volume of proceedings, as well as papers contributed by him during the past year, show that this branch of biology has not been neglected.

The Biology Section meets on the first and third Fridays of every month, at which one or more papers of a thoroughly practical and largely original character are read. In addition to this, the members of the Section call attention at each meeting to the observations made by them during the periods between.

The Section purposes holding weekly field meetings during the summer, and a monthly meeting to compare notes.

The interest in the Association and its work is maintained, and the membership keeps up, the number at present on the roll being 145.

The officers for the ensuing session are:—

President, Rev. Samuel Lyle, B. D.
1st Vice-President, T. J. W. Burgess, M. D., F. R. S. C.
2nd Vice-President, W. A. Child, M. A.
Recording Secretary, A. Alexander.
Corresponding Secretary, H. B. Witton, Jr., B. A.
Treasurer, Richard Bull.
Curator and Librarian, Alexander Gaviller.
Council:—J. Alston Moffat, B. E. Charlton, William Kennedy, James Leslie, M. D., T. W. Reynolds, M. D.

A. ALEXANDER,
Secretary Hamilton Association.

TREASURER'S REPORT.

1887-8.

Read before the Annual Meeting, held 17th May, 1888.

Hamilton Association in Account with R. Bull, Treasurer.

RECEIPTS.

Balance	$ 70 33
Government Grant	400 00
Subscriptions	158 00
Sale of Transactions	19 20
	$647 53

EXPENDITURE.

Rent	$ 250 00	
Books	26 50	
Printing, Postage and Stationery	264 60	
Furniture (cases)	16 50	
Light	8 08	
Insurance	12 50	
Carriage on Specimens	5 82	
		584 00
Balance in hand		$ 63 53

(Signed) R. BULL,
Treasurer.

W. H. BALLARD,
A. T. NEILL, } *Auditors.*

REPORT OF CURATOR AND LIBRARIAN.

FOR SESSIONS 1886-7 AND 1887-8.

THE HAMILTON ASSOCIATION EXCHANGES WITH THE FOLLOWING SOCIETIES AND PERIODICALS:

Publications of the Provincial Government.
Geological and Natural History Survey of Canada, Ottawa.
The Canadian Royal Society, Montreal.
Entomological Society of Ontario, London.
Brockville Society of Natural History.
Canadian Institute, Toronto.
Canadian Record of Science.
Historical and Scientific Society, Winnipeg, Manitoba.
Nova Scotia Society Institute.
New Brunswick Geological and Natural History Survey.
Nova Scotia Society Institute of Natural History.
Royal Colonial Institute.
Fruit Growers' Association, Ontario.
Psyche Monthly Publication.

UNITED STATES.

Harvard University Library, Mass.
Harvard Comparative Zoology, Mass.
Harvard Geological Series, Mass.
New York Microscopical Society, New York.
Peabody Academy of Science, Salem.
American Academy of Science, New York.
The Elisha Mitchell Society Journal.
John Hopkin University Journal.
American Academy of Science, St. Louis.
American Geographical Society.
The Conchologists' Exchange, Philadelphia.

INDIA AND AUSTRALIA.

Bengal Asiatic Society.
The Natural History of Victoria, with colored plates, Melbourne.

GREAT BRITAIN.

Manchester Geographical Society.
Manchester Geological Society.
Scottish Geographical Society.
Glasgow Geological Society.
Edinboro' Geological Society.
Cornwall Mining Association.
Royal Society, London.
Honorable Cymmrodovian Society, London.
Pharmaceutical Journal, London.
The Colonies and India Journal.

THE FOLLOWING DONATIONS HAVE BEEN MADE TO THE MUSEUM:

Three earthen lamps from Pompeii.
Photographs of two bodies found in Pompeii.
Pavement from a house in Herculaneum.
Carbonized wood from the house of Aristides at Herculaneum.
Specimen of Mosaic pavement from the house of the Faun at Pompeii.
Piece of Alabaster from the Temple near the Sphinx.
Petrified wood from Cairo.
Two lamps from Memphis.
Three small tools from Memphis.
Three lachrymatoræ (or tear) bottles from an Etruscan tomb.
Small idol from tomb near the Pyramids of Cheops.
Part of a Roman brick.
Glass work from Venice.
Shells from sea shore of Joppa.
An ancient tile from Jerusalem.
Piece of Pavement from Jerusalem.
Alabaster vase for ointment.
Olive branch from Garden of Gethsemane and cone from cypress tree in ditto.

A branch and cone from a cedar in Lebanon.

Shells from the rock on which the Great Pyramid stands.

Lava with copper coin in it from Mount Vesuvius.

Pavement from Roman theatre at Florence.

Specimen of the sulphur from the bath of Nero at Pozzoli.

Scarabæ from Egypt.

A number of Roman and Egyptian coins.

The above presented by Mrs. Charlton, of Hamilton.

A very fine head of the mountain sheep, from the Rocky mountains. Presented by Mr. W. Hunter, of British Columbia, through F. E. Kilvert, Collector of Customs.

A part of clothing of a British soldier slain at the Battle of Stoney Creek, 1813, consisting of gold braid on cloth and some of the buttons belonging to the same. The same from the battle field of Lundy's Lane. Presented by Mr. C. Blachford, Hamilton.

Two swords from the sword fish. Presented by T. Burrows.

Seven models of hulls of British ships of war. Fourteen copper and four silver English coins and gilt cast of an English spade guinea. One very fine specimen of native copper from Cornwall, England. Presented by S. Symmons.

Twelve mineral specimens from the Northwest. Presented by A. Mckay, M. P.

Collection of mineral specimens from Ontario. Presented by A. E. Walker.

Specimen of magnetic iron from magnetic cave, Arkansas, U. S. Indian wampum from Township of Beverly. Presented by D. Boyle.

Specimen (in bottle) of singing sand from Manchester, Mass., U. S. Presented by Mrs. N. Mills.

Two curious dried botanical specimens.

A quantity of fossils from near Hamilton. Presented by Col. Grant.

A quantity of fossils and minerals from Hungary. Presented by Mrs. Greene.

A pair of buffalo horns from the Northwest.

Flint arrow heads from Hinda's cave in Sheffield, Co. of Cobert, Alabama, U. S. Presented by Maslio Powell.

Four photographs of the members of the Association picnic, held in the glen at Dundas. Presented by B. E. Charlton.

Three photographs of the members of the Association picnic, held in the glen at Dundas. Presented by Dr. Gaviller.

Three photographs of the members of the Association picnic, held in the glen at Dundas. Presented by Mrs. Stewart.

Specimens of Canadian woods, cut and polished. Presented by Messrs. J. Hoodless & Son, Messrs. Flatt & Bradley, Mr. Jones, and Messrs. Sawyer & Co., all of the City of Hamilton.

An old atlas of Newfoundland, Labrador and Gulf of St. Lawrence, published in London, 1779. An atlas of thirty-five maps, published in London, 1725. Presented by Mr. J. H. Killey, Hamilton.

Sixty maps of the United States survey of the lakes of America. Presented by Adam Brown, M. P.

Bottle containing specimens of a cuttle fish, centipedes and spiders (in spirits) from Nassau. Presented by Herbert Mortimer.

ANNUAL REPORT

—OF THE—

Biological Section, i.e. Botany and Zoology

HAMILTON ASSOCIATION,

SESSION 1887-1888.

T. McIlwraith, Chairman. T. W. Reynolds, M. D., Secretary.

The section was organized at a meeting held in the Library, Nov. 23rd, 1887, when the officers were elected.

At this meeting it was decided that during the winter, meetings should be held on the first and third Fridays of every month, that a paper should be presented at each meeting, to be as far as possible of a practical character, and that the members should also bring before the meetings notes and inquiries on matters of interest in connection with the work of the section.

At the meeting held on February 17th, 1888, the following order of business was adopted and has since been followed:

1.—Reading minutes of last meeting.
2.—Amending, if necessary, and sanctioning the same.
3.—Remarks on papers of previous meeting.
4.—Communicating items of interest.
5.—Transaction of business arising out of minutes (this will include answers to questions asked at previous meetings).
6.—Notice of a desire for information on a subject named by the enquirer to lay over till next meeting.
7.—Reading of papers and remarks on same.
8.—Announcing business for next meeting.

The work of the section has so far been of a theoretical character, still the papers have all been more or less practical, and most

of them illustrated by specimens. As a good average attendance was maintained at the meetings, it is to be hoped that a good foundation has been laid and that good practical work will be the result of the session's labor. The following is the programme of papers, etc., presented during the winter :—

Dec. 2, 1887.—"A Biography of the Only Known Carnivorous Larva of a Butterfly." An account of the habits of the Fenesica Tarquinius, with specimens of the chrysalis and butterfly.—J. Alston Moffat.

Dec. 16, 1887.—"Orchids." Description of the general and local varieties, with specimens of the Canadian varieties.—T. J. W. Burgess, M. D.

Jan. 6th, 1888.—"Economic Ornithology." A paper dealing particularly with the English sparrow, its productiveness, and the mischief it is guilty of, in the way of destroying buds, grain and seeds, and driving away song and insectivorous birds.—T. McIlwraith.

Jan. 20, 1888.—"Arboreal Habits of Some of our Native Snakes."—J. Alston Moffat. "Plant Color, and Fertilization by Insects."—A. Alexander.

Feb. 3, 1888.—"Field Notes of a Winter Holiday Trip, during Jan., 1888, to Aiken, S. C.," illustrated by specimens collected there. —T. W. Reynolds, M. D.

Feb. 17, 1888.—"The Mystery in the Life History of Danais Archippus." An account of the formation and migration of flocks of the common milkweed butterfly.—J. Alston Moffat.

March 2, 1888.—Discussion on the analogy between the circulation of sap in trees and the blood in animals. "Notes on the History of Botany."—T. J. W. Burgess, M. D., F. R. S. C.

March 16, 1888.—Discussion on the fertilization of plants by insects. "Notes on Birds of Paradise," with specimens.—T. McIlwraith and T. W. Reynolds, M. D.

April 6, 1888.—"Notes on the Flora of the 49th Parallel, from the Lake of the Woods to the Rocky Mountains." Observations made while serving as Surgeon and Botanist on H. M. British North American Commission, with specimens of the most peculiar and beautiful plants.—T. J. W. Burgess, M. D., F. R. S. C.

April 20, 1888.—"Notes on the Birds seen during the Winter of 1887-8," with specimens.—T. McIlwraith.

May 4, 1888.—"Some Inquiries about the Inception of the Young of the Marsupials."—J. Alston Moffat. "A List of 145 Named Canadian Lepidoptera."—J. Alston Moffat.

As an example of the good that has and can be done by this and other Sections, it may be mentioned that Mr. McIlwraith's paper on Economic Ornithology has been published in the *Farmer's Advocate* and has also been read at the meeting of the Fruit Growers' Association in Ottawa, in February, 1888, with the result that a committee was appointed to secure the necessary legislation to restrict the increase of the English sparrow.

It will be also noticed that Mr. Moffat has made a valuable contribution to Entomology in his List of Canadian Lepidoptera, which has been presented to the Association.

During the summer season, it is the intention that Sectional field-days should be held, as well as those held by the Association in general; also that the members should meet once a month for the purpose of comparing notes on specimens gathered during the intervening time by members on their own account, and hearing the results of their observations in general, on matter connected with the Section's work. These monthly meetings will also be open for general business connected with the Section, similar to that transacted at the winter fortnightly meetings.

ENTOMOLOGICAL DEPARTMENT.

REPORT BY J. ALSTON MOFFAT, MEMBER OF THE COUNCIL OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO.

I herewith present the names which I have added to the list of Canadian Lepidoptera during the period of my collecting, as far as I have been able to procure them to the present time. I have quite a number of specimens still unnamed, some of which may yet prove to be new to Canada.

The gentlemen to whose kindness I am mostly indebted for the identification of my material are :—

Mr. W. H. Edwards, of Colburgh, W. Va., who is carrying forward a most laborious and important work in breeding from the egg, and describing the preparatory stages of the butterfly, and whose "Butterflies of North America," as it issues from the press, excites more and more the admiration of all who are interested in the Diurnals for its thoroughness and the truthfulness of its illustrations to nature.

A. R. Grote, M. A., formerly of Buffalo, now of Breman, Germany, who has long made a special study of the Noctnidae, but has also an extensive knowledge and experience of the science generally. I mention as an illustration of how young the science is yet on this continent, that he has named a large proportion in this department.

The Rev. Geo. D. Hulst, of Brooklyn, N. Y., editor of *Entomologica Americana*, who has the largest collection of North American Geometers in the world.

Prof. C. H. Ferland, M. A., of Amherst, Mass., who has thoroughly qualified himself to take the first rank as an authority on Micro-Lepidoptera on the continent, not only by the study of the large amount of material at his disposal at home, but also by travel for the examination of the best collections in Europe, such as that of the British Museum, Lord Walsingham and Prof. Zeller, thereby informing himself of all that had been done in that particular line before him.

BUTTERFLIES.

DIURNES.

1. Pamphilia dion, Edw.
2. Pamphilia viator. Edw.
3. Endamus electra, Lintn.

MOTHS.

ZYGENIDEÆ.

4. Harrisina americana, Harr.

BOMBYCIDÆ.

5. Limacodes cæsonia, Grote.
6. Sisyrosea inornata, G. & R.
7. Adoneta spinuloides, H.-S.
8. Packardia geminata, Pack.
9. Apatelodes angelica, Gr.
10. Heterocampa marthesia, Crm

NOCTUÆ.

11. Anytus sculptus, Gr.
12. Arzama diffusa, Gr.
13. Parastichtis perbellis, Gr.
14. Scopelosoma Græfiana, Gr.
15. do Moffatiana, Gr.
16. do ceromatica, Gr.
17. do vinulenta, Gr.
18. Lithophane signosa, Gr.
19. do querquera, Gr.
20. Lithophane Thaxteri, Gr.
21. Catocala Levettei, Gr.
22. Allotria Elonympha, Hub.
23. Panopoda carnicosta, Guen.
24. Antiblemma Canalis, Gr.
25. Spargoloma Umbrifascia, Gr.
26. Renia restrictalis, Gr.
27. Hypena vellifera, Gr.

GEOMETRIDÆ.

28. Caberodes majoraria, Guen.
29. Endropia marginata, Minot.
30. do textrinaria, Grote.
31. Anagoga pulveraria, Linn.
32. Ephyra pendulinaria, Guen.
33. Asthena luctata, Guen.
34. do albogilvaria, Morr.
35. Calledapteryx Dryopterata, Gr.
36. Deilinia variolaria, Guen.
37. Semiothisa minorata, Pack.
38. Phasiane mellistrigata, Grote.
39. Thamnonoma brunneata, Tn.
40. Cymatophora umbrosaria, Hb
41. Heterophleps Harveiata, Pk.
42. Lobophora anguilineata, Gr.
43. do montanata, Pack.
44. Petrophora prunata, Linn.
45. do lunigerata, Walk.

PYRALIDÆ.

46. Chalcoela, Robinsonii, Gr.
47. Scoparia libella. Grote.
48. Botis unimacula, G.-R.
49. do quinquelinealis, Gr.
50. do venalis, Gr.
51. Pilocrocis ramentalis.
52. Crocidophora serratissimalis, Zell.
53. Blepharomastix, ranalis, Gn.
54. Eudioptis Hyalinata, Linn.
55. Diathraustra actomaculalis, Fernald.
56. Margarodes quadristigmalis, Guen.
57. Paraponyx plenilinealis, Gr.
58. Nymphaella dispar, Gr.
59. Homophysa albolineata, G-R
60. Cryptolechia tentoriferella, Clem.
61. Tetralopha asperatella, Clem.
62. Nephopteryx ovalis, Pack.
63. do undulatella, Cl.
64. Phycis angusella, Zell.
65. Salebria fusca, Haw.
66. do contatella, Grote.
67. Meroptera Pravella, Grote.
68. Ephestia interpunctella, Hub.
69. do ochrifrontella, Zell.
70. Crambus, sericinellus, Zell.
71. do alboclavellus, Schl.
72. do topiarius, Zell.
73. do elegans, Clem.
74. do caliginosellus, Clm.
75. do fnscicostellus, Zell.
76. Propexus pexellus, Kad.
77. Schoenobius longirostrellus, Clem.
78. Schoenobius Clemensellus, Robs.

TORTRICIDÆ AND TINEADÆ.

79. Teras subnivana, Walk.
80. do maculidorsana, Clem.
81. do Logiana, Schiff.
82. do americana, Fern.
83. Cacœcia infumatana, Zell.
84. do fractivittana, Clem.
85. Loxotænia virescana, Clem.
86. Pandemis lamprosana, Rob.
87. Lophoderus triferana, Walk.
88. do politana, Haw.
89. Tortrix Pallorana, Robs.
90. do quercifoliana, Fitch.
91. Tortrix Fumiferana, Clem.
92. Amorbia humerosana, Clm.
93. Œnectra xanthoides, Walk.
94. Œnectra irrorea, Robs.
95. do violaceana, Robs.
96. Cenopis reticulatana, Clem.
97. do Groteana, Fern.
98. Dichelia caryæ, Robs.
99. Amphisa discopunctana, Cl.
100. Platynota exasperatana, Zell.
101. do sentana, Clem.
102. Conchylis straminoides, Gr.
103. do dorsimacnlana, Robs.
104. Eudemis botrana, Schiff.
105. Eccopsis nitidana, Clem.
106. do concinnana, Clem.
107. do fasciatana, Clem.
108. do exoleta, Zell.

109. Eccopsis inornatanna, Clem
110. do Footiana, Fern.
111. Penthina hebesana, Walk.
112. do chionosema, Zell.
113. Sericoris agilana, Clem.
114. do fuscalbana, Zell.
115. Paedisca transmissana, Wk.
116. do Scudderiana, Clem.
117. do dorsisignatana, Cl.
118. Semasia formosana, Clem.
119. Proteoteras Moffatiana, Fern MSS.
120. Steganoptycha nubeculana, Fern. MSS.
121. Phoxopteris nubeculana, Cl.
122. do semiovana, Zell.
123. do dubiana, Clem.
124. do angulifasciana, Zell
125. Depressaria atroclossella, Cl.
126. do applana, Fab.
127. Semioscopis allenella, Wlsm.
128. Epigraphia eruditella, Gr.
129. Semioscopis inornata, Wlsm.
130. Anesychia texannella, Cham.
131. Choreutis leucobasis, Fern, MSS.
132. Œcophora argenticintella, Cl.
133. Gelechia innocuella, Zell.
134. do flavocostella, Clem.
135. do agrimoniella, Clem.
136. do bicostimaculella, Ch.
137. Plutella cruciferarum, Zell.
138. Bucculatrix pomifoliella, Cl.
139. Adelia purpurella, Walk.
140. Dasycera newmanella, Clem.
141. Ypsolophus pometellus, Fth.
142. Tinea granella, Linn.
143. Chimabacche haustellata, Wlsm.
144. Gelechia roseosuffusella, Cl.
145. Blastobases glandella, Riley.

I append a few notes on some of the species that may prove to be of local interest.

No. 1.—This species was named and described by Mr. Edwards in 1879. See *Canadian Entomologist*, Vol. 11, No. 12, Page 238, where he says: "This species is closely allied to Arpa Bd. and Lec. I formerly received Dion from Mr. G. M. Dodge, Nebraska, and supposed it to be Arpa. This season I have received the species from the southern shore of Lake Michigan, in Indiana, from Mr. Chas. E. Worthington; also from Mr. J. Alston Moffat, of Hamilton, Ont., who says it inhabits one locality there. It would appear then to occupy a belt extending from Canada to Nebraska." I had been taking it for several years before that, and was always expecting to meet with some one that knew it and would give me its name. I at length got tired waiting and sent it to Mr. Edwards a month or two after he had named it. The locality referred to above is the marsh at the north end of Beasley's Hollow. When the Rifle Ranges were situated there, the Club made a plank walk through the

marsh to the butts, and along that walk I took all my specimens feeding on the flowers within reach, and since that has been removed I have not been able to secure a single one, so exclusively does it appear to be confined to that locality, and I have not heard of another for it anywhere else in Canada.

No. 2.—When Mr. Edwards gave me the name of this species, he wrote: "It is a southern species, and remarkably small; not two-thirds the size of the Louisiana examples." I used to take this one in company with the other during the first half of July, but much more abundantly, and it is equally safe now from my interference as its companion. Capt. Gamble Geddes, of Toronto, has found it plenty near the Humber Plains, 6 miles from Toronto. This is the only other locality I have heard for it in the country.

No. 3.—This species was named and described by Mr. J. A. Lintner, of Albany, State Entomologist for New York in 1881, *Canadian Entomologist*, Vol. 13, No. 4, Page 63, where he says: "Described from a single female received from Mr. W. H. Edwards. The specimen was captured in Hamilton, Ontario, by Mr. J. Alston Moffat, in 1877, in company with another like it, which escaped capture. The detection of the above species is a very interesting discovery for this portion of the United States." When I captured this specimen I did not know that I had secured a prize. It was not until I came to spread it that I saw I had got something quite new. It was flying amidst great numbers of a very common form, which it resembled, and which I thought it was but a very fresh specimen of, consequently the other one I saw I made no special effort to secure, and I have never seen another one since, although searched for carefully in the same locality.

No. 4.—A single specimen taken on Lake Erie shore at Port Dover.

No. 7.—One specimen taken at Ridgeway.

No. 11.—Comparatively common here, but not heard of from any other locality in Canada.

No. 12.—Very considerable interest is attached to this species from its being understood that the larvæ feed inside the stems of water plants. It is but a recent discovery, and its life history is not yet worked out. The catterpillars are found here in early spring in the neighborhood of the marsh, often behind the bark of a decaying stump, where they have hibernated, and where they changed to chrysalids with the first warm weather in spring.

No. 15 —This species was separated from the preceding one by Mr. Grote, in 1882, under the following circumstances: The season of 1877 was one of most unusual abundance for Lepidoptera, all through the season and all over the country. Scopelosoma and Lithophane belong to what are called fall moths, from the fact that they do not appear until the end of summer. They pass the winter in the moth state, pair in the spring and deposit their eggs for the brood that is to appear in the fall again. Being nocturnal in their habits, sleeping through the day on the underside or in a curl of a leaf, I discovered that by striking the branch they would drop to the ground as if dead. If the day is cool they may be picked up by the feet and never show the least sign of life. In this way I secured great numbers of them with little trouble, often returning from a hunt with forty or fifty moths of kinds that had been considered extremely rare. In Nov., 1877, I visited Mr. Grote in Buffalo, to get my new things named, taking with me examples of all that I considered different. There was one kind that I had noticed that seemed to differ much in depth of coloring, so I took what I thought the brightest and freshest specimens and received for it the name of Græfiana. In subsequent year's collecting I noticed that the light form, although with a faded look in contrast with the others, was quite fresh, constant, somewhat local, and not so numerous as the bright ones. I began to suspect that we had two separate moths under one name. Mr. Roland Thaxter, of Cambridge, Mass., who has been a most extensive and successful collector of Noctæids, learning through Mr. Grote that I had secured some rarities, communicated with me with a view to exchange. During our interchange I communicated to him my suspicions, and sent to him examples of the light form. He replied that he saw no difference in it from what he took. I then sent him the bright form. He was delighted. This was something quite new to him. He inquired if Mr. Grote had seen it. I related the facts as stated above. I then sent to him a good series in both forms, and he went into communication with Mr. Grote about it. The result was that it received a separate name. Mr. Grote clearly states the case in a contribution (on new moths) to the Bulletin of the U. S. Geological and Geographical Survey in this way: "Scopelosoma Moffatiana, N. S. This species, captured in the autumn, on oak leaves, by Mr Moffat, of Hamilton, I have formerly regarded as the same as Græfiana.

Mr. Thaxter calls my attention to the following points: It is generally larger; more richly colored, being a reddish-orange, while Græfiana is yellow; the transverse lines are blackish, not red, and more uneven; the transverse anterior line arched in Moffatiana; the hind wings are suffused with red in the new species, and I find that the mesial line is more even. I have supposed that Moffatiana was fresh, autumnal Græfiana, and figured it as such in my essay, incorrectly. This discovery shows that the type of Græfiana is the fall form, and that it is always to be distinguished from Moffatiana by its yellow ground color, red lines, which are also straighter and, perhaps, thicker, as well as paler hind wings." There are a great many kinds of these fall moths, exhibiting a great diversity of coloring, from a pale yellow to a deep rust brown, corresponding to all the shades of decaying vegetation.

No. 16.—A very rich form, not uncommon here, but much sought after by collectors from a distance, indicating a general scarcity.

No. 19.—A single specimen taken in 1877, and have not met with another since.

No. 21.—Scarce amidst a general profusion of its kind.

No. 22.—An extremely rare and attractive insect. I took one specimen at Ridgeway, and have not heard of another having been taken in Canada.

No. 23.—A pair raised from caterpillars which fed upon oak leaves.

No. 27.—This seems to be one of those insects that is rigidly confined to particular places for some reason, which is apparently at present known only to itself. It is extremely abundant here some seasons, but it has attracted the attention of nearly every entomologist that has examined my collection as being new to them. The Geometers is a very interesting and attractive family, with their broad wings often brightly colored, but one rather difficult to deal with systematically, from the liability of some of the species to vary greatly. Three years ago I turned my attention to the collecting of small moths especially. It proved to be an almost entirely fresh field for investigation, they having been much neglected by Canadian collectors. Since then I have more than doubled the number of known Canadian species, with seventy-six separate forms yet undetermined. The most of these Prof. Fernald has

seen, and, when returning my material on one occasion, remarked upon them, that "some of the unnamed ones are too poor to name; others are unnamed in my collection, and may or may not be new species; and yet others I have not seen before." No one that has not examined them closely can form any idea of the exquisite beauty of many of these tiny creatures, some of them being ornamented with metalic scales of every conceivable hue and brilliancy.

No. 51.—Extremely rare. One specimen taken many years ago. It appears to have a very wide range, as it is reported from Atlanta, Georgia, U. S.

No. 54.—Probably the first specimen of this moth ever taken in Canada was captured in the greenhouse of Mr. T. H. McKenzie, Dundas, and given to me. It had such an uncommon and foreign appearance that we concluded that it must have been brought with some of his tropical plants. Two years after I saw one on the opposite side of the marsh from the cemetery, but failed to secure it. A week later I took one in Mr. Reid's garden on the heights. That same season one was taken at Bartonville, and but one has been taken since that I know of. It propagates on melon vines and is quite plenty in the south.

No. 58.—Taken at Long Point, Lake Erie. From what I have heard I infer that it is nowhere abundant. The sexes differ strikingly.

No. 119.—This moth was found by me for the first time on the 5th of July, 1886. It was an extremely hot day, so I went to the Avenues to enjoy the shade and breeze, if there was any. Whilst strolling on West Avenue, my eye was arrested by a small moth, new to me, on the side of a maple shade tree. It is a rough, mossy green, and so much resembling the moss on the tree that but for its form it might have escaped detection. On that and two following days I took ten In August I went to Buffalo, to the meeting of the A. A. A. S, taking with me a box full of the most attractive of my little beauties, hoping that I might get names for some of them from entomologists present, but they proved to be all new to them, each remarking that I would have to apply to Prof. Fernald. In winter I sent this, with many others, to the Professor, who pronounced it entirely new, described it and named it. Last summer I found it pretty well distributed over the city, always on the trunks of maples. One was taken last summer by Mr. H. S. Saunders, of London, at an electric light there.

No. 138.—Raised from cocoons that were found by Mr. Alexander, our recording secretary, attached to the under side of twigs on his apple trees last spring, and given to me. A very minute form. Dr. W. Brodie, of Toronto, who is well qualified to express an opinion on the subject, when looking at my collection remarked that it had a much more southern appearance than he would have expected from a locality in such close proximity to his own. Many things rare with him, or altogether wanting, seemed to be abundant with me. Vennor used to say that Hamilton had a climate peculiarly its own. There can be little doubt but what Hamilton is situated in a particularly favored spot in many respects, and its fauna and flora attest the fact

ABSTRACT OF PAPERS

—READ BEFORE—

THE BIOLOGICAL SECTION.

ORCHIDS.

BY T. J. W. BURGESS, M. B., F. R. S. C.

(Read before the Biological Section December 16th, 1888.)

In introducing the subject reference was first made to the beauty and singularity of these plants, which often display a wonderful mimicry, it being stated that these peculiar shapes specially adapt them for cross fertilization, very few of them being capable of self-fertilization Reference was also made to the high prices paid for some of the rarer orchids. In their geographical distribution they were said to be spread over the whole world except the polar and desert regions, though they are essentially tropical in their nature. The number of well-distinguished species of orchids is placed by Bentham and Hooker in their "Genera Plantarum" at between four and five thousand. Dr. Gray in 1872 gave 16 genera and 56 species as belonging to the Northern United States; while Prof. Macoun makes Canadian orchids consist of 15 genera and 58 species, some of which, however, are natives of the Pacific coast, and therefore are not included in Gray's Manual. The latest authorities divide the orchids into five tribes, Epidendreæ, Vandeæ, Neottiæ, Ophrydeæ and Cypripedieæ, of which Vandeæ is not represented in Canada. The tribe Epidendreæ includes five genera—Microstylis, Liparis, Calypso, Aplectrum, and Corallorhiza; Neottiæ, seven genera—Listera, Spiranthes, Goodyera, Arethusa, Calopogon, Pogonia and Epipactis; Ophrydeæ, two genera—Orchis and Habenaria; and Cyripedieæ only one—Cypripedium. *Microstylis* contains three species, M. monophyllos and M. ophioglossoides which

range from Nova Scotia to Lake Winnipegosis, and M. diphyllos confined to the northern Pacific coast. *Liparis* contains but one species, L. Loesellii, which ranges from Nova Scotia to the Saskatchewan. *Calypso* consists of but C. borealis, found from the Atlantic to the Pacific. *Aplectrum* is also restricted to one species, A. hyemale, occurring from Ottawa to the Saskatchewan. Of Corallorhizas we have five species, two of them C. innata and C. multiflora, stretch from the Atlantic to the Pacific, and are recorded by Judge Logie as occuring at Hamilton; C. striata has the same western range, but does not extend east of Ottawa; C. Mertensiana is confined to the coniferous woods west of the Rockies. C. odontorrhiza is doubtful except in south-western Ontario. Both our *Listeras*, L. cordata and L. convallarioides are fairly common from Cape Breton to British Columbia, but neither of them have been found about Hamilton. Of the genus *Spiranthes*, S. latifolia has only been found occasionally in Nova Scotia, New Brunswick and Ontario; S. Romanzoviana is not uncommon right across the continent; while S. cernua and S. gracilis start at Nova Scotia and end respectively at Georgian Bay and the Mackenzie river. S cernua is the only one recorded for this neighborhood, having been found by Judge Logie at The Dell, Ancaster. *Goodyera* contains three species, of which G. repens is found right across the continent; G. pubescens reaches from Nova Scotia to Lake Superior, and is noted by Judge Logie as occurring at the Sulphur Springs near Ancaster; while G. Menziesii extends from Lake Superior to the Pacific. *Arethusa* is confined to one species, A. bulbosa, which occurs from Nova Scotia to London, Ont. *Calopogon* is also limited to one species, C. pulchellus, which ranges from Cape Breton to Lake Huron. Of Pogonias we have three in Canada, P. ophioglossiodes, whose range is almost identical with Calopogon, and which was found by Judge Logie at Millgrove; P. pendula, probably to be found in south-western Ontario, although the author has never seen a Canadian specimen; and P. verticillata, for which our only known station is Komoka, Ont., about 6 miles west of London, where it was found by Mr. Saunders and the author in 1879. *Epipactis* is represented only by E. gigantea, confined to the west of the Rockies. *Orchis*, as now constituted, includes three species, one of which, O. rotundifolia, is the Habenaria rotundifolia of Gray's Manual, thus relegated back to its original genus; it is found from Anticosti, strangely neglecting Nova Scotia and New

Brunswick as far as yet known, westward to British Columbia, and is given in Logie's Hamilton list as occurring at Galt. O. spectabilis is found from New Brunswick to the Detroit river, and is catalogued by Logie as occurring at Hamilton; while the third, O. aristata, is a Pacific coast plant. *Habenaria* includes no less than twenty-one of our fifty-eight species. Of these, H. ciliaris was discovered by the author in 1886 near Leamington, in Essex county, the only Canadian station; H. blephariglottis extends from Nova Scotia to Lake Island, Lake Joseph, Muskoka, Ont.; H. leucophæa and H. lacera, from Nova Scotia to the neighborhood of London, Ont.; H. psycodes, from Nova Scotia to the Kaministiquia and Rainy rivers; H. fimbriata, from Nova Scotia to Hamilton, Ont.; H. chorisianus, H. gracilis, H. sparsiflora, and H. leucostachys are confied to the North-west coast and British Columbia; H. tridentata is common from Nova Scotia to Lake Superior; H. virescens is confined to Ontario; H. bracteata (H. viridis, var. bracteata of the Manual), occurs from New Brunswick to Vancouver Island; H. hyperborea abounds from the Atlantic to the Pacific; H. dilatata is rather common from Cape Breton to the Rockies; H. elegans and H. Menziesii are confined to the North-west coast; H. Unalaschensis, found in the same localities, has only been noted on this side of the Rockies at Anticosti and the Fishing Islands on Lake Huron; H. obtusata is found from Nova Scotia to the Pacific coast, extending into Alaska; H. Hookeri is found from Cape Breton to the north shore of Lake Superior; and H. orbiculata from the Atlantic to the Columbia River, B. C. Nine of these species, viz,, H. fimbriata, H. leucophæa, H. psycodes, H. tridentata, H. virescens, H. bracteata, H. hyperborea, H. Hookeri, and H. orbiculata are referred by Logie to the neighborhood of Hamilton. The last and best known genus, *Cypripedium*, has eight species; C. montanum, confined to the Pacific slope; C. passerinum, ranging from James' Bay and the Pic River to the Rocky Mountains and Yukon River; C. guttatum, said to be abundant in Unalaska, also gathered at Fort Franklin on the Mackenzie River; C. acaule, occurring from Nova Scotia to Lake Superior and the Mackenzie River, also, according to Logie, at Millgrove, Ont.; C. arietinum, ranging from the Saguenay River to the Portage of the Grand Rapid of the Saskatchewan River; C. parviflorum, rather common throughout Canada to Lake Winnipeg and the Rockies; C. pubescens, common from Nova Scotia to the base of the Rocky Mountains; and C

spectabile, often abundant from Cape Breton to the extremity of the Bruce Peninsula. The last three are mentioned by Logie as occurring in the neighborhood of Hamilton.

NOTES ON THE HISTORY OF BOTANY.

BY T. J. W. BURGESS, M. B., F. R. S. C.

(Read before the Biological Section, March 2nd, 1888.)

Botany was defined by the author as the natural history of the vegetable kingdom, but it was stated that while in its widest sense it embraces everything respecting plants, their nature, their kind, the laws which govern them, and the uses to which they may be applied in medicine, chemistry or the arts in general, yet it is commonly restricted to a knowledge of the plants themselves, their mode of growth, their anatomical and physiological phenomena, and those characteristic marks by which the various species may be distinguished, the one from the other.

Some reference having been made to the various superstitions held by the ancient herbalists as to the virtues, etc., of plants, the history proper of botany was taken up, and was divided into four great epochs. The first of these—the ancient—embraces the period extending from the Creation to the destruction of the Western Empire by the Goths and Vandals, which peoples, nursed in war, abhorred the arts and sciences, believing they gave rise to effeminacy. Besides the various allusions by biblical authors, Anaxagoras, Pythagoras, and other ancient Greek philosophers wrote during this period, though the only vestige of the botanical knowledge of the earliest ages that we have in secular literature is to be found in Homer, Aristotle's treatise, though published about 384 B. C., being lost. The proper historical era begins about 300 B. C., and we have treatises published by Theophrastus, Dioscorides and Pliny between then and the end of the ancient epoch. The second, or Arabian epoch, began about the close of the 8th century, when ancient botany began to reappear among the Saracens, who, though at first disposed to be contemptuous of science, as shown by their destruction of the Alexandrian library, now became imbued with a love of it, and a succession of Caliphs, amongst whom was the famous Haroun Alraschid, by

their fostering care of learning and learned men, made Bagdad the most enlightened city of the world. Serapion, Rhazis, Avicenna, Averhoes, Actuarius, Plato Apuleius and Abenguist were the principal writers during this period. With the beginning of the 16th century we enter upon the third epoch—the artificial—during which the artificial arrangement of plants flourished, a period adorned by such names as Cæsalpinus, Morrison, Ray, Tournefort, and the immortal Linnæus. About 1536 the first modern botanical garden was established in Italy by Brasavola; while the first work founded on actual observation was issued by Otho Brunfels, of Mentz, in 1530. In 1560, Conrad Gesner, of Zurich, first proposed an arrangement of plants from the parts of the flower and fruit, the first application of this idea being made by Cæsalpinus in 1583. In 1680, Morrison published his great work, "The Universal History of Plants," Ray's work being published two years later, and Tournefort's in 1694. Linnæus, who was born May 23rd, 1707, published his system in 1735, his great work, "The Species Plantarum," being published in 1753. He died Jan. 10th, 1778. With the death of Linnæus the artificial epoch closes and the natural is entered upon. The fame of being called the founder of the natural system has fallen to Antoine Laurent de Jussieu, whose work, published in 1789, first established natural orders of plants. The next great systematist was De Candolle, whose work was published in 1805, the second great botanical work of this century being the "Genera Plantarum" of Bentham and Hooker. Many other distinguished writers were mentioned in the paper, but most especially the late Prof. Asa Gray.

NOTES ON THE FLORA OF THE FORTY NINTH PARALLEL, FROM THE LAKE OF THE WOODS TO THE ROCKY MOUNTAINS.

BY T. J. W. BURGESS, M. B., F. R. S. C.

(Read before the Biological Section, April 6, 1888.)

This paper consisted of field-notes made by the author while serving as Surgeon on H.M.N.A.B. Commission, which was appointed for the purpose of defining the boundary between Canada and the United States, from the Lake of the Woods westward to the Rocky Mountains, the time occupied in the work being about three

years. This territory has for its eastern boundary the Laurentian highlands, which extend north of the River St. Lawrence and the Great Lakes, from Labrador to the Lake of the Woods, and for its western the Rocky Mountains. It presents three well marked levels or prairie steppes, and may be said to slope gradually eastward. The first level includes the valley of the Red River and region about the Lake of the Woods, and is limited to the west by the more or less abrupt edge of the second prairie level, which forms an escarpment known as Pembina Mountain. Of the Lake of the Woods region, but a small proportion is suitable for agricultural purposes. The northern and eastern shores are almost entirely composed of barren rock. Only here and there, as on Garden Island and at the north-west angle, is there a small area capable of cultivation. Pine (Pinus resinosa) of fair growth occurs in some localities, but swamp elm (Ulmus Americana), poplar (Populus tremuloides), cedar (Thuja occidentalis), spruce (Abies nigra and balsamea), and birch (Betula papyracea), are the most prominent trees. The greater part of the southern and western margins of the lake are equally useless, and are of a forbidding aspect, the immediate border being here formed of a low ridge of sand, barely held together by the roots of various grasses, behind which is generally a stretch of grassy swamp and lagoon, varying from a mile to two miles in width, and bordered by a forest of tamarack (Larix Americana) occupying a soil but little less swampy. The flora of this district resembles that of the Laurentian region north of the St. Lawrence river, and differs completely from that of the prairie country to the west. Of the district covered by the notes it is par excellence, the home of water and moisture-loving plants. The ferns found were also almost entirely confined to this district. West of the Lake of the Woods is an extensive and very generally swampy region which extends in a breadth of from 50 to 75 miles to the eastern edge of the alluvial prairie of the Red River, the flora being much the same as that in the immediate vicinity of the lake. On the Red River Prairie proper is first found a mingling of the plants of the plain with eastern and northern woodland ones. True western plants are still in the minority, while some eastern weeds are seen, fore-runners of an advancing civilization. The soil is uncommonly fertile, being a dark, rich mould, for a depth of from two to four feet, small swamps being scattered uniformly over its surface, but generally so situated as to be easily

drained into the Red River or some of its tributaries. The wooded area is small, only the streams being fringed, but some of the trees attain a large size. The front of the escarpment known as Pembina Mountain and its summit forming the edge of the second prairie steppe are in places thickly wooded, there being more or less timber found for some twenty miles westward to Pembina River, on crossing which the great treeless plain is entered on. No woods now appear except along the valleys of the streams, and even the shrubs are stunted. About the base of Turtle Mountain, which is about 20 miles square, and 500 feet high, the prairie commences to re-clothe itself with timber. Not far from here was seen the first saline lake, a common feature further west. It had not the thick skirting of grasses and sedges of other ponds, but instead a vivid scarlet fringe of Salicornia herbacea. Westward from Turtle Mountain to the Souris River, 170 miles from Red River, the prairie is almost level. Le Grand Coteau or Great Coteau of the Missouri, distant from Red River about 300 miles, forms the eastern edge of the third prairie steppe. It is perhaps the most remarkable monument of the glacial period now existing on the western plains. Its average width is about 45 miles, and its eastern edge is about 150 feet above the level of the second prairie steppe. It presents a confusion of hills, among which are basin-like valleys, without outlet, generally holding swamps or ponds, often saline in character. The greater part of the Coteau is but little better than a barren desert; but west of it a well-defined table land stretches as far as White Mud River, about a hundred miles, which, though little fit for agricultural purposes, is well adapted for pasture; along its edges are sheltered ravines containing groves of poplar, and beneath it are vast deposits of lignite coal. In parts of it we find some of the most peculiar western plants. Beyond this plateau an arid plain stretches to the Milk River, while west of the Milk River the country is covered with a short thin sod. Many of the extreme western plants are here first met with. This country ends at the Sweet Grass Mountains or Les Trois Buttes, which lie about 20 miles apart, and rise nearly 2,000 feet above the level of the plains, or about 6,500 feet above the sea. From the Buttes to St. Mary's River the country improves in appearance and shows evidence of greater rainfall. On crossing the St. Mary's River the country becomes undulating, and is covered with a thick vegetable soil, supporting a luxuriant growth of grass, and timber in

all stages of development. In addition to giving the names of the various plants seen in the different localities, the author described in detail a few of the more beautiful or peculiar ones, viz., Anemone patens, L. var. Nuttalliana, Gr.; Geranium incisum, Nutt.; Œnothera cæspitosa, Nutt; Opuntia Missouriensis D C.; Mamillaria vivipara, Haw.; Sarcobatus vermiculatus, Torr.; and Elæagnus argentea, Pursh.

ON THE INCEPTION OF THE YOUNG OF MARSUPIALS.

BY J. ALSTON MOFFAT, ESQ.

(A Paper read before the Biological Section, May 4th, 1888.)

It was stated that the young are born in a very imperfect condition and small in size, special arrangements being required to secure their existence. When born they are transferred by the mother to a pouch, within which are contained the nipples. For some time the young are nourished involuntarily. Later they can suckle by their own exertions. This statement of the case was contrasted with that of an Australian kangaroo hunter, whose curiosity had been excited in the subject and who took every opportunity to investigate it. He had killed a large number of kangaroos at all seasons of the year. He examined the females carefully inside and out, and he asserted most positively that in no solitary instance did he ever find the slightest symptoms of young inside. On the other hand, he found them in all stages of development attached to the nipple, and so completely a part of the mother that it was impossible to separate them without the use of a knife. Does it then seem probable that a creature so immature—about an inch long, and the color and consistency of an earth-worm, and consequently so helpless—could be made to adhere to the nipple until it grew fast, as described by the hunter? The nipple passes far down the throat of the young, the breathing tubes being quite independent and not interfered with. A peculiar set of muscles in the mother forces a constant supply of nourishment to the young without any exertion on their part while it remains attached. So the conclusion arrived at was, that the young are at the nipple from the beginning of their existence—that they grow, develop, and mature there, and having arrived at a certain stage of maturity, they drop off like a ripe fruit from its supporting stem.

ARBOREAL HABITS OF SOME OF OUR NATIVE SNAKES.

BY J. ALSTON MOFFAT.

(A Paper read before the Biological Section.)

It was remarked that few believed that any of our snakes could climb trees. Mr. Moffat had seen a garter snake moving upward in the corrugations of the bark of a large pine tree, fully five feet from the ground. It was also stated that a pale green snake had fallen from a branch nine feet high, which had been struck by a stick in looking for entomological specimens. It was no uncommon thing to find this kind in trees and bushes. At Long Point, Lake Erie, he had often seen garter snakes on scrub oak five feet from the ground. One he specially noticed was out on the end of a horizontal branch, where it was not one-fourth the thickness of the snake, which, when disturbed, glided off and dropped to the ground as if it was its regular habit. A case was also mentioned of a snake of the largest kind found at Long Point being shot in the top of a maple tree a foot in diameter, with a clear stem 25 feet high, and standing alone.

PLANT COLOR.

ABSTRACT OF PAPER BY A. ALEXANDER.

(Read before the Biological Section, 20th January, 1888.)

More or less intense color always accompanies the various degrees of imperfect vegetation. Spring and autumn tints come under the same explanation as flower colors, in that there is in each case a using up of previously obtained material, not a predominance of the constructive elements throughout the cells. Reference was made to what may be seen among the cryptogams, viz.: the coloring in connection with reproduction, where the unproductive parts of many mosses are yellow or white, their energy being spent otherwise than in producing chlorophyll. Spencer and Grant Allan were quoted as pointing out that "incipient floral color is present in all imperfectly developed shoots," or "might be expected to appear in flowers because of their low constructive energy." Evidence of this may be seen in the Caulerpa, where it is often yellow when in a

comparatively dry or less nutritive habitat, but becomes green when grown in water, to it, a more nutritive condition. The crotons and other foliage plants, so called, or such plants as Arum Maculatum, have their colors more intense when pot bound, or growing in less nutritive places; while we find that green invariably takes the place of the purple, bright rose, scarlet or white of the leaves when grown under more vegetative conditions, as, for instance, when newly repotted. It was also noted that it is where growth is locally restricted—as, for instance, in the petioles of Primula Sinensis, or on the secreting surfaces of Pitcher plants or Drosera—that color tends to appear. Would not a similar explanation account for the red tips of the daisy and other flowers? or for the appearance of new colors at the apex of the petals, as it is in the apex rather than the base or among the disc flowers that growth has most certainly ceased. And may we not similarly account for the predominant white color of winter flowers, because at that time of year all growth is sluggish, and there is less actively destructive change from the primary yellow color. Those who have climbed *alpine heights* for botanic treasures must have noticed that alpine flowers, growing where there is an open and sunny exposure, favoring high destructive change, are notably brilliant. And as the insect is made to figure so largely in what is called the "new biology," in relation to plants and natural selection, it was remarked that this color cannot be said to result because there are more insects in alpine regions than in lowland; nor is the explanation of white rather than red winter flowers to be found in the absence of insects which would select red at that time, as has been suggested. Changes in color during the life of the flower, as seen in say Convolvolus minor or Myosotis versicolor, are but graduations of the natural series of changes observed with greater or less distinctness in nearly all flowers. Such changes occur especially just before death. They are very noticeably caused by altered climatic conditions, as, for instance, where a cold and damp winter has been observed to be productive of white varieties, or a hot, dry summer of red ones. That white varieties of plants, normally red or blue, are products of changed or weakened constitutions is shown in the fact that such plants as white erica may be distinguished while still in the seed-pan, and long before there is any sign of blooming. In relation to the part borne by insects in this connection, it was stated as a very suggestive and striking fact that hues the most

brilliant should exist always unseen in the very structure of the living plant, ready to be developed at any time by proper selective or accidental circumstances. Some of the colors may be produced by the oxidation of the green chlorophyll in person; others are actually present in the green leaf itself, though completely masked during the period of vigor by the preponderance of the natural pigment, which owes its color to a due mixture of them all. When it is considered, however, that colors like these lie ready and waiting in the tissues of every plant, showing themselves wherever the chlorophyll is not present in its most active form, alike in the young leaves or sprouting shoots of spring, and in the dying foliage of autumn, it is, I suppose, somewhat easier to understand how the beautiful and brilliant petals of flowers have been developed by the selective action of insects. The red and orange and blue pigments were potentially there already; the insect's part was only to seize upon and favor them whenever special circumstances happened to bring them out.