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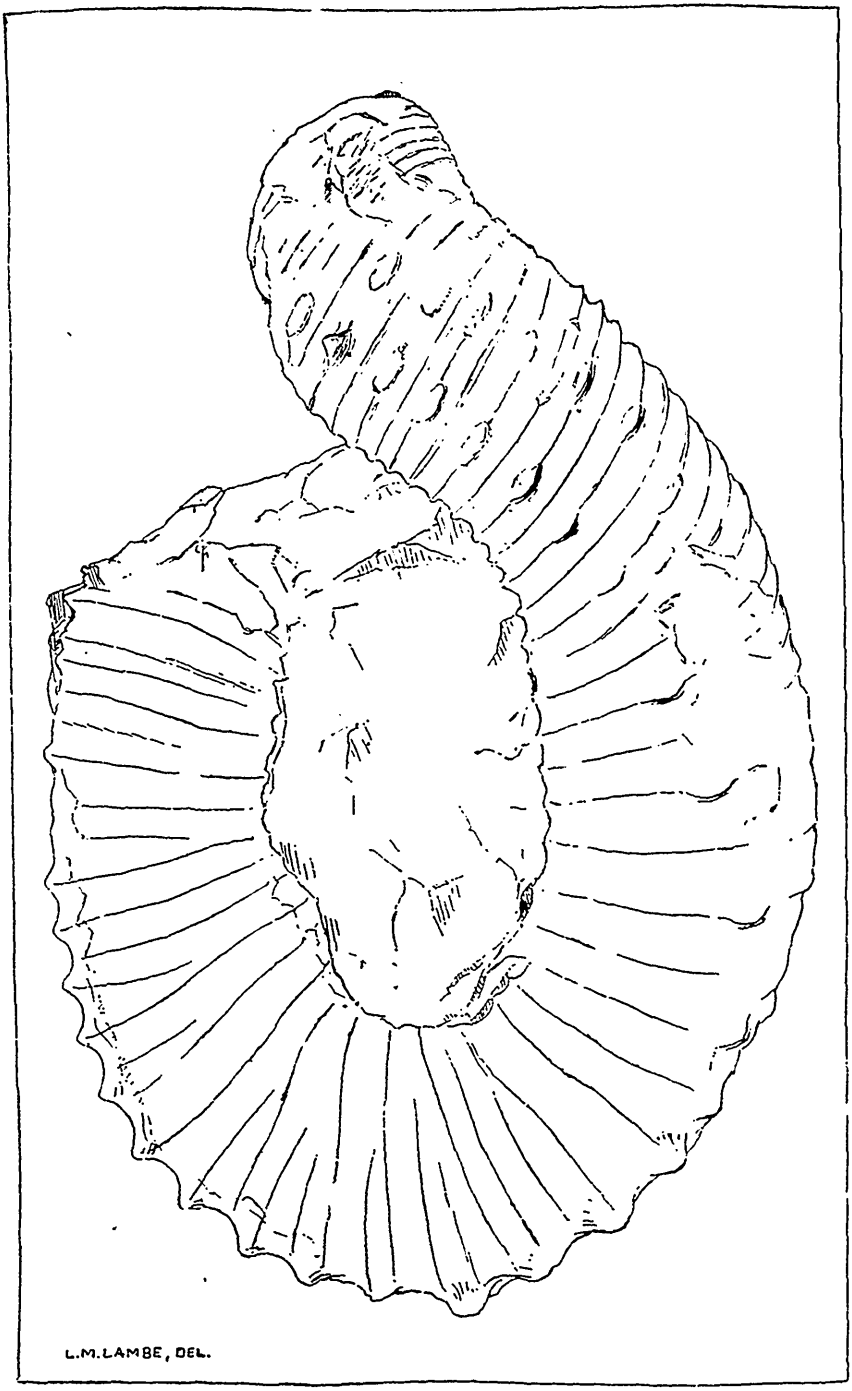

ANISOCERAS VANCOUVERENSE (Gabb).

THE

CANADIAN RECORD

OF SCIENCE.

VOL. VI. APRIL, 1895. No. 6.

NOTES ON SOME FOSSILS FROM THE CRETACEOUS ROCKS OF BRITISH COLUMBIA, WITH DESCRIPTIONS OF TWO SPECIES THAT APPEAR TO BE NEW.[1]

By J. F. WHITEAVES.

ANISOCERAS VANCOUVERENSE.

Hamites Vancouverensis, Gabb. 1864. Geol. Surv. California, Palæont., vol. I., p. 70, pl. 13, fig. 18.

Heteroceras Cooperi, Meek. 1876. U. S. Geol. and Geog. Surv. Terr., vol. II, No. 4, p. 367, pl. 3, figs. 7 and 7a. Perhaps also "?=*Ammonites Cooperi*," Gabb. 1864, Geol. Surv. California, Palæont., vol. I., p. 69, pl. 14, figs. 23 and 23a.

The original description of *Hamites Vancouverensis* is as follows: "Shell large, section elliptical, longest diameter from dorsal to ventral side. Inner width of the curve less than the diameter of the smaller arm. Surface marked by numerous sharp ribs crossing the shell, inclined obliquely forwards; well marked but diminished in size on the ventral side; largest laterally; each rib carrying a small flattened tubercle on the latero-dorsal angle; some

1. Communicated by permission of the Director of the Geological Survey of Canada.

ribs in the curve, on the ventral side, exhibit a tendency to tuberculation, but the shell being broken off at that point, their presence cannot be satisfactorily determined. Interspaces between the ribs broadly concave. Septum unknown. Figure, one-half natural size. Locality, Vancouver Island, associated with *Ammonites Newberryanus* and another Ammonite, species undetermined, and a Baculite, figured on pl. 17, figs. 28 and 28a, and pl. 14, fig 29. Closely allied, in form and ornamentation, to *H. Fremontii,* Marcou, Geol. N. America, p. 36, pl. 1, fig. 3. It differs in the ribs continuing completely across the ventral face, and in each rib carrying a node, instead of every third rib, as in Marcou's species." The specimen figured by Mr. Gabb, it may be added, has a little more than four inches of the prolonged portion of the shell preserved, and a very small piece of the reflected anterior portion.

Until quite recently, the writer had never seen a specimen of this species. In the fall of 1883, Mr. Walter Harvey, of Comox, V.I., made a remarkable collection of fossils (which has since been acquired for the provincial museum at Victoria) from the Cretaceous rocks at Denman and Hornby islands, in the Strait of Georgia. This collection was kindly loaned to the writer for examination and study, by Mr. John Fannin, the Curator of the museum at Victoria, in the spring of 1894. Besides other specimens of much scientific interest, which have been or which will be reported upon elsewhere, it contains a fine example of *Hamites Vancouverensis* or, as it should now be called, *Anisoceras Vancouverense,* from Hornby Island. The still more perfect specimen of that species represented in outline, of one-fifth less than the natural size, on the plate which accompanies this paper, was collected by Mr. Harvey at Hornby Island this year (1895) and kindly forwarded to the writer for examination.

The specimen belonging to the Museum at Victoria is a

well preserved cast of the interior of nearly the whole of the prolonged and reflected portions of the shell, with small pieces of the test remaining. Its maximum length is a little more than five inches and its marginal outline is regularly but rather broadly elliptical, as the shell is curved obliquely outward before becoming straight and prolonged. The distance between the prolonged and reflected portions is much less than the dorso-ventral diameter of the reflected portion. The surface is strongly ribbed, and many of the ribs bear a large conical tubercle on each side of the periphery, but there is much irregularity in the disposition of the ribs and tubercles. On the sides of the shell the ribs are usually simple and disposed with comparative regularity, but they occasionally bifurcate, or a short rib is intercalated between two longer ones, and two ribs frequently coalesce on both sides, at one of the tubercles on the outer margin of the periphery. In some places a single continuous rib devoid of tubercles alternates with a single tuberculated rib or with two ribs that bear a tubercle between them on each side of the periphery, but the pairs of tubercles are placed at varying distances apart longitudinally, and not rarely a little to one side of a rib rather than immediately upon it. The sutural line is nowhere visible.

The specimen figured, which is slightly distorted, is nearly eight inches in its maximum length. Although imperfect posteriorly, enough of the earlier portion of the shell is preserved to show that it is narrowly elongated, sinuous, spirally twisted and curved obliquely outward before becoming straight and prolonged, and that it does not consist of a straight shelly tube bent twice or more upon itself, as in *Hamites* proper. The spiral twist posteriorly is especially marked by the lateral position of the two rows of tubercles which ultimately border the periphery. The ribs, which sometimes trifurcate, are much narrower than the broad concave grooves between them,

and at least one of the tubercles, in the earlier portion of the shell, is prominent and acutely conical, thus giving the impression that the whole of the tubercles upon the ribs of both specimens may be the bases of spines. This specimen has convinced the writer that *Hamites Vancouverensis* is a true *Anisoceras*, allied to *A. armatum*, Sowerby, but devoid of lateral tubercles, also that the fragment from Comox described and figured by Meek as *Heteroceras Cooperi*, is probably a small piece of the abruptly bent part of *Anisoceras Vancouverense*. A similar fragment, now in the writer's possession, was collected quite recently by Mr. Harvey at Hornby Island. It is most likely also that the fragments of the shell of a cephalopod from the Chico Group of California, for which Gabb proposed the name "? *Ammonites Cooperi*," are distorted pieces of *A. Vancouverense*, and if that be the case the laws of priority may require that the species shall be called *Anisoceras Cooperi*, Gabb. (sp.), as the description of Gabb's *Ammonites Cooperi* immediately precedes that of his *Hamites Vancouverensis*.

HETEROCERAS HORNBYENSE. (Nom. prov.)

Shell dextral, depressed turbinate, much broader than high, and composed, so far as is known, of five or six rounded, ventricose volutions, which are in close contact but without embracing; spire moderately elevated; umbilicus broad and deep, exposing the whole of the inner volutions.

Surface marked with simple and not very flexuous transverse ribs. Upon the last volution one or two continuous ribs without tubercles alternate with a rib or pair of ribs which bears or bear a small but rather prominent tubercle on each side of the periphery. Usually two ribs coalesce, both above and below, at each tubercle, but occasionally a single thickened rib bears a pair of tubercles. In places, also, where the test is preserved, the surface is

seen to be marked with fine raised lines, parallel to the ribs. Sutural line unknown.

Maximum breadth of the outer volution of the largest specimen collected, nearly two inches and three-quarters.

Hornby Island, W. Harvey, 1894: two specimens, one with most of three volutions, and the other with the whole of four volutions and a part of the fifth preserved.

It is, perhaps, doubtful whether the distinctions between *Heteroceras* and *Anisoceras* can be maintained. In the one the earlier volutions are said to be always in contact, while those of the other are described as separate and as forming an irregular open spiral. The two specimens from Hornby Island for which the foregoing provisional name is suggested, are coiled in precisely the same way as the *Heteroceras Conradi* of the Mesozoic Fossils,[1] and differ therefrom only in their much finer ribs and more particularly in the circumstance that some of these ribs bear a tubercle on each side of the periphery. On the other hand, the surface ornamentation of the only known specimens of *H. Hornbyense* is so like that of *Anisoceras Vancouverense*, that it is just possible that they may prove to be specimens of the early stage of large individuals of that species.

HETEROCERAS PERVERSUM. (Nom. prov.)

Shell sinistral, but in other respects essentially similar to that of the preceding species.

Hornby Island, W. Harvey, 1894; a single specimen about an inch and three quarters in its maximum diameter, with nearly the whole of one volution remarkably well preserved.

It is not at all unlikely that the early volutions of *H. Hornbyense* may be coiled indifferently to the right or left, and if so, that this may be a mere sinistral variety of that

1. Geological Survey of Canada, Mesozoic Fossils, vol. I., part 2 (1879), p. 100, pl. 12, figs. 1-3.

shell. Or, if *H. Hornbyense* should prove to be the apical portion of *Anisoceras Vancouverense*, it may be that the apex of that species is coiled to the right in some specimens and to the left in others.

Illustrations of each of the specimens referred to in this paper will probably be published in the fourth and concluding part of the first volume of Canadian Mesozoic Fossils.

OTTAWA, March 23rd, 1895.

EXPLANATION OF PLATE II.

ANISOCERAS VANCOUVERENSE.

Side view of the most perfect specimen known to the writer. Four-fifths of the natural size.

CONTRIBUTIONS TO CANADIAN BOTANY.

By JAMES M. MACOUN.

VI.

CALTHA LEPTOSEPALA, DC.

Mount Queest, Shuswap Lake, B.C. (*Jas. M. Macoun.*) Mountains at Roger's Pass, B.C.; mountains north of Griffin Lake, B.C.; Mount Arrowsmith, Vancouver Island, alt. 5,500 feet. (*John Macoun.*) Not before recorded from Vancouver Island.

DRABA ALPINA, L., var. GLACIALIS, Dickie.

Cornwall Hills, west of Ashcroft, Thompson River, B.C., alt. 6,600 feet. (Jas. McEvoy, Herb. No. 5098.*) Not recorded west of Rocky Mountains.*[2]

LUPINUS LAXIFLORUS, Dougl.

Deer Park, Lower Arrow Lake, B.C.; Sproat, Columbia River, B.C., 1890. (*John Macoun.*)

* Whenever herbarium numbers are given, they are the numbers under which specimens have been distributed from the herbarium of the Geological Survey of Canada.

*2 The geographical limits given in this paper refer to Canada only.

LUPINUS NOOTKATENSIS, Don.

Revelstoke and Sproat, Columbia River, B.C.; mountains north of Griffin Lake, B.C. (*John Macoun.*) Mountains south of Tulameen River, B.C. (*Dr. G. M. Dawson.*) North Thompson River B.C.; Mt. Queest, Shuswap Lake, B.C.; Toad Mountain, Kootaine Lake, B.C. (*Jas. M. Macoun.*). East of Stump Lake, B.C. (*Jas. McEvoy.*) Cariboo Mountains, B.C. (*Amos Bowman.*) Not before recorded from interior of British Columbia. The above references include forms which may be ultimately separated into varieties.

MELILOTUS OFFICINALIS, Willd.

Along the streets of Banff, Rocky Mountains, and in gardens at Spence's Bridge, B.C. (*John Macoun.*) Not before recorded west of Ontario, though probably of general distribution throughout the settled parts of Canada.

MEDICAGO DENTICULATA, Willd.

On ballast at Nanaimo, Vancouver Island. (*John Macoun,* Herb. No. 125.) The var. *apiculata,* Willd, was collected by Prof. Macoun at the same place in 1887.

MEDICAGO SATIVA, L.

Ballast heaps at Nanaimo, Vancouver Island. (*John Macoun.*) Not before recorded west of Ontario.

TRIFOLIUM HYBRIDUM, L.

Medicine Hat, Assa.; Banff, Rocky Mountains; Roger's Pass, Selkirk Mountains; Nanaimo, Vancouver Island. (*John Macoun.*)

TRIFOLIUM PAUCIFLORUM, Nutt.

On gravel, Penticton, Lake Okonagan, B.C., 1889. (*John Macoun.*) Only record from interior of British Columbia.

OXYTROPIS CAMPESTRIS, DC.

Dry banks of the Upper Liard River, Lat. 60°, Yukon District, 1887. (*Dr. G. M. Dawson.*) Fort Severn, Hudson Bay, 1886. (*Jas. M. Macoun.*)

OXYTROPIS VISCIDA, Nutt.

Dry banks, Dease Lake, Lat. 58° 30′, B.C., 1887. (*Dr. G. M. Dawson.*)

VICIA AMERICANA, Muhl., var. LINEARIS, Wat.

In thickets at Nanaimo, Vancouver Island, 1887. (*John Macoun.*) Not before recorded west of Rocky Mountains.

VICIA CRACCA, L.

Meadows at Spence's Bridge, B.C., 1889. (*John Macoun.*) Not before recorded west of Ontario.

LATHYRUS OCHROLEUCUS, Hook.

Thickets at Agassiz, B.C., 75 miles from coast. (*John Macoun.*) Western limit in Canada.

LATHYRUS PALUSTER, L.

Thickets at Barclay Sound, Vancouver Island. (*John Macoun.*) Not before recorded from Vancouver Island.

PRUNUS SPINOSA, L., var. INSTITIA, Gray.

In thickets, Pelee Island, Lake Erie, 1892. (*John Macoun.*) Not before recorded from Canada. Naturalized.

PRUNUS PENNSYLVANICA, L.

Forming thickets throughout Labrador north to Lat. 54°. (*A. P. Low.*)

SPIRÆA BETULIFOLIA, Pallas.

Peel's River, Mackenzie River Delta, 1892. (*Miss E. Taylor.*) Northern limit in Canada.

SPIRÆA DISCOLOR, Pursh., var. ARIÆFOLIA, Wat.

Woods at Sicamous, B.C., and Sproat, Columbia River, B.C. (*John Macoun.*) Not before recorded from interior of British Columbia.

SPIRÆA DOUGLASII, Hook, var. NOBLEANA, Wat.

Thickets at Revelstoke, B.C., 1890. (*John Macoun.*) Not before recorded from Canada.

SPIRÆA PECTINATA, T. & G.

Peel's River, Mackenzie River, 1889. (*R. McConnell.*) Northern limit in Canada.

RUBUS STRIGOSUS, Michx.

In river valleys north to Lat. 57°, Labrador. (*A. P. Low.*) Lat. 60° 17′, Long. 103° 07′. (*Jas. W. Tyrrell.*) Peel's River, Mackenzie River Delta. (Miss E. Taylor.)

RUBUS LEUCODERMIS, Dougl.

In thickets, Deer Park, Lower Arrow Lake, B.C., 1890. (*John Macoun.*) Eastern limit.

GEUM CALTHIFOLIUM, Menzies.

Lincoln Mt., Observatory Inlet, B.C., 1893. (*Jas. McEvoy.*) Not found in Canada since Menzies' time.

GEUM MACROPHYLLUM, Willd.

Cedar Hill and Comox, Vancouver Island. (*John Macoun.*) Not before recorded from Vancouver Island.

GEUM STRICTUM, Ait.

Fort Simpson, Lat. 62°, Mackenzie River. (*Miss E. Taylor.*) Common in the vicinity of Victoria, Vancouver Island. (*John Macoun.*)

POTENTILLA GLANDULOSA, Lindl.

Eagle Pass, B.C.; Nanaimo and Mount Benson, Vancouver Island. (*John Macoun.*) Not before recorded from Vancouver Island.

POTENTILLA RIVALIS, Nutt., var. MILLEGRANA, Wat.

Borders of irrigation ditches, Spence's Bridge, B.C., 1889. (*John Macoun.*) Perhaps introduced. Not before recorded west of Rocky Mountains.

SIBBALDIA PROCUMBENS, Linn.

Mount Queest, Shuswap Lake, B.C. (*Jas. M. Macoun.*) Mountains at Griffin Lake, B.C., alt. 6,000 feet; Mount Arrowsmith, Vancouver Island, alt. 5,600 feet. (*John Macoun.*) Not before recorded from Vancouver Island.

AGRIMONIA EUPATORIA, Linn.

Moist thickets, mouth of Kootaine River, B.C. (*Dr. Geo. M. Dawson.*) Revelstoke and Agassiz, B.C. (*John Macoun.*) Not before recorded west of the Rocky Mountains.

POTERIUM CANADENSE, Benth & Hook.

Common in river valleys in Labrador, north to Lat. 58°. (*A. P. Low.*)

POTERIUM SANGUISORBA, Linn.

In fields at Spence's Bridge, B.C. (*John Macoun.*) Not recorded west of Ontario. This reference was placed by mistake under *P. annuum* by Prof. Macoun. (Cat. Can. Plants, vol. II, p. 319.)

PIRUS AMERICANA, DC.

Not rare in interior of Labrador north to Lat. 54°. (*A. P. Low.*)

SAXIFRAGA NIVALIS, Linn.

Borders of coulees, Cypress Hills, Assa., 1894. (*John Macoun*, Herb. No. 4921.) Not before recorded between Hudson Bay and the Rocky Mountains.

HEUCHERA CYLINDRICA, Dougl., var. GLABELLA, Wheelock.

H. Hallii, Macoun, Cat. Can. Plants, Vol. I., p. 158, in part.

Summit of South Kootanie Pass, Rocky Mountains. (*Dr. G. M. Dawson.*)

HEUCHERA CYLINDRICA, Dougl., var. OVALIFOLIA, Wheelock.

H. Hallii, Macoun, Cat. Can. Plants, Vol. I., p. 158, in part.

H. cylindrica, Dougl., var. *alpina*, Macoun, Cat. Can. Plants, Vol. I., p. 526.

Crow Nest Pass, Rocky Mountains; South of Kamloops, B.C. (*Dr. G. M. Dawson.*) Morley and Kananaskis, foot-hills of Rocky Mountains; Eagle Pass, B.C.; Spence's Bridge, B.C. (*John Macoun.*)

DROSERA INTERMEDIA, Drev. & Hayne, var. AMERICANA, DC.

Upper West Branch, Hamilton River, Labrador, 1894. (*A. P. Low*, Herb. No. 4998.) Not before recorded from Labrador.

LYTHRUM ALATUM, Pursh.

Damp ground, Griffin Lake, B.C., 1889. (*John Macoun.*) Not before recorded in Canada west of Ontario, though found in Colorado. It is possible that the seeds of the Griffin Lake plants were in some way introduced, though this is not probable.

ASTER PUNICEUS, L.

Lake Michikamow, Labrador, 1894. (*A. P. Low.*) Not before recorded from Labrador.

ANTENNARIA DIMORPHA, Torr & Gray.

Clay banks near the Police Barracks, Medicine Hat, Assiniboia, 1894. (*John Macoun*, Herb. No. 5052.) Not before recorded east of British Columbia.

HELIANTHUS TUBEROSUS, L.

H. doronicoides, Lam; Macoun, Cat. Can. Plants, vol. I., p. 246.

Along the Thames River at Chatham, Ont., 1894. (*John Macoun*, Herb. No. 5064.) Indigenous.

TUSSILAGO FARFARA, L.

Roadsides near Sutton Junction, Que. (*Jas. Fletcher.*) Near Toronto, Ont. (*Mrs. White.*) Along the shore of Cedar Island, Niagara River, Ont., 1894. (*R. Cameron*, Herb. No. 4941.) Not before recorded west of New Brunswick.

THELOSPERMA AMBIGUUM, Gray.

On the banks of the Saskatchewan River at Police Point, Medicine Hat, Assiniboia, May 31st, 1894. (*John Macoun*, Herb. No. 5073.) New to Canada.

GILIA MINIMA, Gr.

All references under *G. intertexta*, Steud.; Macoun, Cat. Can. Plants, Vol. I., p. 330, go here.

GILIA INTERTEXTA, Steud.

Along an old road near Victoria, Vancouver Island, 1893. (*John Macoun*, Herb. No. 658.) First Canadian record.

ECHINOSPERMUM REDOWSKII, Lehm., var. CUPULATUM, Gr.

Abundant in the vicinity of Medicine Hat, Assiniboia, 1894. (*John Macoun*, Herb. No. 5806.) Not before recorded east of British Columbia.

KRYNITKIA CRASSISEPALA, Gray.

Dry prairies near Medicine Hat, Assa., 1894. (*John Macoun*, Herb. No. 5803.) Our only Canadian specimens, though recorded from the Saskatchewan in Gray's Flora of North America.

MYOSOTIS ARVENSIS, Hoffm.

In a brook (No. 693) and on ballast (No. 694), at Nanaimo, Vancouver Island, 1893. (*John Macoun.*) Not before recorded west of Ontario.

ASPERGO PROCUMBENS, L.

Along garden fences, Whitby, Ont., 1894. (*Chas. McIllivray*, Herb. No. 4954.) New to Canada.

CONVOLVULUS ARVENSIS, Linn.

Ashcroft, B.C. (*Jas. McEvoy.*) Cedar Hill, near Victoria, and on ballast heaps at Nanaimo, Vancouver Island. (*John Macoun.*) Not before recorded west of Ontario.

SALSOLA KALI, L., var. TRAGUS, DC.

Reported from several localities in Ontario. Abundant and spreading in Manitoba.

EUPHORBIA PRESLII, Guss.

In cultivated fields near Chatham, Ont., 1894. (*John Macoun*, Herb. No. 5898.) The only specimens in our herbarium, though reported from Hamilton, Ont., by Buchan.

SAGITTARIA, Linn.

The publication of Mr. Smith's revision of the North American species of *Sagittaria* and *Lophotocarpus* in the Sixth Report of the Missouri Botanic Garden has so altered the nomenclature and has in a few instances so materially affected our knowledge of the distribution of

the species known to occur in Canada, that a complete revision of the references given by Prof. Macoun in Parts IV. and V. of his catalogue is necessary. Many additional references are also given, and the descriptions of two easily confounded species are copied from Mr. Smith's revision, as it is in the hands of very few Canadian botanists. All our herbarium specimens have been examined by Mr. Smith.

S. ARIFOLIA, Nutt. in herb.

S. variablis, var. *hastata*, Macoun, Cat. Can. Plants, Vol. II., p. 77, forms *b* and *c* in part.

Terrestrial, or emergent aquatic, weak, ascending, 2 to 4 dm. high; petioles rather stout, usually curving outward; blade of leaf 6 to 12 or 18 cm. long, arrow-shaped, acute, the margin mostly straight or arcuate, basal lobes divergent, acute or acuminate; scape weak, ascending, simple or rarely branched; bracts lanceolate, acute, 8 to 20 mm. long, scarious margined and obscurely veined, often reflexed; 1 to 3 lower verticils pistillate; fertile pedicels ascending, 15 to mostly 25 mm. long, or sometimes almost wanting; fruiting head round, 8 to 15 mm. in diameter; achenium 2 mm. long, tumid winged on both margins, the sides smooth, or often with a vertical subepidermal resin passage. Phyllodia of two forms, either long, slender, petiole-like, or flattened, linear-lanceolate, 2 to 5 dm. long and 10 to 15 mm. wide.

Grande Vallée, Gaspé, Que.; Nipigon River, Ont.; Hand Hills and Eagle Hills, Alberta; Sicamous, B.C.; Kamloops, B.C. (*John Macoun.*) Manitoba. (*Bourgeau.*) Moose Mountain Creek, Assa. (*Jas. M. Macoun.*)*

S. CUNEATA, Sheldon.

S. variabilis, var. *diversifolia*, Macoun, Cat. Can. Plants, Vol. II., p. 78, in part.

* No localities are given in this paper except those from which there are specimens in the herbarium of the Geol. Survey, or which are included in Mr. Smith's revision.

S. variabilis, var. *gracilis,* Macoun, Cat. Can. Plants, Vol. II., p. 78, in part.

Eagle Hills, Alberta; Sicamous, B.C. (*John Macoun.*) South Thompson River, B.C. (*Dr. G. M. Dawson.*)

S. LATIFOLIA, Willd.

Monœcious, with the lower verticils fertile, or diœcious; scape 1 to 12 dm. high, angled, simple or branched; flowers large, 2 to 4 cm. wide, the petals white; stamens numerous, 25 to 35; fertile pedicels shorter than the sterile; bracts sometimes connate in the upper verticils, acute, acuminate, or obtuse, not scarious; achenium broadly winged on both margins, 2.5 to 3.5. or rarely 4 mm. long, with a lateral horizontal or curving beak $\frac{1}{4}$ to $\frac{1}{3}$ its length, sides usually smooth or with a costate angle curving downward from the base of the beak, rarely with a sub-epidermal resin passage on each face.

Mr. Smith recognizes five forms of this species, two of which with the species proper are found in Canada.

S. latifolia, proper.

S. variabilis, var. hastata, form *a,* Macoun, Cat. Can. Plants, Vol. II., p. 77; in part.

North Pond, and Mt. Stewart, Prince Edward Island; Nation River, near Casselman, Ont. (*John Macoun.*) Ottawa, Ont. (*Wm. Macoun.*) Little Buffalo Lake, Sask. (*Jas. M. Macoun.*)

Form a.

S. variabilis, var. obtusa, Macoun, Cat. Can. Plants, Vol. II., p. 77, in part.

S. variabilis, var. angustifolia, Macoun, Cat. Can. Plants, Vol. II., p. 78, in part.

Campbellton, N.B. (*R. Chalmers.*) Nation River at Casselman, Ont.; Belleville, Ont. (*John Macoun.*)

Form c.

S. variabilis, var. hastata, forms *b* and *c*, Macoun, Cat. Can. Plants, Vol. II., pp. 77 and 78, in part.

Prince Edward Island; Bay of Quinté, Ont.; Lulu Island, mouth of Fraser River. (*John Macoun.*) New Brunswick. (*Chadborne.*) Lake Temiscouata, Que. (*Northrup.*) Missinaiba River, Ont. (*Dr. R. Bell.*) Manitoba. (*Bourgeau.*) Muskeg Island, Lake Winnipeg, Man. (*Jas. M. Macoun.*)

S. LATIFOLIA, Willd., var. PUBESCENS, (Muhl.) J. G. Smith.

S. variabilis, var. *pubescens,* Macoun, Cat. Can. Plants, Vol. II., p. 78.

Specimens collected in the Bay of Quinté, Ont., by Prof. Macoun, with pubescent bracts that are transition forms between this variety and the dicœcious form *a* of the species have been referred here by Mr. Smith.

S. RIGIDA, Pursh.

S. heterophylla, and var. *rigida,* Macoun, Cat. Can. Plants, Vol. II., pages 78 and 79.

Abundant in many places about Ottawa, Ont. (*Fletcher, Fl. Ott.*) In several places in the vicinity of Belleville, Ont., and Weller's Bay, Lake Ontario. (*John Macoun.*)

S. GRAMINEA, Michx, Macoun, Cat. Can. Plants, Vol. II., p. 79.

Newfoundland. (*Miss Brenton*). North Sydney, Cape Breton, N.S.; Gull River, Victoria Co., Ont. (*John Macoun.*) Several stations in New Brunswick. (*Fowler's Cat.*) Little Tobique River, N.B. (*G. U. Hay.*) Lake Muskoka, Ont. (*Dr. Burgess, Dr. Britton* and *Miss Timmerman.*)

LOPHOTOCARPUS CALYCINUS, (Engelm.) J. G. Smith.

Sagittaria calycina, var. *spongiosa*, Macoun, Cat. Can. Plants, Vol. II., p. 78.

Several stations in New Brunswick. (*Fowler, Cat.*)

LISTERA AUSTRALIS, Lindl.

Poplar Ridge, Mer Bleue, near Ottawa, Ont., June 21st, 1893. (*Jas. Fletcher.*) New to Canada. Recorded in *Ottawa Naturalist.*

SCIRPUS SUBTERMINALIS, Torr.

In the Columbia River at Revelstoke, B.C., 1890. (*John Macoun*, Herb. No. 7372.)

ELEOCHARIS ROSTELLATA, Torr., var. OCCIDENTALIS, Wats.

Near Ainsworth, Kootaine Lake, B.C., 1890. (*John Macoun*, Herb. No. 7386.) Not before recorded from B.C. mainland.

AGROPYRUM VIOLACEUM, Hornm.

East Main River, near James Bay. (*A. H. D. Ross.*) Attikanak Branch, Hamilton River, Labrador. (*A.P.Low.*) Not before recorded from Labrador.

THE GOLD DEPOSITS OF MOUNT MORGAN, QUEENSLAND.*

By FRANK D. ADAMS, Ph.D., McGill University.

Mount Morgan is situated just within the tropics, about twenty-six miles south-west of Rockhampton, in central Queensland, and its gold deposits are among the most remarkable ever discovered, not only on account of their extraordinary richness, but also on account of the purity of the gold. Numerous and varied tales are told of the

* Jack, Robert L.—Report on the Mount Morgan Gold Deposits, reprinted from an official report of 21st November, 1884.

Rickard, T. A.—"The Mount Morgan Mine, Queensland."—Trans. Am. Inst. Mining, Eng., Vol. XX., p. 133, 1892.

first recognition of their value, but the best authenticated facts are as follows: The property forms part of a block of 640 acres originally taken up in 1873 for grazing purposes by one Donald Gordon. The Brothers Morgan held land in the same district, and were one day shown by Gordon a fragment of gold-bearing quartz which he had picked up in Mundic Creek. For a consideration, said to have been £20 and as much whiskey as he could drink, Gordon agreed to show them the locality where the specimens had been found. On the hill overlooking the creek he showed them the silicious ironstone that carried visible gold, and they found by sending samples to Sydney that it was even richer than they had imagined, so they purchased Gordon's holding at £1 per acre.

The three Morgans subsequently sold, first a part, and eventually the whole of their interest in the mine. In 1886 a company was formed with a capital of one million shares of £1 each. These shares rose, toward the end of 1888 to £17 5s. (about $86.25) giving the mine a market value of seventeen and a quarter millions sterling, or over eighty-six million dollars.

In one year, ending November 30th, 1889, the Mount Morgan mine produced 75,415 tons of ore, yielding a little over 323,542 ounces of gold, worth $6,657,424, and permitting the payment of $5,500,000 in dividends. The yield per ton was 4 oz., 6 dwts., 4 grs., while the working cost was, as is seen, only 17 per cent. of the value of the product. The yield has now fallen off somewhat, though the mine is still very productive, affording last year 119,900 ounces of gold, and paying dividends to the value of nearly $1,500,000.

The mine does not, as the name would imply, crown the summit of a mountain properly so called, but forms a quarry at the top of a hill only 500 feet above the village at its base, and 1,225 feet above sea level, surrounded by very broken, hilly country and almost encir-

cled by a small stream (Mundic Creek) and is in many respects distinct in position and geological structure from the hillocks about it. The crest of the hill is being rapidly broken away in the quarrying operations, from 1200 to 1700 tons per week being removed.

In a report published in 1884, Mr. Robert L. Jack, the Government Geologist of Queensland, described this remarkable deposit and put forward an explanation of its origin. This report has, after a lapse of some ten years, been reprinted with a few notes and corrections, and the following extract from it presents Mr. Jack's views as to the mode of occurrence and genesis of the deposit:—"In the immediate neighbourhood of Mount Morgan the country rock consists mainly of bluish-grey quartzite—a fine-grained siliceous sandstone, now more or less vitrified—full of minute crystals of iron pyrites and specks of magnetic iron-ore, greywackes of the ordinary type; hard, fine-grained sandstones or mingled siliceous and feldspathic materials, now somewhat indurated; and lastly, occasional masses of shale hardened to a flinty consistency,—and a few belts of serpentine. The strata are of cretaceous age, and the sandstones above mentioned are sometimes charged with auriferous pyrites to a remarkable extent, and although large tracts of these pyritiferous quartzites are too poor to be worked, recent explorations have disclosed a large body assaying from half an ounce up to 174 ounces of gold to the ton. "As the stratified rocks in this locality appear to have been in thick beds, and as their metamorphism has gone to a considerable length, it is not easy to be certain of either dip or strike. The stratified rocks are, moreover, interrupted and intersected in every direction by dykes and other intrusive masses of dolerite (itself altered by the substitution of viridite for augite or olivine), trachyte and other igneous rocks, the intrusive masses apparently occupying as much space as the remnant of the original stratified formation itself.

The work is carried on in two quarries or faces. No. 1 cuts into the hill from a level of about 25 feet below the summit, and is designed simply to remove the top of the mountain for the purpose of passing it through the stampers. No. 2, or Magazine Quarry, presents the aspect of a "sidling" road cut out of a steep hill, and attacks the auriferous deposit at a level of about 100 feet below No. 1. "The central portion of the upper cutting is a large mass of brown haematite ironstone, generally in great blocks (up to some tons in weight), with a stalactitic structure, as if the iron oxide had gradually filled up cavities left in the original deposit. The ironstone contains gold of extraordinary fineness, which, however, after a little practice, can be detected in almost every fresh fracture. The ironstone is more or less mixed with fine siliceous granules. Gradually to the right and left of the central mass the silica more and more replaces the ironstone. It is a frothy, spongy, or cellular sinter, sometimes so light, from the entanglement of air in its pores, that it floats in water like pumice. Fine gold is disseminated throughout this siliceous deposit as well as in the ironstone. Near the west of the cutting is a vertical dyke of kaolin mixed with fine siliceous granules, passing into pure kaolin with some silicates of magnesia, including a fine variety of French chalk.

I selected a number of specimens as characteristic of the various deposits of the upper cutting. These, when assayed by Mr. Karl Staiger, City Analyist, Brisbane, gave the following results:—

No. 5.—Stalactitic brown haematite from middle of cutting, 6 oz., 11 dwt., gold per ton.

No. 6.—Siliceous sinter, veined with quartz, 4 oz., 5 dwt., gold per ton.

No. 7.—A mixed mass of ironstone and silica from level of the road, east of the dyke, 5 oz., 3 dwt., gold per ton.

No. 8.—Iron stained siliceous sinter from west side of dyke, 10 oz., 14 dwt. of gold per ton.

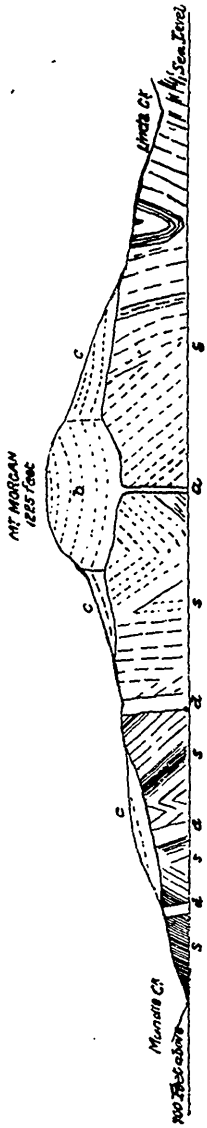

Figure 1.—Section across Mount Morgan.

A, pipe of geyser (theoretical); b, deposit cup of geyser; c, overflow deposit of geyser; s, metamorphic rocks; d, dolerite dyke.

Down the hillsides to the north, west and south, similar deposit is everywhere met with, a frothy, spongy matrix, sometimes aluminous and sometimes siliceous, generally ironstained, and occasionally associated with large masses of red and brown haematite, but gold has as yet only been obtained from a few places away from the hill-top, although naturally there has been vigorous prospecting wherever the "formation" resembles that of Mount Morgan.

After a careful study of the whole formation I have come to the conclusion that nothing but a thermal spring in the open air could have deposited the material under consideration. The frothy siliceous sinter agrees in every respect with the deposits of the New Zealand and Iceland geysers and of the still more wonderful hot springs of the Yellowstone National Park, so graphically and scientifically described by Dr. A. C. Peale (12th Annual Report of the United States Geological and Geographical Survey of the Territories, Part II., Section 2, "On the Thermal Springs of the Yellowstone National Park," Washington,

1883.) The frothy and cavernous condition of the siliceous sinter of Mount Morgan may be accounted for by the escape of steam while the silica was yet (after deposition on the evaporation of the water) in the gelatinous condition so frequently observed in the deposits of hot springs. The aluminous silicates represent the familiar outbursts and flows of mud. The iron oxide appears to have been deposited in some cases along with the silica and alumina, and in others to have been developed later —its solvent fluid having been, as it were, injected into the interstices and caverns of the silica and alumina. In some cases it may have been originally pyrites, as it now and then occurs in cubical hollows. Calcareous sinter is very common in siliceous springs, and its absence from Mount Morgan must needs imply the local absence of limestones among the rocks from which the spring is fed. The silica would be found abundantly in the quartzites and the alumina in the shale and greywackes of the country rock in the neighbourhood, and possibly both silica and alumina may have come in part from a deep seated underlying granite. The gold, and to some extent the iron, may have been dissolved out of iron pyrites of such reefs as the "Mundic Reef" seen in Mundic Creek.

In such active geysers as are accessible to observation, we find a narrow pipe or fissure, terminating upwards in a crater-like cup or basin. The Great Iceland Geyser, for example, has a pipe 12 feet in diameter, which has been sounded to a depth of 70 feet. I have seen no satisfactory explanation of the necessity for a cup, nor can suggest one, but all the same the repeated ocurrence of the cup evidently takes place in obedience to some natural law. It may be taken for granted that the Mount Morgan geyser was no exception to the rule, and I believe that that upper portion of the Mount where ironstone predominates, and to which gold is almost confined, represents a basin occasionally filled with a fluid in which iron,

alumina, manganese and gold were held in solution, to be deposited when the bulk of the water from time to time withdrew into the pipe or the subterranean reservoirs with which the pipe communicated. The overflow of the ejected fluid left a siliceous, aluminous and ferruginous deposit on the slope of the hillside, but the gold does not appear to have been deposited to any extent beyond the limit of the basin. It may be remarked that "prospects" of gold have been obtained in a few localities in the overflow deposit. In such cases it may be a question whether the gold was carried down the overflow or whether it emanated from some subsidiary springs, which, in such cases as our experience of active geysers has shown, are pretty sure to break out in the vicinity of the main overflow. "Callan's Knob," for instance, is suggestive of one of these smaller springs.

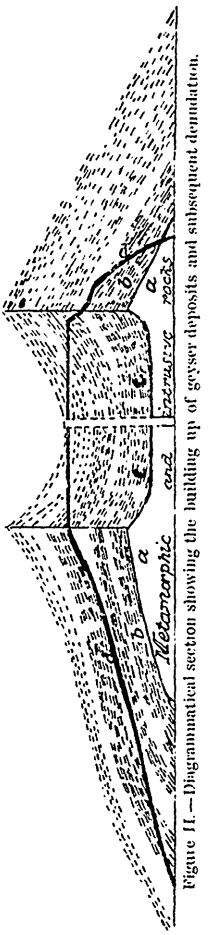

Figure II.—Diagrammatical section showing the building up of geyser deposits and subsequent denudation.

The accompanying diagramatic section (Figure II.) represents my idea of what would take place in the case of a geyser remaining in activity for a, geologically speaking, lengthened period. The original form of the ground may be taken to have been the line (a a). At the end of an outburst the sides of the hill would be covered with a deposit of precipitated material (b b), while on the recession of the water from the cup, a film or layer of solid material (c c) would be deposited on its sides and bottom. If we suppose the cup to be a necessity

arising from the operation of a natural law, as it seems to be, the continued action of the geyser must result in the building up of a cylindrical cup-deposit, surrounded by an overflow-deposit resembling a series of cased saucers placed upside down with the bottom knocked out. Whether the different physical and chemical conditions under which the solvent in the cup and that which overflowed precipitated their solid materials, is sufficient to account for the presence of gold in one deposit and its absence (or scarcity) in the other, is a question which I leave to chemists. As a matter of fact, this appears to have been the case in Mount Morgan."

"After the cessation of thermal activity, the powers of sub-aerial denudation would come into play and might carve down the hill till the line d. d. should represent the surface contour of to-day. Such, I believe, is the history of Mount Morgan as we now see it. Denudation would obliterate the lateral terraces which are so familiar a feature of the scenery of every important geyser district in New Zealand and the Yellowstone, and which were probably not absent from the slopes of Mount Morgan. Mud pipes and other evidences of the outbreak of hot water and gases from minor vents would be removed by the same process."

Since the report from which the above quotations were taken, was written, some ten years have elapsed, and continuous work on a large scale has opened up and revealed many additional details concerning this most interesting ore body.

The supposed "over-flow deposit" is now recognised by Mr. Jacks as consisting merely of altered and weathered portions of the country rock.

So that Figure II. and also Figure I., so far as the overflow deposit is concerned, although they have found their way into scientific publications the world over, are quite erroneous. The pipe also which Mr. Jack states to

be "theoretical," has not been discovered, although the mountain has been traversed by a number of adits and cross-cuts, in addition to extensive surface excavations.

In a second report, however, dated December 12, 1888, Mr. Jack says, "The evidence now on hand goes far to confirm my original view that the auriferous material was deposited by a thermal spring." But it seems clear that if the supposed evidences of deposition in the open air are found to be fallacious, and we have merely an instance of the deposition of auriferous material in a mass of shattered rock by the agency of heated waters, these deposits, which have been considered a remarkable instance of a most unusual mode of occurrence of the precious metals, must be relegated to the large class of ore deposits known to have originated in the way just referred to, and of which the Comstock Lode and other similar deposits are examples. Recent developments, although showing the supposed overflow deposit to be non-existent, and failing to reveal any geyser pipe, have shown the ore body to be confined to the upper portion of the mountain.

Mr. Rickard believes the history of the deposit to be as follows:—

"A period of dynamic disturbance is indicated by the intrusion of dolerite, which, by extreme metamorphism might have changed a dolomite into the serpentine we now see; would have indurated the shales so that they are scarcely to be distinguished from the crystalline rocks, and would also, accompanied by chemical alteration, change a ferruginous red sandstone into bluish-grey, highly pyritiferous quartzite. Approaching the surface the same energy would be expended in fracturing the quartzite and greywacke, the intrusive dolerite would rise through the fissures in the shattered rock, forming dykes, which, meeting a silico feldspathic granular rock (the greywacke) would give it a semi-crystalline character. The sandstone would similarly be vitrified. Later move-

ments would result in the further intersection of this part of the district by the numerous dykes, the decomposed remains of which are now to be seen ramifying through the deposit. Those gradual chemical interchanges would take place which resulted in the alteration of the shattered country rock, and its becoming a portion of the gangue enclosing the auriferous material, which was then or at a later time, deposited. In process of time, sub-aerial denudation removed the sandstone which now is only to be seen on the further summits of the neighboring hills. Atmospheric agency continued to carve away the less siliceous and less porous portions of the country surrounding the deposit, until Mount Morgan, owing to the pervious quartzose nature of its crest, remained as a low hill in an undulating country."

Which of these views is correct, further developments of the property will probably decide.

The character of the Mount Morgan gold itself is also highly interesting. Loch, in his work on gold, published in 1882, says, "no gold has yet been found in nature unalloyed with silver," but the gold which occurs so abundantly in this great deposit is almost free from silver, assaying about 99.7 per cent. of gold, the rest consisting of copper with a trace of iron; the gold being, it is believed, the purest native gold hitherto found.

Argon.

The announcement of the probable existence of a new element in the atmosphere, made by Lord Rayleigh and Professor Ramsay at the meeting of the British Association last summer, aroused the profound attention of the scientific world. A large number of elements have been discovered in the last quarter of a century, but all of them are metallic substances which occur in minute quantities in rare minerals. The latest addition to the list of non-metallic elements was bromin, discovered nearly seventy years ago, and the existence of an undiscovered element belonging to this group did not appear probable. Still less likely did it seem that such an element could be present in the atmosphere. Our knowledge of the air was satisfactory and complete. Innumerable analyses had established the facts in regard

to its composition. Hence the announcement above referred to was met with much scepticism, in spite of the eminent character and skill of the men who made it; and the whole chemical world has waited anxiously and impatiently for a full account of the work. This has now been given in a paper by Lord Rayleigh and Professor Ramsay, which was read before the Royal Society at a special meeting on January 31. The long delay between the preliminary announcement and the presentation of the paper is fully accounted for by this statement of Lord Rayleigh's:

"The research has been in many respects a very difficult one. I am not without experience in experimental difficulties, but certainly I have never encountered them in anything like so severe and aggravating a form as in this investigation. Every experiment that one attempts takes about ten days or a fortnight to carry out to any definite conclusion, and the result has been of necessity much less progress than we could have hoped for, and many of the questions have been left open that we could have wished to settle."

The history of the discovery is in brief as follows: In the course of a series of determinations of the densities of some of the more permanent gases, Lord Rayleigh found in the case of nitrogen that if obtained from chemical compounds it was about one-half per cent. lighter than if extracted from the atmosphere. This discrepancy was naturally thought at first to be due to contamination with impurities consisting of known substances. When experiment had demonstrated that this was not the case, the dissociation of the molecules of the nitrogen derived from chemical sources into detached atoms suggested itself as a possible explanation of its greater lightness. But both gases subjected to the action of the silent electric discharge retained their densities unchanged. This was discouraging, and a further experiment of a different kind disposed of this explanation in a still more decisive manner. It was exceedingly improbable that the nitrogen of chemical origin could be a mixture, as that would necessitate the existence of two kinds of nitric acid. The simplest remaining explanation was to admit the existence of a second ingredient in the nitrogen obtained from the atmosphere. If the supposed gas had a density half as much again as that of nitrogen, the presence of one per cent would suffice to explain the observed differences in density. This explanation brought the investigators face to face with the great improbability that a gas all about us and present in such enormous quantity could have remained so long unsuspected. Its demonstration demanded the isolation and identification of the new gas, and to the solution of this problem the research was now directed.

It is interesting to note here that Cavendish, more than a hundred years ago, in his careful and exact study of atmospheric nitrogen, had really raised this same question of possible admixture with another gas.

Describing his attempts to cause a complete union of atmospheric nitrogen with oxygen by means of the electric spark, he says: "If there is any part of the phlogisticated air (nitrogen) of our atmosphere which differs from the rest and cannot be reduced to nitrous acid, we may safely conclude that it is not more than 1-120th part of the whole." Cavendish, however, laid no emphasis on this residual 1-120th, except as indicating by its minuteness the great purity of the nitrogen from air. But in these days science no longer neglects "residual phenomena," and has found, in many cases before this, abundant evidence of the valuable results to be obtained by a study of them.

In the first attempts to isolate the suspected gas, Cavendish's method was employed. Electric sparks were passed through air confined over weak alkali, and oxygen gradually added till in excess. The products of the union of nitrogen and oxygen caused by the spark were absorbed by the alkali, and finally, when no further absorption took place, the excess of oxygen was removed by alkaline pyrogallate. A residue was obtained which was in all instances proportional to the amount of air operated upon.

Another method of isolating argon, and which also serves for preparing it in considerable quantities, is as follows: Air from which moisture and carbon dioxide have been removed is freed from oxygen by passing it over red-hot copper, and from nitrogen by magnesium turnings heated to a bright redness. The removal of the last portions of nitrogen is a tedious operation, requiring some two days, when the residual gas is found to be pure argon.

The gas obtained by either of these methods has a density one-fourth greater than oxygen (16.20), and dissolves in water about two and a-half times as freely as nitrogen. On account of its solubility, it is present in larger proportion in the gases dissolved in rain-water than in the air, as is indicated by the fact that "nitrogen" prepared from the gases expelled from water has a higher density than that from air,

The spectrum of argon has been examined by Professor Crookes. who finds that "No other spectrum-giving gas or vapor yields spectra at all like those of argon," and says further, "As far, therefore, as spectrum work can decide, the verdict must be that Lord Rayleigh and Professor Ramsay have added one if not two members to the family of elementary bodies."

Professor Olszewski of the University of Cracow, well known for his researches on the liquefaction of air and other gases, was furnished with 300 cc. of argon for the determination of its behaviour at low temperatures and high pressures. He reports that it can be liquefied only when its temperature is reduced (by liquid ethylene) to —121° C., and that the necessary pressure at that temperature is 50.6 atmospheres; or, in other words, that its "critical temperature and pressure" are —121° and 50.6 at. respectively. Its boiling-point is

—186.9° C.; it freezes to an ice-like mass at —191°, and melts at —189.6°. In its behaviour at low temperatures it stands between oxygen and nitrogen, whose critical temperatures are —118° and —146° respectively, and whose boiling points are —182.7° and —194.4°.

Chemically, argon appears to be more inert than nitrogen, all attempts to induce chemical action with even the most active substances having proved abortive.

The facts so far obtainable do not warrant a final decision in regard to its simplicity. If not an element, it is a mixture. There is evidence on both sides, but the balance seems to be in favor of simplicity. Not only does argon appear to be a single elementary substance, but its molecules are apparently of simplest possible structure. A determination of the ratio of its specific heats at constant volume and constant pressure points to the conclusion that its molecules are monatomic, *i. e.*, composed of a single atom each, instead of two atoms, as is the case in almost all elementary gases and vapors.

Certain very interesting and important theoretical issues are raised by this conclusion. In connection with the density which the gas has, it indicates an atomic weight of 40. But in this case there is no place for the new element in the tables of Mendeleieff, which express the periodic law, and which have been so generally accepted. If argon should turn out to be a mixture, the difficulty may dissappear, but if its simple character is finally demonstrated, an awkward dilemma is offered between the validity of the periodic law and that of the conclusions drawn from the determinations of specific heat ratios. The periodic law of Mendeleieff is, after all, as Professor Rücker has said. "an empirical law, which rests on no dynamical foundation." The present situation will strengthen many chemists in their feeling that, although the law is a generalization which has in it many elements of truth, and has hence proved of much value to chemistry, it is by no means a complete or final expression of the relations of the elements.

The discovery of argon is a brilliant achievement. As Professor Crookes said before reading his paper on the spectra of argon, "Here we have a new chemical element, the principal properties of which seem to be the negation of all chemical properties. Chemists will understand how difficult it is to deal with anything which forms no compounds and unites with nothing. The discovery commenced by a prediction, followed after an interval by realization. . . . The prediction and discovery of argon are only equalled by the few discoveries . . . made . . . by the careful study of the periodic law, and to surpass it we must go back to the predicted existence and subsequent discovery of an unknown planet by Adams and Leverrier."
—THE NATION.

Some of the Rarer Summer-Flowers of Canada.

By Robert Campbell, M.A., D.D., Montreal.

It may help to a knowledge of the distribution of plant life in the Dominion, to give a list of the rarer plants picked up in different parts of the country, which have been visited in the summer season, either in the way of duty or pleasure. It was the writer's privilege lately to spend a couple of weeks in South Western Ontario. During that time it was his good fortune to meet with the botanical section of the Natural History Society of London, Ontario, and to spend a few hours with them in field work on and near the banks of the Thames. This expedition was fruitful in the acquisition of not a few specimens, found in Canada only in that district. Anyone familiar with Professor Macoun's Catalogue of Canadian Plants is aware how largely he drew, in compiling it, from the collection made by Dr. Burgess, in the London district. The county of Lambton was also visited lately, —the town of Forest, and the shores of Lake Huron at Kettle and Stony Points, and several captures were made in that region of specimens not often found further east. Galt, Brantford, the County of Lanark, Sherbrooke, Cacouna, Cap-a-L'Aigle and St. John, New Brunswick, all have yielded their quota of the following, now embraced in my collection :—

Anemone nemorosa, L.—Sherbrooke and Hyde Park, Toronto.

Ranunculus multifidus, var. terrestris, Gray.—Township of Drummond, Ont.

Ranunculus repens, L.—Banks of the Thames, London.

Ranunculus Pennsylvaticus, L.—Woods near Brantford.

Delphinium ajacis, L.—Township of Dundee, Quebec.

LIRIODENDRON TULIPIFERA, L.—Kettle Point, Lake Huron.

MENISPERMUM CANADENSE, L.—London, Forest, St. Rose, Island of Jesus, Montreal Island.

PODOPHYLLUM PELTATUM, L.—London, Forest, Brantford, Galt.

SARRACENIA PURPUREA, L.—St. Martin, Island of Jesus.

ADLUMIA CIRRHOSA, Raf.—Brantford, Beauharnois.

DICENTRA CANADENSIS, DC.—Montreal Island, Smith's Falls.

DICENTRA CUCULLARIA, DC.—Montreal Island.

CARDAMINE ROTUNDIFOLIA, Michx.—Montreal Island.

ARABIS DRUMMONDII, Gray.—Rocks above wharf at Point-a-Pic, Murray Bay. (*Arabis confinis*, Watson.)

ARABIS CANADENSIS, L.—Montreal Mountain.

SISYMBRIUM SOPHIA, L.—Lachine.

NASTURTIUM PALUSTRE, var. HISPIDUM, DC.—Huntingdon.

NASTURTIUM ARMORACIA, Fries.—Philipsburgh, Cote des Neiges.

CAKILE AMERICANA, Nutt.—Cacouna, Cap-a-L'Aigle.

VIOLA RENIFOLIA, Gray.—Lachine.

SOLEA CONCOLOR, Ging.—Near London, Ont. (*Ionidium concolor*, Barth & Hook.)

SILENE ARMERIA, L.—Field above Hochelaga.

LYCHNIS VESPERTINA, Sibth.—Dundee, Q., London, Forest.

LYCHNIS, FLOS-CUCULI, L.—Banks of Grand River, Galt.

ARENARIA CAROLINIANA, Watt.—Brantford.

ARENARIA GRŒNLANDICA, Spreng.—Cap-a-L'Aigle.

ARENARIA MICHAUXII, Hook.—Stony Point, Lake Huron.

STELLARIA PUBERA, Michx.—Port-a-Persil, Q.

CERASTIUM ARVENSE, var. OBLONGIFOLIUM, Holl & Brit.—Near St. John, N.B., Cacouna.

HOLOSTEUM UMBELLATUM, L.—Kettle Point, Lake Huron.

BUDA MARINA, Dumort.—Cacouna Island.

HYPERICUM ASCYRON, L.—Fergus, Ont., St. Scholastique, Q.

HYPERICUM ELLIPTICUM, Hook.—Bathurst, Ont.

HIBISCUS SYRIACUS, Niles.—Illinois.

LINUM STRIATUM, Walter.—Township of Drummond, Ont.

GERANIUM MACULATUM, L.—Brantford, London.

ILEX VERTICILLATA, Gray.—Eastern Townships, Q., St. John, N.B.

NEMOPANTHES FASCICULARIS, Rap.—Cap-a-L'Aigle, Labelle, St. John, N.B.

EUONYMUS ATROPURPUREUS, Jacq.—London, Ont.

EUONYMUS AMERICANUS, var. OBOVATUS, Torr & Gray.—Galt.

RHAMNUS ALNIFOLIA, L'Her.—Forest, Ont.

STAPHYLEA TRIFOLIA, L.—London, Ont.

NEGUNDO ACEROIDES, Mœnch.—Galt, Calumet, Montreal.

VITIS RIPARIA, Michx.—St. Rose, Kettle Point, Lake Huron.

RHUS COPALLINA, L.—Cap-a-L'Aigle.

RHUS CANADENSIS, var. TRILOBATA, Gray.—Kettle Point, Lake Huron.

POLYGALA POLYGAMA, Watt.—London, Ont.

POLYGALA SENEGA, L.—Brantford.

TRIFOLIUM ARVENSE, L.—Rabbit-foot clover—Cap-a-L'Aigle.

ASTRAGALUS COOPERI, Gray.—Near London, Ont.

VICIA HIRSUTA, Koch.—Cap-a-L'Aigle.

VICIA TETRASPERMA, Loisel.—Mount Royal Park.

VICIA CAROLINIANA, Watt.—Murray Bay.

APIOS TUBEROSA, Boer.—Huntingdon, Island of Montreal.

SPIRÆA LOBATA, Jacq.—Queen of the Prairie—St. Lambert's.

PHYSOCARPUS OPULIFOLIUS, Maxim.—Beaconsfield, Island of Montreal.

RUBUS CHAMÆMORUS, L.—Saguenay, Port-a-Persil.

RUBUS CANADENSIS, L.—Near St. John, N.B.

GEUM MACROPHYLLUM, Willd.—St. John, N.B.

GEUM VIRGINIANUM, L.—Island of Montreal.

WALDSTEINIA FRAGARIOIDES, Tratt.—Hyde Park, Toronto.

POTENTILLA RIVALIS, Natt.—Cacouna, Cap-a-L'Aigle.

POTENTILLA FRUTICOSA, L.—Island of Montreal.

POTENTILLA TRIDENTATA, Ait.—Cap-a-L'Aigle.

POTENTILLA CANADENSIS, L.—Island of Montreal.

POTERIUM CANADENSE, Benth & Hook.—Cacouna, Island of Montreal.

PYRUS CORONARIA, L.—Galt.

PYRUS ARBUTIFOLIA, L.—Near St. John, N.B.

CRATAEGUS COCCINEA, var. MACRACANTHA, Dudley—Mount Royal Park.

CRATAEGUS TOMENTOSA, var. PYRIFOLIA, Gray.—Mount Royal Park.

CRATAEGUS PUNCTATA, Jacq.—Mount Royal Park.

CRATAEGUS COCCINEA, var. MOLLIS, Torr & Gray.—Mount Royal Park.

SAXIFRAGA AIZOIDES, L.—Point-a-Pic, Murray Bay.

SAXIFRAGA STELLARIS, var. COMOSA, Willd.—Point-a-Pic.

PARNASSIA CAROLINIANA, Michx.—Galt, Island of Montreal, Cacouna.

SEDUM ACRE, L.—Galt, London, Ont.

HAMAMELIS VIRGINIANA, L.—Galt.

DECODON VERTICILLATUS, Ell.—Beauharnois, Montreal.

EPILOBIUM ANGUSTIFOLIUM, var. CANESCENS, Wood.—Kettle Point, Lake Huron, Salmon River.

LIGUSTICUM SCOTICUM, L.—Cap-a-L'Aigle.

THASPIUM AUREUM, Nutt.—Sherbrooke.

CŒLOPLEURUM GMELINI, Ledeb.—St. Helen's Island.

PIMPINELLA INTIGERRIMA, Benth & Hook.—Montreal Mountain, Kettle Point, Lake Huron.

CONIUM MACULATUM, L.—Huntingdon.

BERULA ANGUSTIFOLIA, Hook.—Huntingdon.

CICUTA BULBIFERA, L.—Orangeville.

VIBURNUM OBOVATUM, Watt.—Kettle Point, Lake Huron.

TRIOSTEUM PERFOLIATUM, L.—Galt.

CEPHALANTHUS OCCIDENTALIS, L.—Kettle Point, Montreal Island.

HOUSTONIA ANGUSTIFOLIA, Michx.—Brantford.

HOUSTONIA CÆRULEA, L.—In great abundance in the fields near Sherbrooke, Que.

GALIUM PILOSUM, Ait.—Forest, Ont., and Montreal Island.

GALIUM LANCEOLATUM, Torr.—Galt.

GALIUM ASPRELLUM, Michx.—Orangeville.

DIPSACUS SYLVESTRIS, Mill.—Bathurst, Ont., Lachine.

ASTER LINDLEYANUS, Torr & Gray.—Cap-a-L'Aigle.

ASTER TARDIFOLIUS, L.—Bank of Murray River.

INULA HELENIUM, L.—Drummond, Ont., Bath, Montreal Island.

GALINSOGA PARVIFLORA, Cav.—McGill College grounds.

RUDBECKIA LACINIATA, L.—Galt.

TUSSILAGO FARFARA, L.—Near St. John, N.B.

CNICUS ALTISSIMUS, var. DISCOLOR, Gray.—Cap-a-L'Aigle.

ONOPORDON ACANTHIUM, L.—Galt.

LAMPSANA COMMUNIS, L.—Cacouna Point, Quebec.

HIERACIUM MURORUM, L.—Cap-a-L'Aigle.

SONCHUS ARVENSIS, L.—Cap-a-L'Aigle, Montreal Island.

TRAGOPOGON PORRIFOLIUS, L.—Lucan's Crossing.

TRAGOPOGON PRATENSIS, L.—Montreal Island.

LOBELIA SYPHILITICA, L.—Galt.

LOBELIA PUBERULA, Michx.—Montreal Island.

LOBELIA SPICATA, Lam.—Galt.

GAYLUSSACIA DUMOSA, Torr & Gray.—St. John, N.B.

GAYLUSSACIA RESINOSA, Torr & Gray.—St. John, N.B.

VACCINIUM VITIS-IDÆA, L.—St. John, N.B.

VACCINIUM OXYCOCCUS, L.—Cap-a-L'Aigle, St. John, N.B.

CHIOGENES HISPIDULA, Torr & Gray.—Cacouna Island, Port-a-Persil.

ARCTOSTAPHYLOS UVA-URSI, Spreng.—Cacouna Island, Port-a-Persil.

EPIGÆA REPENS, L.—Lachute, The Trou, Murray Bay.

GAULTHERIA PROCUMBENS, L.—The Trou, Montreal Island.

ANDROMEDA POLIFOLIA, L.—Near St. John, N.B.

CASSANDRA CALYCULATA.—Port-a-Persil, St. John, N.B.

LOISELEURIA PROCUMBENS, Desv.—Cap-a-L'Aigle.

KALMIA ANGUSTIFOLIA, L.—Near St. John, N.B.

KALMIA GLAUCA, Ait.—Cap-a-L'Aigle.

RHODODENDRON RHODORA, Don.—Near St. John, N.B.

LEDUM LATIFOLIUM, Ait.—Port-a-Persil, Island of Montreal.

CHIMAPHILA MUBELLATA, Nutt.—Cap-a-L'Aigle, Montreal Island.

MONESES UNIFLORA, Gray.—Cap-a-L'Aigle.

PLANTAGO LANCEOLATA, L.—Galt, London, Ont.

PLANTAGO DECIPIENS, Barneoud.—Cap-a-L'Aigle, Port-a-Persil.

PLANTAGO CORDATA, Lam.—Beauharnois.

STEIRONEMA CILIATUM, Raf.—Isle Heron.

LYSIMACHIA NUMMULARIA, L.—Beauharnois.

GLAUX MARITIMA, L.—Murray Bay.

LIGUSTRUM VULGARE, L.—Forest.

APOCYNUM CANNABINUM, L.—London, Ont., Beaconsfield.

ASCLEPIAS TUBEROSA, L.—Galt, Stony Point, Lake Huron.

ASCLEPIAS PHYTOLACCOIDES, Pursh.—Galt, London.

ASCLEPIAS MEADII, Torr.—Brantford.

ASCLEPIAS TUBEROSA, var. DECUMBENS, Pursh.—Sandhill, Stony Point.

GENTIANA CRINITA, Frœl.—Galt.

GENTIANA SERRATA, Gunner.—Galt.

GENTIANA QUINQUEFLORA, Lam.—Cacouna Point.

GENTIANA ANDREWSII, Griseb.—Montreal Island.

PHLOX DIVARICATA, L.—Galt.

MENYANTHES TRIFOLIATA, L.—Murray Bay.

HYDROPHYLLUM APPENDICULATUM, Michx.—Near London.

CYNOGLOSSUM VIRGINICUM, L.—Island of Montreal.

MERTENSIA MARITIMA, Don.—Cacouna, Murray Bay.

LITHOSPERMUM LATIFOLIUM, Michx.—Montreal Island.

ONOSMODIUM CAROLINIANUM, DC.—Sandhill, Stony Point.

ECHIUM VULGARE, L.—Bathurst, Ont., Galt.

CUSCUTA GRONOVII, Willd.—Oliver's Ferry, Ont.

HYOSCYAMUS NIGER, L.—Fletcher's field, Montreal.

PHYSALIS GRANDIFLORA, Hook.—Cap-a-L'Aigle.

VERBASCUM BLATTARIA, L.—Galt.

LINARIA CYMBALARIA, Mill.—Near Toronto.

PENTSTEMON PUBESCENS, Solander.—Galt.

LIMOSELLA AQUATICA, var. TENUIFOLIA, Hoffm.—Murray Bay.

GERARDIA PURPUREA, var. PAUPERCULA, Gray.—Montreal Island.

EUPHRASIA OFFICINALIS, L.—Cap-a-L'Aigle, Quebec.

PEDICULARIS PALUSTRIS, var. WLASSOVIANA, Bunge.—Murray Bay.

COLLINSONIA CANADENSIS, L.—Galt.

LYCOPUS SINUATUS, Ell.—Huntingdon, Montreal Mountain.

CATALPA BIGNONIOIDES, Watt.—McGill College grounds, flowered in 1893.

TEUCRIUM CANADENSE, L.—Beauharnois, Huntingdon.

CALAMINTHA NEPETA, Link.—Mount Royal Park.

CALAMINTHA CLINOPODIUM, Benth.—Huntingdon.

HEDEOMA PULEGIOIDES, Pers.—St. Lambert's.

MONARDA DIDYMA, L.—Montreal Island.

LOPHANTHUS NEPETOIDES, Benth.—Mount Royal Park, London.

NEPETA GLECHOMA, Benth.—Montreal Mountain, Brantford, Stony Point, Lake Huron.

CYCLOLOMA PLATYPHYLLUM, Moquin.—London, Ont.

CHENOPODIUM URBICUM, L.—Montreal suburbs.

ATRIPLEX PATULA, var. HASTATA, Gray.—Cap-a-L'Aigle, Cacouna.

SALSOLA KALI, L.—Cap-a-L'Aigle, Cacouna.

PHYTOLACCA DECANDRA, L.—London, Ont.

RUMEX BRITANNICA, L.—London, Ont., Forest.

RUMEX SALICIFOLIUS, Weinmann.—Cap-a-L'Aigle.

RUMEX VERTICILLATUS, L.—Mount Royal Park.

RUMEX SANGUINEUS, L.—Near St. John, N.B.

RUMEX ACETOSA, L.—Cap-a-L'Aigle.

POLYGONUM CILINODE, Michx.—Cap-a-L'Aigle.

ARISTOLOCHIA SIPHO, L'Her.—Brantford.

SASSAFRAS OFFICINALE, Nees.—Glenmorris, near Galt.

DAPHNE MEZEREUM, L.—Montreal Mountain.

DIRCA PALUSTRIS, L.—Sharbot Lake, Drummond, Montreal Island.

SHEPHERDIA CANADENSIS, Nutt.—Murray Bay, London, Ont.

EUPHORBIA PEPLUS, L.—Streets of Montreal.

EUPHORBIA HUMISTRATA, Engelm.—Mount Royal Park.

EUPHORBIA OBTUSATA, Pursh.—Montreal Island.

CELTIS OCCIDENTALIS, L.—St. Helen's Island, London, Montreal Island.

BŒHMERIA CYLINDRICA, Willd.—Suburbs of Montreal.

PLATANUS OCCIDENTALIS, L.—London, Forest.

MYRICA GALE, L.—Cacouna Island.

CARPINUS CAROLINIANA, Walter.—Drummond, Galt.

POPULUS HETEROPHYLLA, L.—Labelle.

EMPETRUM NIGRUM, L.—Cacouna Island, Cap-a-L'Aigle.

PINUS BANKSIANA, Lambert.—Cap-a-L'Aigle.

PICEA NIGRA, Link.—Cap-a-L'Aigle.

TAXUS CANADENSIS, Willd.—Cap-a-L'Aigle.

MICROSTYLIS OPHIOGLOSSOIDES, Nutt.—Cap-a-L'Aigle.

LOBELIA AMŒNA, Michx.—Stony Point, Lake Huron.

CORALLORHIZA ODONTORHIZA, Nutt.—Galt.

CORALLORHIZA MULTIFLORA, Nutt.—Galt.

SPIRANTHES ROMANZOFFIANA, Cham.—Cap-a-L'Aigle.

SPIRANTHES CERNUA, Richard.—Montreal Island.

SPIRANTHES GRACILIS, Bigelow.—Near London, Ont.

GOODYERA REPENS, R. Br.—Cap-a-L'Aigle.

EPIPACTIS HELLEBORINE, Crantz.—Montreal Mountain.

CALOPOGON PULCHELLUS, R. Br.—Stony Point, Lake Huron.

ORCHIS SPECTABILIS, L.—Drummond, Bathurst, Ont., Mount Royal Park.

HABENARIA HYPERBOREA, R. Br.—Cap-a-L'Aigle, Mille Isles.

HABENARIA HOOKERI, Torr.—Calumet.

HABENARIA ORBICULATA, Torr.—Mount Royal, London.

HABENARIA PSYCODES, Grey.—Stony Point, Lake Huron.

HABENARIA FIMBRIATA, R. Br.—Stony Point, Lake Huron.

CYPRIPEDIUM SPECTABILE, Swartz.—Lanark, Stony Point.

CYPRIPEDIUM ACAULE, Ait.—Hochelaga Banks.

DIOSCOREA VILLOSA, L.—Near London, Ont.

ALLIUM CANADENSE, Kalm.—Kettle Point, Lake Huron.

DISPORUM LANUGINOSUM, Barth & Hook.—Banks of Thames, near London, Ont.

LILIUM PHILADELPHICUM, L.—Sandhill, Stony Point, Lake Huron.

LILIUM CANADENSE, L.—Dundee, Que., Montreal Island.

VERATRUM VIRIDE, Ait.—Sherbrooke.

ARISÆMA DRACONTIUM, Schott.—Near London, Ont.

SYMPLOCARPUS FŒTIDUS, Salisb.—Sherbrooke, Nuns' Island, near London, Ont.

TRIGLOCHIN PALUSTRIS, L.—Stony Point, Lake Huron.

CHARA FRAGILIS, L.—Galt.

PELLÆA GRACILIS, Hook.—Banks of Grand River, Fergus.

ASPLENUIM TRICHOMANES, L.—Point-a-Pic, Murray Bay.

CYSTOPTERIS BULBIFERA, Bernh.—Orangeville, Cap-a-L'Aigle.

OSMUNDA CINNAMOMEA, var. FRONDOSA, L.—Cap-a-L'Aigle.

CAMPTOSORUS RHIZOPHYLLUS, Link.—Philipsburgh, Que.

LYCOPODIUM SELAGO, L.—Cap-a-L'Aigle.

LYCOPODIUM LUCIDULUM, Michx.—Cap-a-L'Aigle.

LYCOPODIUM ANNOTINUM, L.—Cap-a-L'Aigle.

LYCOPODIUM CLAVATUM, L.—Cap-a-L'Aigle.

LYCOPODIUM CAROLINIANUM, L.—Cap-a-L'Aigle.

LYCOPODIUM COMPLANATUM, var. CHAMÆCYPARISSUS.—Cap-a-L'Aigle.

NOTE ON A SPECIMEN OF BELUGA CATODON, FROM THE LEDA CLAY, MONTREAL.

By SIR WILLIAM DAWSON, F.R.S., ETC.

This animal, the White Whale or Beluga, once very abundant and still not uncommon in the Lower St. Lawrence, is widely distributed throughout the northern seas. It occurs in Greenland, and the same or a similar species is found on the coasts and in the rivers of Alaska and Siberia. It is only a rare and occasional visitor on the coasts of northern Europe. It is one of the smaller of the toothed whales, and subsists on fish, especially cod, haddock, loche and flounders. Its creamy white colour distinguishes it very markedly from all our other cetaceans. Its favourite abode seems to be the tideways and estuaries of large rivers, which it sometimes ascends for great distances in search of food. A stuffed

specimen now in the collection of this Society is said to have been taken in the St. Lawrence, near Montreal.

In the Pleistocene Period, and especially in that part of it marked by the deposit of the marine Leda clay, when all the lower lands of the St. Lawrence valley were submerged, the Beluga must have had a much wider range than at present, and was probably very abundant. Hence its remains have been more than once found in the Leda clay, sometimes as entire skeletons, in other cases as detached bones. Its first recorded occurrence was the discovery of the greater part of a skeleton by Thompson, the geologist of Vermont, in 1849, in a railway cutting near Lake Champlain, at an elevation of 60 feet above the lake, or about 150 feet above the sea. It occurred in clay, the equivalent of our Leda clay, the Champlain clay of Dana, associated with marine shells of northern types. It was regarded by Thompson as a new species, and named *Beluga Vermontana;* but a comparison with the Canadian specimens found later, and with recent bones in the Museum of McGill College, enabled the late Mr. Billings to refer it to the modern species usually known as *Beluga Catodon*, Lin., though the specific name, *albicans*, Müller, perhaps has priority. It is the *Delphinus albicans* of Fabricius in his Fauna Grœnlandica (1780). The best specimens heretofore found in Canada are one discovered in Peel's Brickyard, Montreal, one found near Cornwall, and another discovered at Bathurst, N.B., and described by Gilpin and Honeyman. The two former specimens, of which the first is nearly perfect, are now in the museum of the Geological Survey in Ottawa, and were noticed by the late Mr. Billings in the Proceedings of this Society.

The present specimen was found in the brick-clay near Papineau Road, by the workmen of Messrs. Smith, brick-makers, when excavating the clay in the present winter. By the care of these gentlemen the bones were collected

[1] Thompson's Vermont, Appendix.

and were handed to Dr. McEachran, Dean of the Faculty of Veterinary Science, and by him presented to the Peter Redpath Museum, where they are now being mounted by Bailly for the collection of Pleistocene fossils, and may be compared with a fine recent specimen from Little Metis. The skeleton is nearly complete, and possibly some of the missing bones may be secured when the snow has disappeared. The locality is approximately about 100 feet above the River St. Lawrence, and the specimen occurred at the depth of 22 feet in the clay, associated with shells of *Leda (Yaldia) glacialis, Tellina (Macoma) Grœnlandica* and minute tests of Foraminifera. With the bones was also found a fragment of Coniferous wood, which is determined by Prof. Penhallow as that of the Black Spruce—*Picea Nigra.*

The Leda Clay was probably deposited at a depth of 50 to 80 fathoms, which corresponds approximately with one of the most marked shore lines on the Montreal Mountain at a height of about 470 feet above the sea, and with the old sea beach at Smith's Falls, Ont., which afforded some years ago the bones of a whale, described in the Proceedings of this Society in the Record of Science, Montreal, 1883. At the time, therefore, when this animal perished, and was imbedded in the Leda clay, the Montreal Mountain was a small rocky island in a wide inland sea, extending from the Laurentian Hills on the north to the high ground of the Eastern Townships on the south, communicating with the Atlantic, not only by the Gulf of St. Lawrence, but also by a strait between the hills of New England and the Adirondacks, and extending westward at least as far as the Thousand Islands. This arm of the sea was inhabited by a rich boreal fauna, consisting of species now found in the colder waters of the Gulf and River St. Lawrence, and in the Greenland Seas. Complete collections of these animals may be seen in our Museums, and have been catalogued in publications on the Pleisto-

cene of Canada. There would thus be wide scope and probably abundant food on what is now the fertile plain of the Province of Quebec, for the Beluga and the Greenland seal, whose bones are found associated with it in the Leda clay.

Note by Prof. Penhallow on the Specimen of Wood referred to in paper on Beluga.

The specimen of wood found in association with the whale skeleton obtained from the Leda clay, Montreal, consisted of a small branch about three-fourths of an inch in diameter and five inches in length. It proved not to be impregnated by mineral matter, and readily yielded to the softening influence of water, increasing considerably in volume. Upon microscopical examination it was found that the structure was in an advanced stage of decay, and was penetrated in all directions by the mycelium of a fungus. The structure was so far broken down that nearly all the secondary growth of the cell walls had disappeared, and together with this, the markings upon which a distinction of the species must rest. The generic characters, however, were sufficiently preserved to satisfactorily ascertain that the wood is a Picea, and among existing species it approaches most nearly to P. Nigra, which it, in all probability, is.

Timber of Canada.

Paper Read Before the Society by Hon. J. K. Ward.

There are about 6,000 sawmills in the Dominion, employing during the season of, say, 150 days, not less than 15,000 men in and around the mills, sawing, piling, shipping, etc. In the woods during winter, getting out the logs and timber, and river driving, there are about the same number. Six thousand mills, averaging each 400,000

ft. per season, makes up the apparent output of all the mills. This quantity is sawed in a single day by some of the larger mills, while many of the smaller mills do not turn out 200,000 in the season. The difference in the apparent output of the mills—that is, 2,500 million—and that returned as cut on public lands is made up as taken off private lands and the Crown Lands of Nova Scotia, of which we have no returns.

The area under license in the different provinces is about 100,000 square miles, yielding annually (1893) about 2,500 million feet b. m. of sawed lumber, pine and spruce principally, and hewn timber divided as follows among the different provinces:

Ontario—7,140,000 logs, producing 728,000,000 feet b. m., principally pine; 40,000 pieces white and red pine, 42,000,000 feet b. m.; 133,000 pcs. boom timber, 2,000,000 feet b. m.; average size of pine and spruce logs, 90 feet: ordinary revenue, $939,000: ex bonus, $958,000; area under license, 21,500 miles; area unoccupied, 17,000 miles.

Quebec—Area under license, 48,000 miles, producing spruce and pine logs, 6,170,000, equalling 683,000,000 feet b. m.; producing pine, spruce and birch timber, 18,500,000 feet b. m.; railroad ties and other wood, 22,500 pieces, 12,000,000 feet b. m.; pulp cedar, etc., 10,000 cords; revenue, $892,000.

New Brunswick—Area under license, 6,000 miles, producing pine and spruce logs, 87,000,000 b. m.; hemlock logs, 7,000,000 b. m.; cedar, 14,000,000 b. m.; tamarac, 1,400,000 b. m.; 14,700 cubic feet pine and hardwood timber, 176,400 b. m.; 12,000 boom sticks, 240,000 b. m.; revenue and bonus, $102,000.

British Columbia—Area under lease, 1,200 miles, producing 80,000,000 b. m. fir and cedar; 10,000,000 cedar shingles. The timber produced in British Columbia being so much larger than is found in the east requires a

very different equipment to handle it from what is used in this part of the country.

Manitoba and Territories—Area under license, 2,200 miles, producing pine and spruce logs, 24,000,000 feet b. m.: 10,000 railroad ties, 320,000 feet b. m.; 2,000,000 shingles: 5,000,000 laths; revenue, $70,000.

Large as the foregoing is, it only forms one-quarter of the sawn lumber received in Great Britain, and one-sixteenth of the timber, the great proportion being the product of the north of Europe and Southern States. While not an alarmist as to our supply of pine timber, I cannot but consider the wanton waste of it a sin, when so much good lumber has been and is being thrown away. A mistake is made by our mill men in not having more sawing capacity than the fast mills now in use possess, sawing, as they do, in 12 hours 40,000 or 50,000 feet with one circular saw. Too much haste is required to do this, when more money might be got out of the same logs, by employing two sets of saws, with the necessary trimming machinery, and doing the work with less speed. It does seem as if the lumbermen of the past, as well as many of the present day, entertained the idea that the supply of pine in Canada was inexhaustible and were anxious to get rid of it as quickly as possible.

With our vast amount of hardwood, which is fast coming into use, with the facilities of getting it to market, as well as the modern machinery for manipulating it, along with the great quantity of wood supply, said to be in British Columbia, all this, with the natural increase, if fire can be kept at bay, we can reasonably conclude that the end of our forest supply is a good way off. When that time comes, I hope a substitute will be found.

The carrying trade and commerce is largely indebted to the forest. There is more tonnage employed on the St. Lawrence and canals in conveying lumber and timber to market than on any other commodity. Quebec was

once the greatest timber and ship building port in the world. Forty years ago as many as forty to fifty ships were built in a single year. Now there is not one. In years gone by as many as 600 sailing ships visited the port in the spring and fall, taking away 300,000,000 feet b. m. of timber and lumber: as much as 18,000,000 cubic feet of square timber were shipped in a season; last season about 3,000,000. Its once famous coves and wharves are deserted and falling to pieces, most of the pine deal business being done at Montreal that was formerly transacted at Quebec.

Mr. Ward emphasized the necessity of preserving the forests from fire, quoting at length from Hon. Peter White on the question. Continuing he said: "In selling lands to settlers, I would make it a condition of sale that 20 acres in every 100 should be given free and that it should be forever kept as woodland. The uninitiated, travelling through the woods after the shantymen have taken all they think worth taking, would hardly notice that the chopper had been there, except for seeing an occasional stump, a few chips, or a top of a tree, the great bulk of the timber remaining to hold back the water in its natural beds, and to prevent sudden rises and falls in the rivers, which oftentimes cause serious damage by overflowing the banks or becoming so low that they refuse to do the work they once performed with ease. To avoid these troubles and have our country remain well wooded for many years, it is but necessary to give the trees indigenous to it, leave to grow, and there will be no necessity to plant. I have no doubt but that much of the land that has been denuded of its timber would in a very few years be covered with a spontaneous growth of wood, and so prevent our country from becoming an arid waste, by utilizing only that portion of it which can be profitably worked.

To an inexperienced eye there may be hardly an evi-

dence at first glance of the disappearance of the pine. The hardwoods with which the pine is interspersed are usually left standing to a considerable extent, and so are the smaller pine, so that even a well cut country will still look splendidly wooded. No doubt the time will come when it will be carefully re-cropped. But the commercial value is largely gone, and with it the natural desirability, for the cutting of the pine greatly lessens the value of the woods as vast reservoirs, holding the snows in spring and the rains of summer, so as to feed steadily the innumerable streams of the water sheds. Consequently, spring floods and summer droughts for the cleared lands in the valleys follow close on the lumberman's axe. A certain amount of attention has been aroused by the rapid retirement of the pine. Bad as the axe is, fire is worse. The Ontario Government has recently attempted to enforce strict precautions against fire, and it has also appropriated as a provincial park an enormous reserve near Lake Nipissing, thirteen hundred square miles, of which nine hundred are pine timber, situated on one of the chief natural watersheds of the province. But a great deal more than this is necessary if the Canadian pine forests are not soon to disappear like the tracts of Maine. We cannot urge too strongly on the government to set apart all lands not suitable for making a decent home for the settler. Much of the land that they are tempted to go on is not worth the trouble of clearing; it is only the presence of the lumberman, in many cases, that enables him to exist. The question of revenue is of importance, as well as other considerations in not destroying the forests and the country of its principal source of wealth.

The product of the forest is disposed of about as follows:

Exported sawn lumber and timber.....	$24,000,000
260 million feet b. m. sawlogs.....	208,000
Railroad ties, pulpwood, bark.....	27,000,000

The first timber shipped to Europe from Canada was sent from Quebec to Larochelle by Talon in 1667. Lieut. Hocquart shipped timber and boards to Rochefort in 1735. In 1823, 300 cargoes were shipped from Quebec.

In the early part of the present century, the Montmorency mills were established by a Mr. Usboirne. Mr. Peter Patterson, a ship carpenter by trade, who had spent some time in Russia, became an employee of Mr. Usboirne's, and finally proprietor of the property, and became one of the largest manufacturers of lumber in Canada. Sir John Caldwell established mills at Riviere-du-Loup en Bas and at Etchemin. The late William Price, father of the Hon. J. Price, of Quebec, established large mills at Chicoutimi, St. Alexis, L'Anse-St. Jean, St. Etienne, Batiscan, Matane and many other places, leaving an immense business to his sons, which is now conducted by the son before named. The late Allan Gilmour, and relations of the same name, carried on for many years a large business on the North Nation, the Gatineau and Mississippi (Canada), and at Trenton, Ont., the younger branches of the family continuing the business.

Philomene Wright, one of the first lumbermen on the Ottawa river, came from Woburn, Mass., in the United States, arriving at the Chaudiere Falls—or the Asticou, as called by the Indians—as early as the year 1796. It was not till 1797 that he finally decided to make his home in Canada, and on the 20th of October, 1799, he and two companions pitched upon the site of the future city of Hull. He finally quitted Woburn for Canada on the 2nd of February, 1800. He was accompanied by five families, and had in his train fourteen horses, eight oxen and seven sleighs. The first tree was felled on the site of the homestead on the 7th of March, of the same year. He brought the first square timber from the Ottawa to Quebec in the year 1807. He built the first

slide on the Hull side of the river in 1829. He was elected the first member to represent the County of Ottawa in 1830. He died in 1839, and sleeps, an honored memory, in the little cemetery on the Aylmer road. Philomene Wright built his first saw and grist mills in 1808; they were, unfortunately, burned down, but were rebuilt in 60 days.

About eighteen years prior to this the first saw mill on the Ottawa had been built at Point Fortune, by a Mr. Story. It boasted one upright saw, and it is recorded that when the man in charge gigged back the carriage for a fresh cut, he would sit down on the log to take his dinner, and was about through by the time the cut was finished. With our present saws the same can be done in four seconds.

Among our successful lumbermen have been the late James McLaren, of Buckingham; Peter McLaren, of Perth; Bronson, Weston & Co., Perley & Patee, J. R. Booth, Alex. Fraser, of Westmeath; W. Mackey, and the late firm of Hamilton Bros., whose father was one of the first in the trade at Hawkesbury, Ont. Many others have taken an active part in the business, with more or less success.

West of the Rocky Mountains, Canada, contains vast quantities of valuable timber, the manufacture of which is rapidly increasing, to meet the wants of the Pacific coast and islands. Much of this lumber will find its way east to the treeless prairies.

As to the Canadian method of lumbering, when circumstances will permit, we pile or skid before the snow becomes too deep. When the snow is deep we draw direct from the stump to the lake or river. Our style of living in the shanty, and, in fact, the building itself differs in the various parts of the country. Until very recently, particularly in the Lower St. Lawrence, the fare of the shantyman was very primitive, the commonest tea being

quite a luxury, and the only variety in the bill of fare was that it consisted of pea soup, bread, pork and beans for dinner, the same, with the addition of tea for supper, and either, less the pea soup, for breakfast. On the St. Maurice, for many years, the living has been good and substantial, with comfortable shanties provided with stove, tables, and bunks, the cooking being usually done in an outside compartment. The shantyman's condition, however, is improving with the times.

Our shantymen, whether English or French, as a rule, are as good axemen, and expert drivers and canoemen, as can be found in any country. Our people are well up in dam building, as well as in making slides and clearing away the rivers to facilitate driving. Our rivers, as a general thing, being very precipitous and rapid, require extensive improvements, especially for the running of square timber.

I can hardly let the occasion pass without a reference to two of our woods, the first because of its usefulness to the poor aborigine, whose heritage we possess; it served to cover his wigwam, and was the material for his canoe, to aid locomotion; the latter, the great wood of commerce.

The white birch, or boleau, has within a few years become of some value when found within easy reach, having been turned to account for the manufacture of spools and spool wood for thread makers, the white part of the wood only being used. It is made into squares, varying from one inch, in eighths, to say, two inches, and three or four feet long. Many shiploads have been shipped to England and Scotland the past few years, principally from the Lower St. Lawrence. The red, or heart, being worthless to the spoolmakers, is either used as firewood or left to rot. There are vast quantities of this wood in the interior, too far from navigation or rail to be of any value. It is mostly found on poor soil, mixed with balsam, small spruce and cedar. It makes good firewood

when dry. The bark is useful to the Indian for the making of his canoe; the vessel for retaining the sap of the maple; his drinking cup and the cover of his wigwam. The yellow birch provides a cough remedy by boiling the sap down to a syrup; and, lastly, though not least, it furnishes the proverbial birch-rod, which, though almost obsolete, sometimes does good service, even in these days of advanced ideas. Vast quantities of the dwarf or black birch have been used as withes in rafting logs, some concerns using as many as thirty or forty thousand in a season, each of them representing a young tree; but little of this is done at present.

We now come to what every lumberman considers the king of the forest, in grandeur, usefulness and value, the white or cork pine, or *pinus strobus* of the scientists, the tree of all others that serves more purposes than we can enumerate. Among them the tiny match, the mast for the great ship, the frame of the sweet sounding piano, and wherever a soft, easy-working wood is wanted, either in the arts, the workshop, or the factory, there it is to be found. As an article of commerce, it far surpasses in value and quantity any other wood, if not all sorts put together. It supplies more freight for vessels coming into the St. Lawrence than any other commodity; it gives more employment to wage-earning men than any industry in our country, except agriculture. It employs more capital in manipulating it from the time the men leave for the woods in the fall, to make, haul and drive the logs and timber to the mills—the building of mills for sawing, the construction of barges and steamboats to convey it to market, as well as the large amount of freight furnished to railroads, the erection of factories to convert it to the various uses to which it is put. It is safe to say, that the value of the output of pine lumber alone, produced in Canada, is at least $25,000,000, or two and a half times as much as that of any other manufacturing industry; and,

when we consider that 60 per cent. is paid for labor, and that nearly all to men, representing a large population, it is readily seen how important it is, either by legislation or otherwise, to protect and conserve the source of this great factor in our prosperity. How can we extol sufficiently this monarch of the forest that we are so much indebted to? The tree when growing in the open country is of little or no value, except as a shade tree, its lateral branches reaching almost to the ground. It is in the dense forest we have to look for the great tree of commerce, where nature acts the pruner. There the branches decay and drop off, the trunk shoots upward high above its neighbors, seeking that which it was deprived of below —light and air. By this action of nature we get our clear pine, so much prized by mechanics. As the branches drop off, the wood grows over them, and we get the stately tree carrying its size well up, and often attaining 60 or 70 feet to the branches. I once saw a tree that measured 40 inches in diameter 70 feet from the ground, without a knot or defect visible in this space. Naturally, however, it is very rare to get a log or the best of timber without finding knots or defects as you get near the heart, the remains of the dead branches that fell off during the tree's youth. My experience teaches me that white pine is of slow growth. The smallest trees that ought to be taken for saw logs or timber should be at least fourteen inches at the butt. This would take not less than fifty years to produce, and such a tree as I have before described as much as one hundred and fifty; more than three inches in twenty years. Large groves of pine are usually found on poor light soil, I think, consequently, that the bulk of the pine found under such circumstances is apt to be punky or defective for the want—so to speak —of nourishment. The best pine is usually found on stronger soil mixed with hardwood. It is unpleasant to contemplate the want of this valuable timber. Once gone

it is gone forever, and cannot be reproduced in our or our children's time, as unlike mineral or the other products of the soil, the quantity produced from these are limited by the amount of labor employed in producing them. Perhaps, however, time will find a substitute in some artificial wood, or employ metal to take its place.

Hardwoods, to which I will briefly refer, that were once almost discarded, except for burning, are coming largely into use in consequence of the improved wood-working machinery that has been devised of late years, making the work of preparing and completing joiner work much more simple and easy than it was to do the same thing in pine when I served my time over 50 years ago, and when flooring, mortising, tenoning, sticking mouldings out of dry spruce with hard knots, was done by hand. The facilities also for reaching hardwoods and getting them to market will help to make up for the loss of this favorite material, which, I hope, is yet a long way off. I might say before closing this part of my subject that the magnificent cedar of British Columbia will, no doubt, largely take the place of white pine for joiner-work. The Douglas fir will be a valuable substitute for our coarser woods, when they become scarce and high in price. A lumberman's life is not passed on a bed of roses, yet there is a charm about it to those who have the stamina to endure its hardships, and enjoy its excitements, that is not easily forgotten. Who, that has followed it, can forget the log drive from early morn to sun-down, kedging across the lake to the tune of the chanteur, or breaking the jam in the roaring cascade, whose noise is drowned by the yells and shouts of the crew on seeing the great mass move off, each great log as it were, trying to get ahead of its neighbor, until they reach still water. What excitement after the risk run and efforts made! Old lumbermen can and do look back to such scenes with much pride. What other business has so many contingencies connected with

it, apart from the ordinary mishaps in trade ?—sometimes too much snow, other times too little. On other occasions the ice or the floods carry away his booms and scatter the logs, to be often stolen by land pirates, who will secrete his property, and annoy him in trying to find it.

As to the utility of the forest, though it may not attract the rain or influence its downfall, there can be no doubt as to its regulating the flowing of the waters by holding them back in the glades and swamps, sheltering the land from the fierce rays of the sun, preventing rapid evaporation to a great extent, and thus preventing oftentimes damaging floods and dried up streams. For the reasons advanced, does it not behoove us to use our influence to bring about such legislation as will have the effect of preserving and protecting our forests, on which so much depends ?

Additional notes on Recent Canadian Unionidæ.

By J. F. Whiteaves.

Unio Canadensis, Lea.

In a letter to the writer, dated June 18th, 1895, Mr. Simpson says, "I think there can be little doubt, from examining the type of *U. Canadensis*, that it is a somewhat injured specimen of the male of *U. ventricosus*, Barnes.

Mr. Bryant Walker, of Detroit, informs the writer that he has, in his cabinet, specimens of each of the following species, from the Detroit River :

Margaritana Hildrethiana, Lea.

Main channel of the Detroit River off Belle Isle, collected by the Michigan Fish Commission in 1895.

UNIO LEIBII, Lea.

Detroit River, at the upper end of Fighting Island, collected by Mr. Walker in 1873 or 1874, and identified by the late Dr. James Lewis.

UNIO MULTIRADIATUS, Lea.

Same locality, collector and date as for the preceding species; also, Thames River, Ontario, from the collection of the late Dr. George A. Lathrop.

UNIO SULCATUS, Lea. (= *U. perplexus*, var. *perobliquus*, Conrad. Types from Detroit River, and Wabash R., Indiana.)

Collected by Mr. Walker in the Detroit River at the upper end of Fighting Island, in 1873 or 1874; at the upper end of Belle Isle in 1894: and in the same river, at the locality first mentioned, by the Michigan Fish Commission, in 1895.

UNIO VERRUCOSUS, Barnes.

Main channel of the Detroit River off Belle Isle, collected by the Michigan Fish Commission in 1895, and Detroit River opposite Grassy Island, collected by Mr. Walker in 1895.

Mr. Walker also states that he has, in his collection, twenty-six species of Unionidæ from the Detroit River and Lake St. Clair, viz., *Anodonta Benedictii*, *A. Footiana*, *A. fragilis* and *A. subcylindracea*; *Margaritana deltoidea*, *M. Hildrethiana*, *M. marginata*, and *M. rugosa*; *Unio alatus*, *U. circulus*, *U. coccin us*, *U. ellipsis*, *U. gibbosus*, *U. gracilis*, *U. Leibii*, *U. luteolus*, *U. multiradiatus*, *U. nasutus*, *U. Novi-Eboraci*, *U. phaseolus*, *U. pressus*, *U. Rangianus*, *U. rectus*, *U. triangularis*, *U. ventricosus* and *U. verrucosus*

OTTAWA, July 9th, 1895.

OBITUARY.

GASTON, MARQUIS DE SAPORTA.

The Marquis de Saporta was born July 28th, 1823, and died, at the age of 72 years, on January 26th of the present year, at his residence in Aix-en-Provence.

Since the appearance of his first paper on the Fossil Plants of Provence, in 1860, he has been a prominent palæobotanist, and yields to few cultivators of that science in the number, variety and importance of his memoirs and larger works. His largest and most important work is that on the Mesozoic Flora of France, to which he added only last year a valuable report on the Mesozoic Plants of Portugal. A summary of this last work, in connection more particularly with its bearing on the palæobotany of North America, from the pen of Prof. Lester F. Ward, a fellow laborer in the United States, has lately appeared in *Science*, and perhaps with the exception of those of his great rival, Heer of Zurich, who passed away before him, no European works on the botany of the Mesozoic Period are more frequently referred to than those of Saporta.

Though a specialist on the floras of the later geological periods, he could enter with enthusiasm into the whole history of the vegetable kingdom, in a manner at once elaborate, careful and attractive to general readers, and with an enlightened grasp of the succession of plants in time, and of their relations to the various changes of climate and geography in the different periods. This is remarkable in his popular work, "Le Monde des Plantes," which goes over the whole field of geological botany, is written in a clear and vivid style, and illustrated with geological maps and very clever restorations of the forests of different periods.

His memoirs also cover a wide geographical range, as specimens from many regions were submitted to him, and

he was always ready, in the kindest and most genial spirit, to give the benefit of his advice and information to his fellow laborers in every part of the world. His work was characterized by much discrimination and care, and by a judicious attention to the geological horizons; but, like many other palæobotanists, he was occasionally carried away by his enthusiasm so as to recognize as plants mere imitative markings. This was especially the case in the controversies in which he took part respecting the nature of certain markings on rocks whose algal nature had been maintained by Delgado and others, while to Northorst and to palæontologists generally who were familiar with the tracks of animals and the imitative tracings on the surfaces of aqueous deposits, they were of animal or of inorganic origin.

In conjunction with Professor Marion, Saporta published a work on the Evolution of Plants, which forms three volumes of the French International Library of Science. It abounds with curious information of a very suggestive character, but was perhaps too ambitious in the present state of knowledge. This the authors frankly admit, stating in conclusion that they can but point out some landmarks to their successors, "who may decipher the inscriptions of which we can but spell out some letters."

But though an evolutionist, Saporta was by no means an agnostic. He saw in the grand succession of vegetable forms a great and profound design, related to the inorganic world and its mutations on the one hand and to the animal kingdom on the other. He sums up this conclusion in his "Monde de Plantes" in the following words, which may serve as an example of his style and of his habit of thought in the wider problems of his science:—

"Mais, si l'on remonte de phénomène en phénomène plus haut que les apparances mobiles et contingentes, il semble que l'on aboutisse forcément à quelque chose d'entier, d'immuable et de supérieur, qui serait l'expression

première et la raison e'être absolu de toute existence, en qui se résumerait la diversité dans l'unité, eternel probleme que le science ne saurait resoudre, mais qui se pose de lui-même devant la conscience humaine. La serait la vraie source de l'idéal religieux; de cette pensée se dégagerait d'une façon lumineuse, cette conception de notre âme à laquelle nous appliquons instinctivement le nom de Dieu.

Saporta was correspondent de l'Institut de France, a Foreign Member of the Geological society of London, an Associate Fellow of the American Academy of Sciences, and an Honorary or Corresponding Member of many other societies on both sides of the Atlantic.

J. W. DAWSON

ANNUAL PRESIDENTIAL ADDRESS.

NATURAL HISTORY SOCIETY OF MONTREAL.

By PROF. WESLEY MILLS, M.A., M.D., ETC.

When, owing to your kindness and continued confidence, you placed me in office for a second term, with all the duties and responsibilities which are associated with this honorable position, I trust you did not expect another presidential address from me on resigning as I now do in favor of some other member who may be thought worthy to occupy this place of greatest responsibility, if not of highest honor in the Society. It is not my intention to do more than make a few remarks on this occasion, and after merely referring to the salient features of the Society's work this year, I shall confine what I have to say pretty much to one thought: The spirit of the naturalist.

You will gather from the various reports presented this evening the state of our affairs, and the lines along which progress, obvious to everyone, has been made, such as the

improvement in the large hall, the additions to the library, and the desirable advance made in binding and arranging many valuable publications.

We have, like other societies and individuals, suffered from the financial depression so prevalent, but I cannot allow the occasion to pass without referring to the successful efforts of one of our members, Mr. J. S. Shearer, to collect money from friends to support the RECORD OF SCIENCE, which continues to be the vehicle of much valuable original publication, and in this way still maintains, at home and abroad, the reputation which it long ago acquired, of being a reliable and valuable source of reference for Canadian Science.

It will require strenuous exertion to preserve the reputation it has acquired; but if the Society can do this it will accomplish much.

The course of Somerville lectures, based on the Resources of Canada, as viewed by the Naturalist, was in able hands, and we are deeply indebted to all those who took part, and particularly to those specialists who came from a distance and gave their services gratuitously.

If it were possible for the Society to publish these lectures from year to year in a collective form, both the public and the Society itself would be the gainers.

The regular meetings of the Society have been better attended, perhaps, than in any previous year.

The affiliation brought about between various societies with kindred aims last year and in operation this year, has so far worked well, though there is room for a more vital connection than as yet seems to exist.

Turning from these details allow me a few moments to develop a thought which does not concern our Association alone, but human beings everywhere.

What is the spirit of the naturalist? Wherein does he differ from other men? Do these differences elevate him or the reverse?

Between all scientists there is a close bond. All seek the truth for truth's sake. To all this is the one—the only finality. Everything else is subordinate at the best.

But the naturalist, in the sense that has attached to the word for centuries, is more closely allied to the poet and the artist than is commonly supposed. A poet or an artist who finds no delight in nature is not genuine—he does not deserve the name.

Those poets who have most readily found access to the hearts of men in all ages have been naturalists—not, it may be, technically, but really. Those who have delighted in mountain, wood, river, sky, insect, bird, the workings of the wondrous soul of man—these are the real naturalists. Now, may a man not work on all these in a dry and formal way, getting results of a certain value, but without the spirit of the naturalist? And may not a man of limited opportunities observe with the acuteness of ken and the glow of feeling that is the very soul of the soul of the poet or the painter?

Landseer portrayed animals well because with the technical skill and the talent for form and color he united the sympathetic love of his fellows lower in the scale of being.

The naturalist is a man of truth through and through. He is equally a being of simplicity of nature. Questions of rank and precedence and power among his fellows trouble him not. The "boss" is as far from the naturalist in spirit as can well be conceived. Men of the latter type cannot be made into naturalists by the bestowment of ordinary or honorary memberships in societies, or by any offices they may attempt to fill. It is not given to them to see the beauties in nature that fascinate or to feel the pulses that thrill. He who would be a naturalist in spirit must, like he who would enter into the Kingdom of Heaven, become as a little child.

Indeed, between the qualities of the true Christian, the real gentleman in heart and the naturalist there is much

in common as well as with the poet and the artist. But I must not dwell further on these thoughts.

Last year I expressed my belief that our greatest need was the addition to our ranks of young and enthusiastic workers. That and a more abounding spirit of the kind I have been referring to seem to me still our greatest needs.

Why do not more candidates of this type come knocking at our doors? Why do not our schools and colleges produce such people? Is our education the great success many would have us believe? If education generates little or none of this spirit but simply produces a type of men and women better able to succeed in the commercial and social race—that and nothing more—is it a success? I leave these questions with you to answer. My own reply you will readily divine.

During the past two years I have not found my office a sinecure, but your kind co-operation, with our valued Superintendent's knowledge, energy, tact and courtesy, have made the duties that have fallen to me as light as possible. Mr. Griffin has on all occasions assisted me in the most efficient, cheerful and courteous way. To him and to all who have smoothed my path I am grateful.

Field Day to Philipsburg.

The annual field day of the Natural History Society is looked upon as being the picnic of the year and, with fine weather, it was little wonder that some 300 or so of Montreal's representative people boarded the cars at Windsor station *en route* for Philipsburg. Among those noticed were the following: Mr. and Mrs. S. Finley and family, Mr. and Mrs. Walter Drake, Mr. and Mrs. R. A. E. Greenshields, Mr. and Mrs. John S. Shuter, Mr. and Mrs. J. H. R. Molson, Mr. and Mrs. S. H. Ewing, Mr. and

Mrs. Albert and Miss Holden, the Misses Radford, Master and Miss Holden, J. Donald Morrison, Mr. Matthew Hutchison and party, J. F. Whiteaves, F.R.G.S., Ottawa; Mr. Malcolm Morison, Mr. C. F. Williams, Mr. and Mrs. F. W. Richards, Mr. and Mrs. David Robertson, Dr. Davidson, A. F. C. Ross, Mrs. P. S. Ross, Mr. S. Campbell, Mr. and Mrs. Jos. Fortier, Mr. Robert Law, Miss Law, Miss Ella Law, Mr. E. T. Chambers, Mr. and Mrs. George Boulter, Rev. Dr. Warden, Mrs. Warden, Miss Ida Sumner, Miss Grace Sumner, Master Arthur Sumner, Mr. A. E. Holden, Miss Hill, Mr. Percy Molson, Miss Mabel Molson, the Misses Harrington, Dr. Ker, Mr. and Mrs. John S. Shearer, Miss Marion Shearer, Miss Murray, Rev. Dr. and Mrs. Campbell, Mr. and Mrs. James Slessor, Dr. Stirling, Dr. Deeks, Dr. A. A. Robertson, Mr. W. F. Egg, and Master George Egg, Mr. and Mrs. Vennor, Dr. and Mrs. Lovejoy, Mrs. Edgar Judge, Mr. Geo. Sumner and family, Mr. S. W. Ewing, Mr. and Mrs. F. H. Hart, Mr. J. Stevenson Brown, Miss Louise Brown, Miss Emily Brown, Master F. C. Brown, Mrs. Saxe, Mr. Percy C. Ryan, Mrs. J. C. McArthur, Mrs. Pennington, Mr. and Mrs. R. Harvey, Mrs. J. B. Goode, Mr. and Mrs. S. C. Stevenson, Dr. Baker Edwards, Miss Edwards, Mr. Brissette, Mrs. C. S. J. Phillips, Mr. C. E. H. Phillips, Miss Phillips, Master Allan Phillips, Mr. and Mrs. Albert Ross, Mr. William Reid, Howard T. Barnes, Lachlan Gibb, Master Charles Waterous, Mrs. John Scott, and daughters, Prof. J. B. Williams, Miss Dora Warrington, Miss Lilian Gault, Mr. Arnold Finley, Mr. Wait, Miss Lovejoy, Dr. Burgess, Mr. H. H. Lyman, Dr. Stirling, Miss Ida Boulter, Master George Ewing, Mr. and Mrs. Farquhar Robertson, Mrs. John Gibb, the Misses Hodge, Mrs. Pennington, Mr. W. A. Oswald. The officials of the Philipsburg Junction Railway present were: Messrs. Wells, Manager, and Henry Timmis, Secretary. A large contingent from the Montreal Camera Club and the Montreal Agassiz Society were also present.

After a most enjoyable train ride through the prettiest part of the eastern townships the destination of the party, Philipsburg, was reached about 11.30.

Here the party were met by Major E. L. Bond, who has his handsome summer residence on the shores of the bay.

In a brief but explicit and interesting address Major Bond welcomed the visitors, this pleasant duty devolving upon him in the absence of the Mayor, by virtue of his position as President of the Philipsburg Junction Railway Co. The principal spots of historic interest were described, including the old Methodist Church, the first built in the Eastern Townships, and directions were given to the various sections of the Society as to the most suitable places for the pursuit of the particular hobbies. After the various competition conditions had been announced by the Rev. Dr. Campbell, the party dispersed, to amuse themselves, each in their own particular way.

The botanical section went off in charge of Mr. H. B. Cushing, while Dr. Deeks took charge of the geologists.

All too soon came the end of the day's pleasure and scientific research, and the hoarse whistle of the locomotive was heard summoning the wanderers back to the train. Assembled here, a most interesting address was given by Mr. J. F. Whiteaves, a member of the Royal Geological Society, descriptive of the formation, strata, etc., of Philipsburg and the adjacent country. At the conclusion of this, three cheers for Major Bond were called for and heartily rendered, after which the train was boarded for the return journey.

The collections made during the day were adjudicated upon by the following judges :—

Geological section—Mr. J. F. Whiteaves, F.R.G.S., and Dr. Deeks.

Botanical section—Dr. Burgess, of Verdun, and Mr. H. B. Cushing, of McGill.

Entomological section—Mr. H. H. Lyman.

The results were announced as follows :—

Botanical section—First prize, Mr. John Saxe, with 76 named varieties. In the unnamed class, Miss M. E. Baylis was awarded first prize for a collection of 94 specimens, while Miss F. E. Cushing with 73 specimens received honorable mention.

Geological section—In this section Miss Ethel Radford, B.A., was awarded the prize, with a collection of some 40 specimens.

Entomological section—In this section there were no collections, consequently no prize was awarded, speaking well for the comparative immunity of Philipsburg from beetles and "other creeping things."

Mr. H. B. Cushing has furnished a memorandum of the plants collected during the day, and Dr. Deeks has kindly subjoined a list of the fossils for which the prize was awarded.

LIST OF PLANTS COLLECTED AT PHILIPSBURG, QUE.

June 1st, 1895.

Anemone Virginiana, L.; Hepatica acutiloba, DC. (past flowering); Ranunculus abortivus, L.; Ranunculus recurvatus, Poir; Caltha palustris, L.; Aquilegia Canadensis, L.; Actæa alba, Bigel; Chelidonium majus, L.; Dicentra Canadensis, DC. (past flowering); Capsella bursa-pastoris, Mœnch.; Viola palmata, L. var. cucullata, Gray; Viola blanda, Willd; Viola Canadensis, L.; Stellaria media, Smith; Malva rotundifolia, L.; Tilia Americana, L.; Geranium Robertianum, L.; Oxalis corniculata, L. var. stricta, Sav.; Vitis cordifolia, Michx; Acer spicatum, Lam.; Acer saccharinum, Wang (in fruit); Trifolium pratense, L.; Trifolium hybridum, L.; Medicago lupulina, L.; Robinia Pseudacacia, L.; Rubus strigosus, Mix.; Fragaria vesca, L.; Rosa Blanda, Ait.; Rosa rubiginosa, L. (not in flower); Tiarella cordifolia, L.; Mitella diphylla,

L.; Ribes Cynosbati, L. (in fruit); Osmorrhiza brevistylis, DC.; Osmorrhiza longistylis, DC.; Viburnum Lentago, L.; Antennaria plantaginifolia, Hook.; Chrysanthemum leucanthemum, L.; Taraxacum officinale, Weber; Hydrophyllum Virginicum, L.; Cynoglossum officinale, L.; Lithospermum officinale, L.; Veronica serpyllifolia, L.; Nepeta Glechoma, Benth.; Rumex acetosella, L.; Asarum Canadense, L.; Thuya occidentalis, L.; Orchis spectabilis, L.; Iris versicolor, L.; Sisyrinchium angustifolium, Mill; Maianthemum Canadense, Desf.; Trillium grandiflorum, Salisb, (past flowering); Arisaema triphyllum, Torr.; Eleocharis tenuis, Schultes; Carex intumescens, Rudge; Carex hystricina, Muhl.; Carex arctata, Boott; Carex gracillima, Schwein; Carex pallescens, L.; Carex Hitchcockiana, Dewey; Carex laxiflora, Lam.; Carex aurea, Nutt.; Carex varia, Muhl; Carex stipata, Muhl; Carex rosea, Schkuhr; Carex cephalophora, Muhl; Carex Deweyana, Schwein; Poa annua, L.; Poa pratensis, L.; Equisetum arvense, L.; Equisetum sylvaticum, L.; Polypodium vulgare, L.; Adiantum pedatum, L.; Camptosorus rhizophyllus, Link; Aspidium marginale, Swartz; Cystopteris bulbifera, Bernh; Onoclea sensibilis, L.; Onoclea struthiopteris, Hoffmann; Osmunda regalis; Osmunda cinnamomea; Botrychium Virginianum, Swartz.

Fossils.

The species collected belonged to the following genera: Bathyurus, Bathymellus, Illaenus, all fragmentary; Orthoceras, Cystoceras, Lituites Pleurotomaria, Murchisonia, Maclurea, Ecculiomphalus, Ophileta, Orthis, Strophomena and Camerella.

Report of Chairman of Council of the Natural History Society of Montreal, for the Year ending 27th May, 1895.

To the President and Officers of the Society:

The meeting this evening makes the seventh regular monthly meeting of the Society for the present session, at all of which very interesting papers have been contributed.

The Council has held nine ordinary and two special meetings, all of which have been well attended.

The Annual Field Day was held at Labelle last year, and although the weather was none too promising, the attendance was larger than usual and the result satisfactory to all concerned.

The Somerville Course of Lectures for the past winter were upon "The Resources of Canada, as viewed by a Naturalist," and proved of such great interest to those able to attend, that a wish has been expressed that the lectures should be published in pamphlet form; a most desirable thing to do if we only had the funds at our disposal. We hope the idea will not be lost sight of.

The conversazione which was in contemplation for last winter had to be postponed.

The Government Grant which the Society formerly received and spent in the publication of the Record of Science, has not been forthcoming again this year,—nevertheless, the Record of Science is still being issued; the Society's being able to continue this work is entirely due to the efforts of Mr. John S. Shearer, who collected the needed funds from the friends of the Society.

A number of repairs and improvements have been made to the building and museum, including the renovating and re-seating of the large lecture hall. This the Society could not have done but for the efforts of Mr. John S. Shearer, who collected the required amount.

The attendance of visitors at the museum shows, on

Saturdays 2,600, on evenings of Somerville course, 350, and ordinary, 209, the Saturday attendance being double that of previous years, but the ordinary visitors were only half of other years, due largely to restricted American travel.

Our President, Dr. Wesley Mills, has given much time and labour to the work of the Society, and through his efforts papers have never been wanting at the Society's meetings.

The whole respectfully submitted,

GEO. SUMNER,
Chairman of Council.

Montreal, May 21st, 1895.

NATURAL HISTORY SOCIETY OF MONTREAL.

REPORT OF THE HON. CURATOR.

Gentlemen,—During the past season a number of valuable donations have been made to the Society, duly reported at the monthly meetings and acknowledged.

Considerable work has been done at the Museum by Mr. Winn, Mr. Williams and Mr. Dunlop, and the Superintendent, Mr. Griffin, has overhauled all the mammals, clearing them of moths, but I would suggest that they be re-arranged to show off to better advantage.

The monkeys and marsupials have been cleaned and renamed and placed in a case on the landing. The British birds have been properly named and placed in two cases on the landing. All the birds have been carefully inspected, properly arranged and a large number renamed on fresh labels. The reptiles have been sorted out, cleaned and named on fresh labels, and placed in two cases on the lower flat. This work was creditably done by Mr. Williams.

The Birds' Eggs have been overhauled, and the collection was found to be in a dilapidated condition, but Mr. Dunlop has endeavoured to clean them, and for the present placed them in a cabinet in the Curator's room. I hope to have shortly a very large and valuable collection of Birds' Eggs donated to the Society.

The Insect Cabinet is being attended to by Mr. Winn, and good progress has been made in arranging the collection of Insects.

Among the Birds, a number of specimens are badly attacked by moths, requiring immediate attention, and making it necessary to have a bath made, with proper chemicals, to rid them of moths. Otherwise the whole collection of mammals and birds in the Museum will gradually be destroyed. I have given a description of the bath and chemicals required to the superintendent, and they can be procured at a cost of about fifteen dollars.

No meetings of the Museum Committee have been called, but I think it would be well to have such in the future.

The number of visitors to the Museum on "free days" has more than doubled that of last year, showing a gratifying and more lively interest taken in the Museum by the public.

I regret that I could not give more time to the Museum, although I have kept a general supervision over the work done the past year; but there is a great deal of work yet to be done in the preservation of the valuable specimens in the Museum, and I would suggest that a proper Museum catalogue should be made and printed for the use of the Society, and to be sold to the public. I would also suggest that somebody should be appointed Curator who could give the greater part of his time in the interest of the Museum.

Respectfully submitted,

ERNEST D. WINTLE,

Montreal, May 27, 1895. *Hon. Curator.*

Natural History Society of Montreal,

IN ACCOUNT WITH

F. W. Richards, *Hon. Treas.*

Dr.

To 145 Ordinary Members, Sub.	$580 00		
" 5 Associate " "	5 00		
		$585 00	
" Rents		985 50	
" Collected by Mr. Shearer for R. & S		300 00	
" Field Day Receipts	$454 50		
" " " Disbursements	356 15		
" " " Surplus		97 35	
" Tenants' proportion of Renovations		72 62	
" Entrance Fees to Museum		12 95	
" Interest Merchants' Bank		6 87	
" Cash for 6 old Benches		6 00	
" Donation J. R. Dougall		3 00	
" One sub. to Record of Science		3 00	
			$2,072 29

Cr.

By Superintendent's Salary	$456 00		
" " Commission	48 50		
		$504 50	
" Record of Science		375 84	
" Repairs, Reseating and Renovations		333 64	
" Light		191 90	
" Fuel		128 32	
" Taxes		33 95	
" Sundry Expenses		180 07	
" Lectures		58 70	
" Museum		87 80	
" Cash in hand		177 57	
			$2,072 29

F. W. Richards,
Treasurer.

Audited and found correct,

A. Holden
John S. Shearer. } *Auditors.*

May 21st, 1895.

Report of the Library Committee.

The Library Committee have little to report at the present meeting. Much time has been taken up in collecting together the parts of the various volumes of exchanges which have for some time been accumulating in the library. These have been arranged and put into the hands of the binder to the number of 248 volumes, the Council having voted $150 for binding. These books, it is expected, will be placed on the Library shelves before the next meeting of the Society. Many valuable works which were lying about in the closets under the library cases will be found among them, as also useful works in the French and German languages. Your Committee have also obtained in exchange for duplicates, by permission of the Council, twelve volumes of *Popular Science Monthly*, of recent date. The exchanges for the Record of Science have been duly acknowledged and recorded.

The donations to the Library received during the year are as follows:—

Donors.	
Sir J. W. Dawson:	"The Canadian Ice Age,"
	"Life of Peter Redpath,"
	"Notes on Genus Naiadites."
Dr. G. Dawson:	"Presidential Address to the Royal Society of Canada."
McMillan & Co., N.Y.	"Ampleoxus and the Ancestry of the Vertebrates."
	"From the Greeks to Darwin."
E. D. Wintle:	"Birdnesting."

Respectfully submitted,

E. T. Chambers,
Hon. Librarian.

Report of the Natural History Society of Montreal, for 1895, to the Royal Society of Canada.

The Natural History Society of Montreal has, this year again, availed itself of the privilege of sending a delegate to represent it at the annual meeting of the Royal Society of Canada.

The work of the Society has been carried on during the present year in an efficient manner, and it is a cause of satisfaction to be able to state that there has been an increased attendance at the monthly and other meetings of the Society, showing that the members appreciate the importance of its work.

The Museum is now being thoroughly overhauled and all the specimens are being renamed. During the present year a larger number than usual of donations from friends of the Society have been made, including one from the Council of Arts, through the Secretary, Mr. S. C. Stevenson, showing that the public as well as the members have an interest in the work of the Society. It is also pleasing to note that the attendance, during the present year, of outsiders at the Museum on Saturdays, on which days the Museum is free to the public, has been nearly double that of previous years.

The Society is fully impressed with the desirability of continuing the publication of the Canadian Record of Science, and has made arrangements to do so. It has appropriated from its funds an annual sum of $200, and it hopes in the future, as it has done this year, to replace the annual grant of $400, which the Government has discontinued, by the subscriptions of the generous patrons of science to be found in Montreal. It may be mentioned that the circulation of the Record has increased, and that in view of this fact and of the value of the work, the Society is firmly determined, even at the cost of a heavy inroad on its finances, to continue its quarterly publication

The project of the affiliation with it of other kindred associations is still engaging the attention of the Society. Besides the increase to its membership from the members of the affiliated societies who have become associate members, there has also been an increase this year on the roll of ordinary members.

The Annual Field Day last year took place on the 2nd June, and was largely attended. The excursion was on the Montreal and Western Railway to the village of Sault aux Iroquois, now called Labelle in honor of the great colonizing priest of that name, where the excursionists were most cordially received, and while the excursion afforded both enjoyment and an opportunity for research to the members and their friends, it also realized a profit which was an acceptable addition to the funds of the Society. This year, the excursion on the annual field day will be to Phillipsburg, on Missisquoi Bay.

The following papers were read and discussed at the Monthly Meetings of the Society:—

Oct. 29th.—"Bivalve Shells in the Coal Formation, and what they teach," by Sir Wm. Dawson, LL.D., F.R.S.; "The Effects of Great Pressure on Rock Structure," by Prof. F. D. Adams, M.A., Sc., Ph.D.

Nov. 26th.—"The Mechanism of the Horse's Foot and its management, from a Humane Standpoint," by Prof. D. McEachran, F.R.C.V.S., Eng.; "The Psychic Development of Young Animals, and its Physical Correlation," by Prof. Wesley Mills, M.A., M.D.

Jan. 28th.—"Meteorites and what they Signify," by Prof. B. J. Harrington, B.A., Ph.D.; "Unusual occurrence ofthe Razor-Billed Auk at Montreal, Remarkable Flight of Certain Birds from the Atlantic Coast up the St. Lawrence to the Great Lakes," by E. D. Wintle, Esq.

Feb. 25.—"Dimorphism and Polymorphism in Butterflies," by H. H. Lyman, M.A.; "Additional Remarks on

the Flora of the Island of Montreal," by Rev. R. Campbell, D.D.

March 25th.—"Ancient Engineering," by Prof. J. T. Nicholson, B.Sc.

April 29th.—"Canada's Timber Resources and Lumber Industry, with some Reminiscences of those Connected with the Trade," by the Hon. J. K, Ward.

On the last mentioned date, Mr. J. B. Williams was to have read a paper on "Birds: What are they? Where are they? and whence are they?" but time did not allow it to be done; he will, however, favor the Society by reading it at the next Monthly Meeting.

The course of the Somerville lectures this year was on "The Resources of Canada, as viewed by a Naturalist." The lectures were delivered on the Thursdays from the 7th February to the 21st March, inclusively; they were free to the public and were well attended. The Museum was open to the public for one hour previously to each lecture.

The lectures were as follows:

1.—"The General Geographical Relations of Canada," by Sir J. W. Dawson, LL.D., F.R.S.

2.—"The Useful Minerals of Canada," by Captain R. C. Adams.

3.—"Some of the Agricultural Products of Canada," by Prof. Wm. Saunders, Director of Dominion Experimental Farms.

4.—"Wheat, and Canada's Relation to the Wheat Supply of the World," by Edgar Judge, Esq.

5.—"The Remedy for the Scarcity of Wood in the Old Settlements, and the Care of Growing Trees," by the Hon. H. G. Joly de Lotbinière.

6.—"Our Native Mammals of Economic Value," by Dr. Robert Bell, of the Geological Survey.

7.—"Canada's Fish and Fisheries," by Prof. E. E. Prince, of the Department of Fisheries, etc.

The gentlemen whose names now follow are the present officers and members of the Council of the Society :—

Patron : His Excellency Lord Aberdeen.

Honorary President : Sir J. William Dawson, C.H.G., LL.D., F.R.S., F.R.S.C.

President : Dr. T. Wesley Mills.

First Vice-President : John S. Shearer.

Vice-Presidents : Hon. Edward Murphy, J. H. R. Molson, Sir Donald A. Smith, Dr. B. J. Harrington, Rev. Dr. R. Campbell, George Sumner, Edgar Judge, J. H. Joseph, Mr. Justice Wurtele.

Recording Secretary : R. W. McLachlan.

Corresponding Secretary : Dr. J. W. Stirling.

Treasurer : F. W. Richards.

Curator : E. D. Wintle.

Members of Council : Frank D. Adams, Albert Holden, L. A. H. Latour, N. N. Evans, James Gardner, Joseph Fortier, Hon. J. K. Ward, A. F. Winn, J. Stevenson Brown.

Chairman of Council : George Sumner.

Superintendent : Alfred Griffin.

Before concluding, the Society offers its thanks to the Royal Society for the volumes containing its proceedings and papers.

(Signed) J. WURTELE, D.C.L.,

Delegate.

Montreal, 13th May, 1895.

REPORT OF EDITING AND EXCHANGE COMMITTEE.

The four issues of the "Record of Science" for the year were got out in good time, and were of a fair average as to the quality of their contents. The "Record" continues to command the attention of scientists in all parts

of the world, as the exchanges received for it indicate. These exchanges are of great value, and constitute in themselves a very important addition annually to our Library. The Committee feel much indebted to Mr. Shearer for his successful efforts in raising the funds necessary for carrying on the publication, since the Legislative grant was withdrawn. Of course, if larger means were at their disposal, they could add greatly to the value of the "Record," by more numerous and costly illustrations, than the funds at present at command admit of; but they are striving to do the best they can under the circumstances, and they hope to continue to justify, by the variety and excellence of the contents of the "Record," the liberality of the members of the Society in furnishing the extra amount required for its maintenance.

Respectfully submitted, on behalf of the Committee, in the absence of the Editor, Dr. F. D. Adams, by

ROBERT CAMPBELL,
Acting Editor.

ABSTRACT FOR THE MONTH OF MARCH, 1895.

Meteorological Observations McGill College Observatory, Montreal, Canada. Height above sea level, 187 feet. C. H. McLEOD, *Superintendent.*

DAY.	THERMOMETER.				BAROMETER.				†Mean pressure of vapor.	‡Mean relative humidity.	Dew point.	WIND.		SKY CLOUDED IN TENTHS.			Per cent. of Possible Sunshine.	Rainfall in inches	Snowfall in inches.	Rain and snow melted.	DAY.
	Mean.	Max.	Min.	Range.	Mean.	Max.	Min.	Range.				General direction.	Mean velocity in miles per hour	Mean.	Max.	Min.					
1	34.78	39.9	23.0	16.9	29.4457	29.544	29.401	.143	.1903	93.0	33.0	S.W.	12.5	10.0	10	10	13	0.04	0.2	0.05	1
2	8.38	23.1	6 0	17.1	29.8573	29.911	29.783	.128	.0537	84.3	4.7	S.W.	14.5	5.8	10	0	54	....	Inap.	Inap.	2
SUNDAY. 3	.....	29.0	5.0	24.0	.....	.....	.....	....	.....	....	....	S.W.	19.7	....	...	..	00	....	Inap.	Inap.	3... .....SUNDAY
4	0.42	9.9	— 6.0	15.9	29.9115	30.194	29.611	.583	.0400	93.7	2 2	N.	20 3	8.3	10	0	00	....	4.2	0.42	4
5	8.52	15.3	1.7	13.6	30.0783	30.236	29.858	.378	.0543	85.3	5 0	S.W.	23.8	2.3	0	0	96	....	0.1	0.01	5
6	17.23	26.5	9.0	17.5	30.2932	30.362	30.251	.111	.0858	89.3	14.5	S.W.	14.4	2.8	10	0	95	....	0.1	0.01	6
7	26.58	35.2	12 6	22.6	30.0245	30.244	29.809	.435	.1230	83.0	22.3	S.	10.8	5.8	10	0	40	....	....	....	7
8	33.17	39.0	27.0	12.0	29.6312	29.792	29.477	.313	.1683	88.7	30.2	S.W.	4 0	2.3	4	0	89	....	Inap.	Inap.	8
9	25.02	33.7	19.5	14.2	29.5447	29.636	29.462	.174	.1138	84.3	21.2	S.W.	17.4	5.7	10	0	69	....	Inap.	Inap.	9
SUNDAY ... 10	.....	26.7	11.5	15.2	.....	.....	.....	....	.....	....	....	S.W.	16.6	....	....	..	84				10... .....SUNDAY
11	11.12	17.6	— 0.2	17.8	30.3672	30.314	30.211	.103	.0533	73.7	4.2	S.W.	6.0	0.0	0	0	89	....	....	....	11
12	14.87	24.8	5.0	19.8	30.1653	30 230	30 091	.139	.0738	82.5	10.7	N.E.	2.4	3 2	10	0	78	....	....	....	12
13	29.37	38.6	18.0	20 6	29.9632	30 107	29.803	.304	.1443	84.8	25.5	S.E.	8.3	9.8	10	9	09	0.03	....	0.03	13
14	15.52	36.5	4.8	31.7	30 0985	30.266	29.807	.459	.0845	82.8	11.2	W.	26.5	5.7	10	0	63	0.11	Inap.	0 11	14
15	10.33	16.2	2.0	14.2	30.0045	30.184	29 799	.385	.0550	78.3	5.0	W.	14.3	3.5	10	0	78	....	....	....	15
16	17.58	25 8	11.8	14.0	29.6942	29.773	29.611	.162	.0775	79.8	12.7	W.	14.3	4.7	10	0	73	....	....	....	16
SUNDAY 17	.....	30.2	11.2	19.0	.....	.....	.....	....	.....	....	....	W.	27 5	....	....	..	74	....	0.1	0.01	17.....SUNDAY
18	16.30	25.1	4.2	20.9	29.5702	29.627	29.474	.153	.0763	79.3	11.0	W.	35.2	8.3	10	0	00	....	0 4	0.04	18
19	24.35	30.3	16.8	13 5	29.8547	30.018	29 702	.316	.1065	80.2	19.5	W.	25 5	2.0	10	0	91	....	....	....	19
20	20.78	25.9	15 2	10.7	30.0795	30.110	30.062	.048	.0853	76.3	14.5	N.W.	6.5	0.7	2	0	96	....	....	....	20
21	22 83	29.3	14.2	15.1	30.1305	30.191	30.082	.109	.1027	82.0	18.3	W.	10 8	6.3	10	0	87	....	....	....	21
22	32.18	36.5	26 0	10.5	30.3332	30.410	30 243	.167	.1562	86.2	28.5	N.	7.4	4.7	10	0	59	...	....	....	22
23	33.07	38.9	25 4	13.5	30.4195	30.496	30.292	.204	.1553	81.7	28 0	S.W.	11.3	0.0	0	0	97	....	....	....	23
SUNDAY.. 24	.....	38.2	28.8	9.4	.....	.....	.....	....	.....	....	....	S.	19.0	....	.....	..	12	....	0.2	0.02	24 ..... SUNDAY
25	35.92	40.7	33.5	7.2	29.6725	29.941	29 602	.339	.1955	92.7	33 7	S.W.	21.0	7.8	10	0	21	0 21	...	0.21	25
26	31.02	35.3	29 4	5 9	29.6668	29.717	29.623	.094	.1568	90.2	28.5	S.W.	21.0	7.7	10	0	10	....	Inap.	Inap.	26
27	27.45	30.8	23.0	7.8	29.7030	29.820	29.481	.339	.1288	85.5	23.8	S.W.	18.1	6.7	10	0	56	....	0.2	0.02	27
28	30.07	35 3	24.0	11.3	29.6233	29 892	29.381	.511	.1462	87 3	27.0	N.W.	17.9	8 8	10	3	26	....	0.2	0.02	28
29	26.25	31.9	21.0	10.9	29.9972	30.036	29 956	.080	.1197	83.7	22.0	N.W.	16.4	8 5	10	0	83	..	....	....	29
30	23.13	31.8	15.5	16.3	30.2018	30.300	30 059	.241	.0952	74.7	16.5	N.W.	18.2	0.0	0	0	98	....	....	....	30
SUNDAY.....31	....	30.2	15.3	14.9	.....	.....	.. ..	....	.....	....	....	S.W.	16.8	....	0	5	94	....	....	....	31 .....SUNDAY
....Means	22.16	29 94	14.65	15 29	29.9327	30.052	29.805	.247	.1093	84.0	18.2	S. 67¼° W.	16.1	5.1	8.3	1.0	59 0	0.45	5.6	1.01	Sums ....
21 Years means for and including this month	24 28	31 63	16.64	14.75	29.9688	....	.....	.262	.1087	75 9	....	.....	....	6.0	..	..	¶47 1	0.94	22.8	3.21	21 Years means for and including this month.

ANALYSIS OF WIND RECORD.

Direction.....	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	CALM.
Miles	898	95	19	616	677	5077	3009	1578	
Duration in hrs .	58	13	3	52	53	275	161	96	33
Mean velocity...	15 5	7.3	6.3	11.8	12.8	18.4	18 7	16.4	

Greatest mileage in one hour was 52 on the 18th.
Greatest velocity in gusts 60 miles per hour on the 18th.

Resultant mileage, 7810.
Resultant direction, S. 67¼° W.
Total mileage, 11969.
Lightning on 1st.

*Barometer readings reduced to sea-level and temperature of 32° Fahrenheit.

§ Observed.

† Pressure of vapour in inches of mercury.

‡ Humidity relative, saturation being 100.

¶ 14 years only.

The greatest heat was 40.7° on the 25th; the greatest cold was —6.0° on the 4th, giving a range of temperature of 46.7 degrees.

Warmest day was the 25th. Coldest day was the 4th. Highest barometer reading was 30.495 on the 23rd. Lowest barometer 29,381 on the 28th, giving a range of 1.115 inches. Maximum relative humidity was 98 on the 4th and 25th.

Minimum relative humidity was 64 on the 30th.

Rain fell on 4 days.

Snow fell on 15 days.

Rain or snow fell on 17 days.

Auroras were observed on 1 night on 22nd.

Lunar halos 2, on 8th and 31st.

Solar halos, 9 on 7th, 12th, 15th, 16th, 18th, 21st, 27th, 29th, 31st.

ABSTRACT FOR THE MONTH OF APRIL, 1895.

Meteorological Observations, McGill College Observatory, Montreal, Canada. Height above sea level, 187 feet. C. H. McLEOD, *Superintendent.*

DAY.	THERMOMETER.				BAROMETER.				†Mean pressure of vapor.	‡ Mean relative humidity.	Dew point.	WIND.		SKY CLOUDED IN TENTHS.			Per cent. of Possible Sunshine.	Rainfall in inches	Snowfall in inches.	Rain and snow melted.	DAY.
	Mean.	Max.	Min.	Range.	Mean.	Max.	Min.	Range.				General direction.	Mean velocity in miles per hour	Mean.	Max.	Min.					
1	30.05	34.8	25.0	9.8	29.7998	29.991	29.640	.351	.1202	71.0	22.0	S.W.	5.2	8.3	10	0	00	....	Inap.	....	1
2	33.95	38.5	29.1	9.4	29.6278	29.649	29.608	.041	.1533	78.7	28.0	S.W.	7.0	9 2	10	5	00	....	....	....	2
3	32.32	36.9	28.9	8.0	29.6107	29.653	29.550	.103	.1463	80.0	27.0	W.	12.1	9.0	10	4	19	Inap.	....	Inap.	3
4	30.57	35.8	25.3	10.5	29.8325	29.939	29.728	.211	.1458	84.8	26.7	S.W.	18.7	7.3	10	0	40	....	....	....	4
5	35.90	41.4	29.8	11.6	30.1305	30.214	30.030	.184	.1382	65.8	25.5	S.W.	16.9	2.2	10	0	56	....	....	....	5
6	37.48	46.0	30.0	16.0	30.3285	30.357	30.276	.081	.1605	71.7	29.0	N.E.	6 0	0.8	5	0	90	....	....	....	6
SUNDAY.....7	.....	50.0	28.2	21.8	.....	.....	.....	...	.....	....	....	S.E.	12.2	....	....	..	50	0.02	....	0.02	7.... .....SUNDAY
8	41.32	46.0	38.2	7.8	29 8958	30.098	29.631	.467	.2565	98.2	41.0	S.E.	11.3	10.0	10	10	00	0.61	....	0.61	8
9	45.03	47.6	39 0	8.6	29.3613	29.544	29.236	.308	.2888	95.3	43.7	S.E.	15.2	10.0	10	10	00	1.05	....	1.05	9
10	29.15	30.5	24.0	15.5	29.8948	30.252	29.575	.677	.1152	71 3	21 2	N.W.	24.8	2.3	10	0	95	....	....	....	10
11	25.92	33 4	16.0	17.4	30.5090	30.656	30.431	.225	.0952	66 3	16.5	S.W.	11.8	1.0	4	0	93	....	..	....	11
12	37.57	46.6	25.9	20.7	30.3698	30.555	30.135	.420	.1497	66.3	27.0	S.E.	13 4	7.0	10	0	03	0 01	....	0.01	12
13	42.03	47.2	38.7	8 5	29.8927	30.016	29.826	.190	.2548	95.0	40 7	S.E.	9 3	10.0	10	10	00	0.49	....	0.49	13
SUNDAY..... 14	.....	45.0	36.5	8.5	.....	.....	.....	....	. ..	...	....	N.	10.2	....	....	..	00	0.87	....	0.87	14... .....SUNDAY
15	38.73	43.5	36.2	7.3	29.8730	30.088	29.732	.356	.2125	90 3	36.0	N.E.	33.0	9.7	10	8	00	0.32	....	0.32	15
16	39.22	48.3	34.0	14.3	30.2217	30.269	30.168	.101	.1737	72.3	30.8	N.	24.6	6.3	10	0	28	....	....	....	16
17	44.83	57.2	32.8	24.4	30 1505	30.242	30.077	.165	.1642	56.2	29.5	N.E.	9.2	0.0	0	0	96	....	.....	....	17
18	49.37	59.8	38.0	21.8	30.0885	30.149	30.014	.135	.1760	49.8	31.2	N.	9.5	0.0	0	0	94	....	....	....	18
19	54.03	67.4	40.2	27.2	29.9755	30.050	29.910	.140	.2222	55.0	37.3	N.W.	13.4	1.2	7	0	85	....	....	...	19
20	48.87	58 6	38.2	20.4	30.0518	30.091	30 015	.076	.2465	71 0	39.7	N.	10 5	1.3	5	0	95	....	....	....	20
SUNDAY.....21	.....	64.0	40.0	24.0	.....	.....	.....	....	.....	....	....	S.	13.2	....	....	..	95	....	....	....	21.....SUNDAY
22	44.82	50.9	38.0	12.9	29.7993	29.893	29 715	.178	.2532	85.3	40.5	S.	15.6	5 0	10	0	23	0.37	....	0.37	22
23	39.32	42.8	36.0	6 8	29.7333	29.875	29.621	.454	.2160	89.3	36.3	S.E.	21.5	8.3	10	0	00	0.02	....	0.02	23
24	45.33	60.3	31.2	29.1	29.8162	29.960	29.671	.289	.2143	70.2	35.5	S.W.	17.1	6.7	10	0	20	Inap.	....	Inap.	24
25	50.27	59.2	40.0	19.2	29.9267	30.098	29.864	.234	.2527	70.2	40.5	S.W.	15 3	7.7	10	0	28	....	....	....	25
26	43 47	51.6	34.2	17.4	30.2517	30.283	30 214	.069	.1885	66.5	33 0	N.	7.6	4.3	10	0	67	....	....	...	26
27	44.22	53.7	34.0	19.7	30.3265	30.389	30.281	.108	1717	59.3	30.7	N.	15 0	1.7	10	0	81	....	....	....	27
SUNDAY.....28	.....	60.0	38.0	22.0	.....	.....	.....	....	.....	....	....	N.	5.3	....	.....	.	92	....	....	....	28.....SUNDAY
29	57.13	68.6	42.0	26.6	30.1713	30.256	30.086	.170	.2687	59.3	42.0	S.	9.7	4.2	10	0	94	....	....	....	29
30	49.60	58.3	43.5	14.8	30.2562	30.307	30.147	.240	.2433	68.0	39.2	N.	15.4	6 3	10	0	31	Inap.	....	Inap.	30
31	....	....	....	....	.....	.....	.....	....	.....	....	..	.....	....	....	....	..	..	....	....	....	31
....Means	41.17	49.76	33.70	16 06	29.9984	30.113	29.890	.222	.1934	73.4	32 7	N. 33¾° W.	13.7	5.4	8.5	1.8	45.8	3.76	0.0	3.76	Sums .....
21 Years means for and including this month	40.00	48 49	32.29	16.19	29.9523	.....	.....	.206	.1699	66.5	....	.....	....	6.2	..	..	51.2	1.64	6.1	2.26	21 Years means for and including this month.

ANALYSIS OF WIND RECORD.

Direction.....	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	CALM.
Miles.....	2264	1476	197	1382	693	1867	848	1118	
Duration in hrs..	158	97	29	113	42	120	62	75	24
Mean velocity...	14.3	15.2	6.8	12.2	16.5	15.6	13.7	14.9	

Greatest mileage in one hour was 38 on the 15th.

Greatest velocity in gusts 48 miles per hour on the 15th.

Resultant mileage, 1330.
Resultant direction, N. 33¾° W.
Total mileage, 9845.
Average mileage per hour, 13.7.
Slight earthquake shock on 17th at 11.15 a.m., lasting about 10 seconds, travelling in a S.E. direction.

* Barometer readings reduced to sea-level and emperature of 32° Fahrenheit.

§ Observed.

† Pressure of vapour in inches of mercury.

‡ Humidity relative, saturation being 100.

¶ 14 years only.

The greatest heat was 68.6° on the 29th: the greatest cold was 16.0° on the 11th, giving a range of temperature of 52.6 degrees.

Warmest day was the 29th. Coldest day was the 11th. Highest barometer reading was 30.656 on the 27th. Lowest barometer was 29.236 on the 9th, giving a range of 1.420 inches. Maximum relative humidity was 100 on the 8th, 9th and 14th.

Minimum relative humidity was 32 on the 29th.

Rain or snow fell on 12 days.

Auroras were observed on 4 nights, 10th, 11th, 20th and 26th.

Lunar corona on the 2nd.

Fog on 2 days, 8th and 9th.