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The Rate of Propagation of the Venous Pulse.[1]

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This research was undertaken at the suggestion of Prof. Karl Hürthle, of Breslau, to determine the rate at which the venous pulse travels. Before I began my experiments Prof. Hürthle had satisfied himself that a venous pulse could frequently be observed in the veins of the neck and extremities of normal dogs.

He had also devised very sensitive apparatus for recording the same (Hürthle's venous manometers). Tracings of the pulse in the veins of the extremities of normal dogs, taken with this apparatus, are shown in Figures 1 and 2. Other investigators had also observed the venous pulse in the extremities of normal animals, and still others (2 and 3) had studied it in normal and pathological human subjects, but no one had undertaken to measure the rate at which it travelled. It seemed probable that this would be found different from that of the arterial pulse, on

[1] This research was reported in German in Pflürger's Archives for March.

account of the differences in pressure in the two kinds of vessels.

My experiments were all performed on dogs, which first received an injection of morphine, and were then thoroughly anæsthetized with a mixture of equal parts of chloroform and ether.

FIG. 1.—Pressure tracing from artery (below) and femoral vein (above). Time $\frac{1}{5}$ seconds. From a dog.

Pulse tracings were taken on a blackened surface simultaneously from two points on the veins. At the same time a chronograph was arranged to mark seconds or fifths of seconds on the recording surface, so as to indicate the rate at which it was moving. By this means it was possible to estimate the time elapsing between the appearance of a certain wave on the tracing taken from a vein at a point near the heart, and on that taken farther away from the heart. Then, in order to estimate the rate at which a given pulse wave travelled, it was only necessary to know, in addition, the distance of the points on the veins from one another measured along the line of blood flow, or more exactly the difference in the distances of the two points from the heart (right auricle).

The recording surface employed was that of Hürthle's large clockwork kymograph.

The pulse waves were recorded by inserting a fine glass canula, with a long drawn out point, into the vein through a side branch. (See Fig. 3.) The canula was then connected by rubber tubing with one of Hürthle's venous manometers, which marked the waves on the surface of the kymograph.

Hürthle's venous manometers which were used in the experiments consist of small metallic tambours, 10 mm. in diameter, covered over with thin rubber tissue slightly stretched. On the centre of this membrane rests a light metal disc of 8 mm. diameter, which supports, and transmits its movements to a lever moving very easily and writing at one end on the kymograph with a suitably shaped quill. The lever magnifies the up and down movements of the disk as 120:5.

On account of the very slight variations in pressure underlying the venous pulse, friction has to be minimized as much as possible. This is accomplished by adjusting the lever against the kymograph by a screw arrangement, so that it exerts the slightest possible pressure upon it. The manometers, the glass canulas, and the rubber tubing connecting them were filled with saturated solution of magnesium sulphate, which prevented the clotting of the blood in the vein over the opening of the canula.

It was possible, by measuring the distance that the lever of the manometer was raised, and comparing this with the effects of known pressures of water at the close of the experiments, to estimate approximately the pressure present in the veins at any point represented on the tracings.

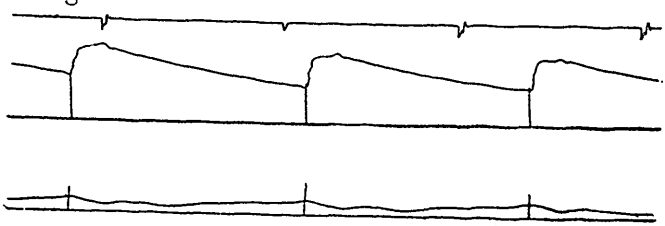

FIG. 2.—Pressure tracing from artery (above) and brachial vein (below). Time in seconds. From a dog.

The rate of propagation was measured in two regions:

1. Through the external jugular vein.
2. Through the inferior vena cava to the femoral vein.

In the first case, pulse tracings were taken simultane-

ously from the central and peripheral ends of the external jugular, by inserting one canula into it through the posterior scapular vein, and another through the external maxillary.

To measure the rate of propagation through the inferior vena cava, one tracing was taken as above from the central end of the external jugular, and the other from the femoral

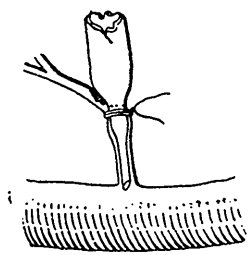

Fig. 3.

vein by introducing a canula into it through the deep femoral. At the end of the experiments the distances of the points on the veins used from the right auricle were measured; if one indicates the distance of the point nearest the heart by $e_{,}$, and the distance of the point farthest away by $e_{,,}$ then the length of vein for which the rate of propagation of the pulse waves is estimated is $e_{,,} - e_{,}$.

Finally, at the end of the experiment the points on the two tracings, corresponding to one another in time, were established by causing both levers to write vertical lines, with the kymograph standing still. The marking of these points was sometimes attended with considerable difficulty, on account of the waves being less sharp than those of the arterial pulse.

In most cases, however, a fair number of satisfactory markings could be made. An example of these markings is seen in *Fig. 4*. The distance apart of the vertical lines indicates how much later the wave began in the distal part of the vein than in the central, the exact time being estimated by comparison with the horizontal line between the tracings, on which seconds are marked.

If now one indicates with (a) the distance in centimetres between the vertical lines marking the beginning of a given wave in the two tracings, with (s) the rate at which the recording surface travels in centimeters, with ($e_{''}-e_{'}$) the length of vein being studied, and with (v) the rate of propagation of the pulse in that length of vein, then

$$v = s\,\frac{(e_{''}-e_{'})}{a}$$

As regards the presence of a pulse in the veins of the animals experimented on, it may be said that one could always be observed and recorded in the central end of the jugular. In most cases it could also be recorded from the distal end of the jugular and from the femoral; but the waves were sometimes not sharp enough for satisfactory marking. The estimations reported below were taken

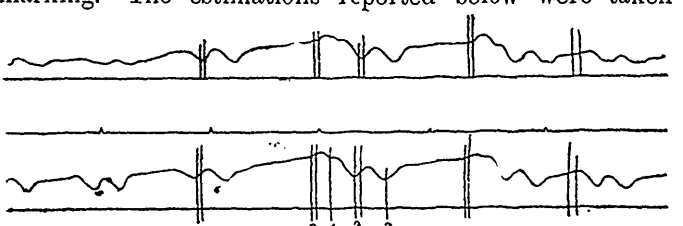

FIG. 4.—Pressure tracing from central (below) and peripheral end (above) of external jugular vein. Time in seconds. From a dog.

from cases where the markings were considered reliable enough to make the errors very slight. It is a noteworthy fact, that the best tracings were frequently obtained from the smallest and weakest dogs. Similar observations have been made by Gottwald (1) on dogs, and Gerhardt (2) on human subjects. Gerhardt claims to have observed the venous pulse most frequently in weak and anæmic girls.

Although a discussion of the form of the venous pulse does not properly find a place in this paper, it is necessary to allude to it briefly in order to have names for the various waves whose rate of propagation was studied. Following Fredericq (4), Gerhardt (2) and others, I distinguish, as may be seen in Fig. 4, a presystolic wave, 0, a systolic

wave, 1, a first and second diastolic wave, 2 and 3, Such a typical and complete form, however, cannot always be observed, but one or more of the above mentioned waves is often absent from the tracing.

THE RATE OF PROPAGATION THROUGH THE JUGULAR VEIN.

The results of the measurements made in the different experiments were arranged in tabular form, as given below, and also the rate of propagation and the pressure in the jugular, estimated by the methods described above. The results are set down in order according to the velocity.

TABLE I.

Rate of Propagation of the Presystolic Wave.
(All measurements in centimeters.)

Difference in the distance from the right auricle of the distal and proximal points on the veins. $e_{,,} - e_{,}$	Distance on recording surface between beginning of wave in the two tracings. a		Distance travelled by recording surface per second. s		Calculated velocity of pulse. v		Pressure in central end of jugular in centimeters water. p
23·5 − 12·5 = 11	·065	....	1·85	....	313	....	5·5
	·060	...	1·70	....	312	....	5·5
	·070	....	1·80	....	283	....	5·4
	·080	....	1·75	....	241	....	3·2
	·100	....	1·83	...	201	....	3·5
				Average	270	....	4·6

In the remaining tables only the calculated results will be given, namely, the rate of propagation in centimeters per second and the pressure in centimeters of water in the central end of the jugular vein.

TABLE II.

Presystolic Wave.

v		p
228	....	8·5
225	...	9·5
218	....	8·8
194	.. .	8·5
173	....	8·5
170	....	9·0
Average 201	....	8·8

TABLE III.

Presystolic Wave during Dyspnœa.

v		p
257	....	8·9
254	....	9·1
235	....	9·3
235	....	9·4
231	....	9·2
221	....	8·5
208	....	9·3
205	. ..	9·2
Average 220	....	9·1

TABLE IV.

Systolic Wave.

v		*p*
364	....	5·5
337	....	4·9
330	....	5·2
291	....	5·8
264	....	5·5
259	....	4·7
248	...	4·2
248	....	3·9
248	....	3·5
228	....	6·0
194	....	4·5
Average 268	....	4·9

TABLE V.

Systolic Wave.

v		*p*
161	.. .	7·5
147	....	7·7
143	...	6·8
134	....	7·6
130	....	7·3
115	....	6·9
Average 138	....	7·3

TABLE VI.

First Diastolic Wave.

v		*p*
278	....	2·9
264	....	2·7
257	....	2·8
254	....	2·9
252	....	2·7
248	.	2·5
248	...	2·5
241	....	3·0
220	....	3·2
214	...	2·8
205	...	2·4
198	....	3·7
198	....	2·7
198	....	2·0
196	....	2·7
193	....	2·0
180	...	2·0
165	....	2·0
Average 223	....	2·6

TABLE VII.

First Diastolic Wave.

v		*p*
139	....	6·8
130	....	6·3
117	....	6·3
117	....	5·5
116	....	6·0
114	....	6·1
108	....	6·1
103	....	6·0
102	....	5·3
100	....	4·9
99	....	5·3
98	....	5·7
98	....	5·2
95	....	5·5
93	....	5·5
92	....	5·5
92	....	5·5
89	....	4·8
86	.. .	5·0
85	....	5·2
85	....	5·0
Average 103	...	5·6

RATE OF PROPOGATION OF THE PULSE THROUGH THE INFERIOR VENA CAVA.

TABLE VIII.

Presystolic Wave.

v		*p*
138	...	2·4
128	....	3·1
128	...	3·1
122	....	2·7
106	....	2·0
92	....	2·7
89	....	2·7
Average 115	....	2·7

TABLE IX.

First Diastolic Wave.

v		*p*
117	....	2·0
113	....	2·2
104	....	2 6
104	....	1·5
93	....	2·0
92	....	2·6
Average 104	....	2·1

TABLE X.

First Diastolic Wave.

	v		*p*	
	136	....	6·5	
	127	....	6·5	
	120	..	6·5	
	119	...	6·5	
	112	....	6·3	
	101	....	7·1	
	140	....	4·6	Dyspnœa.
	136	...	4·2	
	130	....	4·8	
	124	....	4·8	
	114	....	4·5	
	112	....	3·2	
	110	...	2·9	
	106	...	2·8	
	101	....	2·9	
	101	....	2·5	
Average	118		4·8	

TABLE XI.

Second Diastolic Wave during Dyspnœa.

	v		*p*
	70	....	−2·5
	69	....	−2·6
	67	....	−2·3
	65	...	−2·5
	64	....	−2·0
	63	....	−2·0
Average	66	....	−2·3

In the following table the average rates and pressures from the preceding tables are brought together:

TABLE XII.

Table.	Average velocity.	Average pressure.	Wave.	
I.	270	4·6	Presystolic	Jugular vein.
II.	201	8·8	"	
III.	230	9·1	"	
IV.	268	4·9	Systolic	
V.	138	7·3	"	
VI.	223	2·6	I. Diastolic	
VII.	103	5·6	"	
VIII.	115	2·7	Presystolic	Through inferior vena cava to femoral.
IX.	104	2·1	I. Diastolic	
X.	117	4·8	"	
XI.	66	−2·3	II. Diastolic	

The results of the investigation may be summarized as follows:

1. The changes in the pressure of blood within the right auricle and great veins are propagated through the larger veins of the trunk and extremities, causing a venous pulse.

2. The rate of propagation of this venous pulse varies between one and three meters per second in round numbers. This is much slower than the rate of propagation of the arterial pulse, which is to be explained by the lower pressure within the veins, and the differences in the walls of the two kinds of vessels.

3. A direct proportion between rate of propagation and pressure within the external jugular vein could not be demonstrated.

4. Some of the waves, especially the presystolic and the systolic, travel faster than others.

LITERATURE:

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(2) Gerhardt, Archiv. f. exper. Pathologie, Vol. 34, p. 402.
(3) Friedreich, Deutsches Arch. f. klin. Med., Vol. 1, p. 241.
(4) Frédéricq, Travaux du lab. de Léon Frédéricq, Vol. 3, p, 85.

A FOREST FIRE AT ST. JOHN ABOUT 2000 YEARS AGO.

By G. F. MATTHEW, LL.D., F.R.S.C.

The opening up of a bog deposit near St. John has revealed some interesting information about the physical history of the region around the Bay of Fundy in past ages, both antecedent to and contemporaneous with the presence of man on its shores. Not the least notable is the discovery that St. John was swept by a forest fire about the beginning of the Christian era.

Among the objects found in this peat bog are charred twigs, and flakes of wood also charred, that have been found at several points at a definite depth in the bog. These objects are scattered over the surface of a certain layer of the bog, where they are buried among unburned twigs, leaves of grass and other vegetable remains in a partly decayed condition, but so little changed that their brown color contrasts strongly with the jet black of the burned twigs.

From the way in which these light charred fragments are buried among the unburned material it is inferred that they were blown in upon the bog from the surrounding hills. These hills being much drier than the bog, would

be liable to be swept by forest fires, while the water-soaked bog would preserve the trees which were growing on it as well as the scorched fragments resting upon its surface. The antiseptic properties of the peat would help to preserve the charred fragments as well as the remains of the vegetation into which they had fallen, and thus bring them down to our time comparatively unchanged.

These burnt twigs are in a layer about two feet below the present surface of the bog. On this layer they are plentiful, but scattered examples are found about half an inch or an inch lower down. If we allow for the possibility of animals traversing the bog, we shall understand that it would be possible for some of the fragments of charcoal to be forced a short way into the yielding moss of its surface by their feet, and thus these fragments that are more deeply buried may have originally belonged to the one principal layer.

We have found this charcoal layer at the three points in the bog where sections of the bog deposit were taken, and always at about the same distance from the surface.

In 1880 and 1881 the author investigated the fresh water deposits of Lawlor's Lake, in the Torryburn valley, five miles N.E. of St. John; and incidentally in connection therewith, examined two dry basins in the same valley, one at the east and west ends of the lake. In the latter basin the section of the Recent deposit showed fragments of charcoal at a depth of two feet and a half. That this charcoal layer may have been cotemporary with that at the Rockwood bog seems probable, notwithstanding that it is buried to a greater depth, for through the Torryburn basin runs a small brook which, although connected originally with Lawlor's Lake by an underground passage through limestone rock, may be considered to have carried more sediment than could come to the Rockwood bog, which lies in the col of a small valley, from which the water flows in two directions; the Rockwood deposit at

this stage (two feet below the surface) was a purely vegetable deposit.

From the fact that both at Torryburn and Rockwood there is a charcoal deposit at about the same horizon in the Recent deposits, it appears reasonable to infer that they had probably a common origin, and that this was a forest fire, which extended over an area of at least some miles in the vicinity of St. John. The question arises—if there was such a fire at the time indicated, how was it set?

It has been suggested that such fires arise from the heat developed by a lightning stroke. But while buildings are often destroyed in this way, it would seem that growing trees, which are often struck, seldom take fire. This may be attributed to the dampness of the trunk and foliage, which rapidly conducts the electricity away; and then if a fire should originate from this cause, it stands a good chance of being extinguished by the rain which usually accompanies a thunder storm.

I have seen it stated that in the South of France forest fires have been known to originate from the drops of balsam which exude from pine trees, these drops forming natural lenses which concentrate the rays of the sun and lead to ignition of the wood through the resinous vapors that escape the balsam or gum.

It appears to the writer that neither of these causes has been active in this region in Recent Geological Time in setting fire to forests. For we have in the Rockwood bog a record of the physical events of this kind for a period reaching back for from 6000 to 9000 years. The Rockwood deposit has been carefully examined inch by inch, and layer by layer, from the summit to the bottom, and this in three different places, but no charcoal fragments have been met with, except at the one level of two feet below the surface. If the fire had been due to physical causes there is good reason to think that such fires would have recurred at intervals, from the time that the

country was first forest-clad, after the Champlain Period, until now, but, as we have remarked, only the one layer of scorched twigs and flakes of wood is known, and that at a period about two thousand years back.

Another possible source of such a fire is the agency of man. It is claimed by some archæologists that the earliest men on this continent were unacquainted with the use of fire. To men of this race we will not ascribe the calamity which devastated the neighborhood of St. John; but men who knew not of fire were followed by those who did know, and the carelessness of such a people seems sufficient cause for the phenomenon in the Rockwood bog. We know the care which the savage exercises to prevent the spread of fire from his camping ground; he knows the destruction of game animals that would accompany the sweep of a forest conflagration, which for the sake of himself and his tribe is to be avoided. The savage also is in constant fear of his human enemies, and the smoke of his camp-fire might reveal his presence to a prowling adversary; hence he makes his camp-fire as small as possible, and hovers over it. The fire he makes is thus also easily extinguished. The first users of fire, however, who entered the Acadian forests may not have learned or felt the need of these precautions, and thus have carelessly allowed a fire to spread. From these various considerations we infer the *probability* that the forest fire recorded in the Rockwood bog was due to the agency of man.

Is it possible to fix within a reasonable limit the time when this event occurred?

Only those who have sectioned and examined the trees and shrubs which grow on the margin of what the Danes call a *Skovmose* or Forest Bog can have any conception of the exceedingly slow rate at which trees grow in such situations. In the first place, their roots are constantly buried in the cool, damp moss, and the whole plant is constantly bathed in the moist and chilled air that covers the

bog. But further, it is impossible for the roots of such trees to reach a magazine of mineral sustenance, such as the ground affords, but as a recompense they spread out their long slender roots to a surprising distance over the surface of the bog in search of food. The juices of the bog afford them little or no lime and potash, the roots can not pass through the water-soaked subsoil, and so they are literally starved. Spruce trees (*Abies nigra*) that are no better than little shrubs in such situations, will show by the rings of growth that they are 30 or 40 years old. A growth for the same number of years would have enabled their brethren on the upland to reach the size of stalwart trees.

Cedar trees (*Thuja occidentalis*) also have been dwarfed in the same way, but not to the same extent, as some of them have finally struggled up to considerable dimensions. One such tree, the tenacity of whose roots had been weakened by the drainage of the bog, due to the operations of the park commissioners of Rockwood Park, had fallen across the canal they made. The overturning of the tree showed just how far the roots descended into the bog, and it was to a depth no greater than six inches; the boll of the tree had sunk deeper than this, owing to the weight of its trunk, but the lowest layer of roots started out at this level to radiate through the moss of the bog. At the time the tree fell the lower tier of roots had perished (probably many years before), and the life of the tree was sustained by an upper tier of roots that spread out about three inches from the surface of the bog. Many of the roots of even this second tier had perished, for the tree had long passed its prime.

One of the park commissioners was kind enough to have the tree sawed as near to the base as the heart wood remained, and thus exposed the annual layers of growth. On counting these layers it was found that the tree had attained the age of four hundred years. Moss grew up

around the base of the tree, and regular layers of peat moss and forest vegetation had accumulated above the roots during the long period of its growth.

During this period of four hundred years it would appear that the bog added only six inches to its depth. As far down as the charcoal layer there is no great difference in the nature of the bog deposit; sometimes an extra amount of forest mould shows that the trees which grew along the borders of the bog were able to throw out colonies into the open sphagnous area; at others a return of a moister climate reversed the conditions, and the bog encroached on the forest; but assuming that the growth was comparatively uniform, twelve hundred years would have elapsed from the time when the charcoal layer was deposited until the seed of this cedar sprouted in the moss of the bog.

But in estimating the age of the charcoal layer, other factors are to be considered; one of these is the condensation of the peat in the lower layers by the weight of the superincumbent mass of vegetable matter. To test this, a sample of the peat above the roots of the cedar tree was weighed and compared with that of the peat a foot down from the surface; the latter was found to be a third heavier, showing a considerable condensation of the mass; at a lower level the weight was still greater. Allowing for the reduction of bulk from this cause in the lower layers, I think it may be assumed that 2,000 years have elapsed since the charcoal layer was deposited, and therefore since the occurrence of the forest conflagration of which it is a witness.

The Rock Formation of the Bermudas.

By J. S. Buchan, Q.C., B.C.L.

A few *preliminary* remarks concerning the Bermudas generally may be of interest, and will assist in making the special subject before us more clearly understood.

The Bermudas are a cluster of islands about 350 in number, many being, however, mere rocks, situated in the Atlantic Ocean in Lat. 32° 20′ N. and Long. 74° 50′ W., or, to describe their position in other words, a straight line 700 miles long, drawn almost due south from Halifax, would pass through them, while another due west, about 600 miles in length, would almost strike Charleston in South Carolina.

The islands lie to the south of a coral reef or atoll about 24 miles in length by 12 in breadth, of which the part above water is the southern fringe or edge, containing in all only about 19 square miles of land, and said to be, with the exception of St. Helena, the most isolated body of land on the globe.

They form the only coral reef in the Central Atlantic, and almost the only instance in which living, reef-building coral is found so far to the north, the conditions being, however, favorable to it, owing to the temperature of the water being raised by the Gulf stream.

The surface of the islands presents a succession of low, rolling hills, with valleys between them, and scarcely any level ground, the highest point being Gibb's Hill, on which the light-house is situated, 362 feet above sea level. The soil, of a red-brown color, is only a few inches deep, but very fertile.

The islands are altogether of coral formation, which is found in various stages, from the sand thrown up by the waves to the stalagmite which marks the floor of some ancient cave from which the roof and walls, with the hill in which it was formed, have been swept away.

The process by which the final stage, if it may be so called, is reached, is not only of great interest in itself, but particularly so because it is now, as it has doubtless been throughout the whole history of the islands, going on, and can be studied in all stages of progress.

The beginning of this process must be sought for in the reefs which surround the islands, and protect them from the direct force of the sea. Out on the reefs, where the coral is living and growing, fragments are constantly broken off and thrown in towards the shore by the violence of the surf, to be by the same means gradually ground up into a fine sand, which is eventually washed up to form a beach, wide stretches of which are exposed at low water.

From this point the evolution of the rock formation may be said to begin. The sand is blown inland by the wind, forming great ridges, which have the appearance of enormous snowdrifts. The principal "sand-glacier" where this is now to be seen is at Elbow Bay, on the south shore, where the sand has drifted far inland to great depths, completely filling up valleys, and even overwhelming houses in its progress. The whole of the land has been formed in the same manner, as in some of the quarries a stratum of the red surface soil is sometimes seen under 30 or 40 feet of more recent rock, formed by the sand drifting over the land surface, and then becoming consolidated.

The first stage in the formation of the land is thus reached, when the sand has been piled up into a hill, which continues to grow until it has perhaps assumed a form, which prevents it from continuing to drift in the same direction.

When this stage has been reached, the surface soon becomes covered with vegetation, and the process towards the next stage begins. The sand by its own weight becomes more compact, especially where the drift is of great depth, and through the action of the rain water per-

colating through it, the sandbank gradually changes first into the material shown in the specimen marked No. 1 in the Museum, and in the course of time into the hard crystalline form marked No. 2, which is simply a later, or more advanced form, of the rock under the same process, but appearing more particularly where the pressure has been greatest.

The other specimens, Nos. 3 and 4, are the result of a different action. In many cases, through certain parts of the sand hill being more soluble or less compact than others, cavities are opened, which are enlarged in various ways until caverns are formed, in which the water, percolating through the roof, forms stalactites and stalagmites, in the manner common to all limestone formations, but in the Bermuda caves with great rapidity, owing to the soluble nature of the rocks. For the same reason, whole hills have in some cases been swept away by erosion, or more properly, by the softer parts of the rock becoming disintegrated, and in some cases apparently dissolved by the action of the elements, leaving in places sharp pinnacles, composed of the harder parts of the rock, standing, and in others, the floors of caves covered with stalagmite. The specimen No. 3 was, in fact, taken from such a cave floor on Ireland Island, near the dockyard, and No. 4 from one of these pinnacles, which seem to become cemented together into a quasi-stalactite, and then, when the softer parts disintegrate, it is further hardened by weathering.

This in brief is the process by which the coral rock is formed, which throughout the islands is everywhere the same.

This rock is of the greatest value to the people, particularly in view of the fact that wood is not available for building purposes, owing to its scarcity. The rock, when *in situ*, is soft, and easily cut into any shape with ordinary tools. When a quantity of the material is required for any purpose, the soil is removed from a hillside, a large

block cut out of it, which is then sawn into the desired size and shape, and the pieces piled up until they become hardened, which soon occurs when exposed to the action of the sun and the atmosphere.

The blocks and slabs thus obtained form an excellent building material, which is further protected by a white-wash, made from a very strong lime, obtained from the same rock as the building material itself. The islands have excellent roads, which are for the most part cut through the hills so as to leave no gradients, and the surface of which becomes as hard and smooth as ordinary asphalt.

There are no freshwater streams or wells in the Bermudas, and the water-supply is obtained altogether from the rains. Every one who erects a dwelling is obliged by law to provide a tank or cistern of a certain capacity, proportionate to the dwelling, the cistern being frequently built in the excavation from which the material for the house was taken, which only required a covering of cement to make it water-tight.

As is frequently the case with coral islands, the Bermudas are steadily sinking, possibly on account of the weight of new material as it is added to them, and this would seem to have been the case throughout their whole existence.

The coral insect appears to be incapable of existing in more than 30, or at most 50 fathoms of water, but even close to the reefs depths of from 12,000 to 15,000 feet are found. From this it would appear that the base of the Bermudas was a great elevation, possibly of volcanic origin, on which the coral insects found a suitable formation to build the reefs from which the islands were formed, and if the Atlantic were drained it would have the appearance of a huge mountain from 2½ to 3 miles in height, rising from an almost level plain.

As the building progressed, the mountain continued to

sink, so that what was once dry land is now far beneath the waves. This was shown by the discovery during the excavations at Ireland Island for the floating dock, of trunks of large cedar trees at considerable depths below the present sea bottom, and in dredging the channel leading into Hamilton Harbor the roof of a cave filled with stalactites was broken through, which proves that the place where it was found must have been dry land. Trunks of cedar are also found out in the reefs surrounding the islands, which are now altogether submerged.

No information, so far as I have been able to ascertain, exists as to the depth of the coral formation. A few years ago an attempt was made by an English scientific society to obtain such information by means of a diamond drill in the Island of Funafuti, in the Southern Pacific, but the experiment failed, owing to the sand filling the bore. It was then proposed to make the experiment in the Bermudas, but this as yet does not appear to have been done. It would, however, be a matter of great interest, and might prove of much value in determining the age of this recent formation, as well as settle some other questions, if such a project were carried out.

Note on the Glaciation of Mount Orford, P.Q.

By Principal Dresser, St. Francis College, Richmond, P.Q.

In the recent and very interesting "Report on the Surface Geology and Auriferous Deposits of South-eastern Quebec," by Mr. R. Chalmers (Annual Report Geological Survey of Canada, Volume X., New Series, Part J), it is stated that no evidences of glaciation were observed near the summit of Mount Orford. The extreme height of glacial action, from which the thickness of the greater Laurentide glacier is calculated, is thought to have been

1800 feet. Above this the mountain is said to have stood as a "minatak" or island within the glacier to a height of at least 1000 feet.

From these conclusions it is evident that the observations on which they are based did not include that dome-shaped part of the summit of the mountain, which is apparently its highest point. This, which is separated from the highest of the bare and exposed peaks along the front, or southern face of the mountain, by a deep ravine, shows most undoubted evidence of glaciation. Here, near the point where a flagstaff has stood for the past few years, the rock, a fine-grained and much-altered diabase, is distinctly striated, and the whole eminence has a generally smoothed and rounded appearance.

Fragments of clay-slate and pebbles of other rock foreign to the mountain occur here, and boulders of serpentine, evidently from the western base of the mountain, are to be seen in other places near by. The rock appears to have suffered less from atmospheric erosion than at points of about equal height a few hundred yards to the south, from which it seems reasonable to infer that it has here been protected by a thin mantle of drift, of which the transported rock fragments mentioned above are remnants, which have not been removed by summer rains or forest fires.

The direction of the glacial striæ, as measured at the flagstaff by Mr. A. H. Honeyman, of Knowlton, Que., and the writer, was found to be S. 25° E., magnetic, which fairly accords with the directions given by Mr. Chalmers for striæ caused by the greater Laurentide glacier at the foot of the mountain. These range from S. 25° E. to S. 53° E. on the true meridian.

Reasoning from this limit of the height reached by the ice-sheet, viz., 1800 feet, Mr. Chalmers shows that if it passed over the range of hills along the United States boundary line, some 2000 feet in height, as was probably

the case, that those hills must have stood relatively lower than at present. This hypothesis is then applied to the explanation of certain high level terraces near the international boundary line, and the deformation of gravel beds around Lake Memphremagog and along the Coaticook and Salmon rivers. But in view of the evidences of ice action at a much greater altitude than 1800 feet, the hypothesis may be no longer needed. And as Mount Orford is the highest point mentioned in the area under discussion, it is, therefore, apparent that the maximum elevation reached by the ice of this region in glacial times has not yet been ascertained, and is not likely to be from evidence obtainable in the Eastern Townships.

On the Height of Orford Mountain.

N. N. Evans and O. E. Leroy.

A good deal of interest is attached to the height of Orford Mountain, not only because its peak is frequently ascended by excursionists to view the magnificent panorama of lake and river, mountain and valley spread out before them when standing upon its summit, but also because certain geological theories involving a more or less accurate knowledge of the elevation are under discussion at the present time; and the various figures given for the height vary so widely as to be quite unreliable.

The recent excursion of the Natural History Society of Montreal to Orford offering a very favorable opportunity for a barometric determination of its height, the writers made careful observations upon that occasion; and as much interest in the result was expressed by many members of the Society, it was thought advisable to publish the figures thus obtained, as offering probably the most

correct of the many widely-divergent numbers given in this connection.

With respect to the determination of altitudes by means of the barometer, a few words may not be out of place, and the following, from Johnson's Theory and Practice of Surveying (Ed. 1887, p. 128), may be quoted:

"It (the aneroid barometer) has a vernier attachment, and is read with a magnifying-glass to single feet of elevation. It must not be supposed, however, that elevations can be determined with anything like this degree of accuracy by any kind of barometer. The barometer simply indicates the pressure at the given time and place, but for the same place the pressure varies greatly from various causes. All barometric changes, therefore, cannot be attributed to a change in elevation, when the barometer is carried about from place to place.

"If two barometers are used simultaneously, which have been duly compared with each other, one at a fixed point of known elevation and the other carried about from point to point in the same locality, as on a reconnoissance, then the two sets of readings will give very close approximations to the differences in elevation. If the difference of elevation between distant points is desired, then long series of readings should be taken to eliminate local changes of pressure. The aneroid barometer is better adapted to surveys than the mercurial, since it may be transported and handled with greater ease and less danger. It is not so absolute a test of pressure, however, and is only used by exploring and reconnoissance parties. For fixed stations, the mercurial barometer is to be preferred."

The observations on the trip were made with two aneroid barometers, one manufactured by Cary, of London, and the other by Usteri-Reinacher, of Zürich. The instruments were carefully compared with the standard mercurial barometer in the Observatory at McGill College, where readings were made throughout the day, and these

readings, reduced to sea-level, furnished the corrections necessary to eliminate barometric changes due to varying weather conditions. Observations of temperature were made simultaneously with the barometric observations, and these furnished further corrections in the calculation of the results.

The elevations above sea-level thus obtained were as follows:

Station.	Cary.	Ust.-Rein.
Windsor Station.....	130 feet.	127 feet.
Orford Siding.....	929 "	934 "
Summit of mountain...	2642 "	2683 "

The agreement between the results is quite as close as could be expected, but it would be of much value could a series of such observations be obtained, as the mean of a large number of results naturally carries more conviction with it than that deduced from only two. However, it may be considered certain that the height of Orford Mountain is, in round numbers, two thousand six hundred and fifty feet above the level of the sea.

It might be of interest to add that upon a clear day Montreal Mountain is visible from Orford, as was the case upon the occasion of the excursion above mentioned, and conversely, under favorable conditions, Orford is visible from Montreal Mountain, being seen above and beyond the middle of the Shefford Mountain group. This group, as viewed from Montreal, consists of a long ridge towards the observer's left, rising towards the right into two rounded bosses; Orford is seen over the ridge.

McGILL COLLEGE, June, 1900.

OLDHAMIA.

By G. F. MATTHEW, LL.D., F.R.S.C.

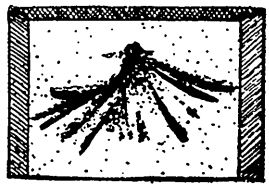

Fig. 1. Fascicle of Oldhamia mag. $\frac{2}{1}$, Cambrian, Div. 1 b, Caton's Island, N.B., Canada.

About twelve years ago (1888) the writer collected from the Cambrian rocks of the St. John Group a fossil which he thought to be a fascicle of Oldhamia.

The object was not described at the time, because he had hopes that in later explorations he might meet with better examples, or others that would throw a better light on the structural details of the fossil. This expectation was not realized, and therefore it seems desirable to put on record the description of this object, hoping that others may be able to supplement the information here given.

Oldhamia is an interesting form, of which the first examples were found in the Wicklow Mountains in Ireland, and were described by Edward Forbes. At first and for a number of years it was regarded as a characteristic fossil of the Lowest Cambrian, but later discoveries have given a wider range to the genus.

Robert Etheridge, Jr., says that Forbes regarded these forms as probably belonging to the Polyzoa or Hydrozoa; but Mr. Busk, a high authority on the Polyzoa, did not recognize them as of that class, and suggested that they might be corallines after the type of Acetabulifera. Rev. Mr. Berkly also suggested this seaweed as a probable ally, because the structure, though jointed, showed no trace of definite cells such as Bryozoa (or Polyzoa) and Hydrozoa have.

Prof. H. A. Nicholson in his Palæontology classes Oldhamia with the Hydrozoa, but stated that its nature was *uncertain.*

This fossil occurs in the finer layers of the green and purple grits of Lower Cambrian age at Bray Head in Ireland, where the fronds are in great abundance, matted together and spread over the surface of the finer layers. The species which occur here are *O. antiqua* and *O. radiata.* Though Goeppert refers them to different genera, some later observers think they are all of the one species, but in different attitudes of preservation. *Radiata* appears to be the form first described, and so would be the type of the genus. The form figured by Nicholson (after Salter) as *O. antiqua* is not of the same type as that which Zittél figures under the same name. They appear to belong to different species, and perhaps Nicholson's figure represents the type *radiata.*

Mr. Etheridge says that "Oldhamia *must have had a calcareous or semi-calcareous structure to have been preserved at all,*" and when one notices how deeply the mould of this fossil is indented on the surface of the slate, this claim seems well founded. Mr. Etheridge also remarks of Goeppert "that he does not seem to have perceived that the hard filament must needs have been connected by a membrane, not quite destroyed, and that the frond must have been sufficiently hard to impress the sandy deposit in which they are imbedded." We (R. Etheridge) place these singular organisms provisionally in the class Hydrozoa, believing them to have close affinities with the Sertulariidæ, and belong to that group rather than the calcareous corallines. He also adds that *O. antiqua* is rarer than the other, but Prof. Nicholson says that *O. antiqua* is the commoner species.

There seems to be considerable uncertainty still as to the exact horizon in the Cambrian at which the original Oldhamia was found. At first the fossil was referred to

the lowest Cambrian, as the slates and grits of Bray Head were correlated with the Llamberis slates on the opposite side of St. George's Channel. But there is really no absolute evidence fixing the age of these grits, as the oldest fossiliferous horizon in this district, with determinable trilobites, is Ordovician.

On the continent of Europe Oldhamia has been found in Cambrian beds from the Trimadœ downward. Prof. C. Malaise has found it in the slates of the middle division of the Cambrian of Belgium; and also at the base of the upper division (Salmien), which contains the Dictyonema zone, he has found remains singularly like this fossil. Prof. Jules Bergeron, who has studied the Cambrian system in the south of France, found Oldhamia in the upper part of the "Olemus Substagi." It may therefore be looked for in any part of the Cambrian from the base to the Dictyonema zone.

Dr. Chas. Barrois has noted the existence of the genus Oldhamia in the Cambrian rocks of the Pyrenees, but his species (*O. Hovelaquei*) differs from *O. antiqua* by its greater size, by the frond not being jointed appendages, and by the mode of insertion of the appendages, which are not branched. He says that the appendages or leaves were rigid (as with other species of the genus). He considers that the nearest analogy of this form is with certain seaweeds of the family Dasycladeæ, such as Acrogenia of the Devonian and Acetabulifera of the Eocene.

Barrois says that Oldhamia is related to several small forms of Chondrites that appear in the earlier geological epochs, and are characterized by a frond, erect, divided into rounded branches more or less numerous, of which the substance was probably stiff, and of a cartilagenous or gelatinous nature. Such are several palæozoic Chondrites described by Goeppert, the *Chondritis flabellaris* of Saporta of the Upper Lias, and others. The regular branching of the stems and the fan-like arrangement of the appendages

forbids us, he says, from comparing this fossil with the tracks of worms.

From the above cited authorities it is clear that there is a wide difference of opinion as to the affinities of Oldhamia, for while the majority of the English palæontologists incline to place it with the Hydrozoa, the German and French writers suppose the genus to belong to the Algæ.

The following brief description is all that can be said about the St. John Group forms:

OLDHAMIA SP.

A detached fascicle, having about eleven visible spreading appendages, of which the outer are horizontal and the others set at a more and more acute angle until the middle ones are vertical. Several of the appendages are branched, with branches standing at a wide angle; the appendages were thick and rigid, sub-lanceolate in form and obtusely pointed; some appendages are wider than others; they spring from a common base, which is somewhat nodose.

The fossil is in the condition of a mould in fine argillaceous sandstone; as the rock shows no clear marks of stratification, it is not known whether the fossil was in a vertical or horizontal position.

It would seem from the quotations in the earlier part of this article that while the writers who have described species of Oldhamia agree in ascribing to it a frond with rigid leaves or appendages, there is a great diversity of opinion as to the substance of which the frond or stem and branches was composed. In the case of the Acadian species, however, there is no trace of the original substance, though the mould is well filled out; it seems most probable, therefore, that the frond was calcareous. Shells of Obolus (Botsfordia) in the same layers of sandstone preserve in most cases the greater part of their calcareo-corneous shells, and their dark color.

Size.—This fascicle is about 7 mm. long (including the nodular base) and 15 mm. in width. The single appendages are about 5 mm. long.

Horizon and Locality.—In olive-gray argillaceous sandstones of Division 1, Band *b*, at Caton's Island, King's County, New Brunswick, Canada, in company with *Botsfordia pulchra*. Rare.

Progress of Geological Work in Canada during 1899.

By H. M. Ami, M.A., D.Sc., F.G.S.,
of the Geological Survey of Canada.

INTRODUCTORY NOTE.

The following synopsis of geological work in Canada for the year 1899 has been prepared with a view of furnishing students of geology in Canada with as complete a list of the writings of those engaged in geological work as possible. It comprises, besides general geological writings bearing upon questions of stratigraphy, and nomenclature, the titles of papers upon other branches of geological work. These include writings on palæontology, on mining and kindred subjects. It is one of the difficulties against which geologists in a young country like Canada have to contend, namely, that there is practically no complete bibliography of Canadian geology available. For a number of years past the writer has attempted to bring together in the form of a card catalogue the writings concerning Canadian geology, published both in Canada and elsewhere. He will be under extreme obligations to the contributors of that science who will kindly forward him such titles of

geological writings as are likely to be of value in compiling a catalogue of Canadian geological works.

The present list contains one hundred and nine separate titles of papers bearing on the geology of Canada for 1899, including one or two records for previous years hitherto unnoticed. It has been prepared in the hope that it may serve to fill a want in the direction of bibliographic references, without which it is practically impossible to be in touch with or know what is going on in the scientific world about us.

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Review of "Report on the Geology and Natural Resources on the area included in the Nipissing and Temiscaming map sheet, comprising portions of the District of Nipissing, Ontario, and of the County of Pontiac, Quebec."

Journal of Geology, Vol. 7, No. 7, pp. 713-717, Oct.-Nov., 1899. Chicago.

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Sir William Dawson (Biographical Sketch of).

(Science, n.s., Vol. 10, pp. 905-910, Dec. 22, 1899), N.Y. (with portrait). Also in "McGill Outlook," Montreal, for Dec., 1899.

ADAMS, FRANK D.

Studies in the Geology of the Vicinity of Montreal, which might be undertaken by members of the Natural History Society.

Can. Rec. Sci., Vol. 8, No. 2, pp. 65-70. July, 1899 (issued Dec. 30th, 1899), Montreal, Que.

ADAMS, FRANK D., and BARLOW, A. E

(Report of Geological Work of, in Central Ontario).

Sum. Rep. Geol. Surv. Dept. for the year 1898, pp. 106-111, 1899. Govt. Printing Bureau, Ottawa.

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On the Geology of Wolfville, and part of the Basin of Minas, Nova Scotia.

The Evangeline Journal, Third edition, Season 1899. Rockwell & Co., Wolfville, Nova Scotia, issued June, 1899.

AMI, H. M.
The Mastodon in Western Ontario.
Abstract. Science,n. s., Vol. 7, p. 80, 1898. (Not previously recorded).

AMI, H. M.
Sir William Dawson (The Scientific Work of) (in French). L'Aurore, 34me Année, No. 50, pp. 4-5. Montreal.

AMI, H. M.
(Notes on general results of a Palaeontological Survey of numerous outcrops in the Counties of Antigonish, Pictou, Colchester, Cumberland, Hants, and Kings, Nova Scotia).
Summary Report, Geol. Surv. Dept., pp. 180-182. Govt. Printing Bureau, Ottawa.

AMI, H. M.
(List of Fossil Organic Remains from the altered grey slates with shaly bands (of the Silurian) from six miles west of Canterbury Station, along the St. Andrews and Woodstock branch of the Canadian Pacific Railway).
Summary Report for 1898, Geol. Surv. Dept., p. 137, issued 1899. Govt. Printing Bureau, Ottawa.

AMI, H. M.
On a new or hitherto unrecognized geological horizon in the Gas and Oil Region of Western Ontario, Canada.
Journal Can. Mining Institute, Vol. 2, pp. 186-191, 2 pl., 1899. Ottawa. (Also issued as separate under cover.)

AMI, H. M.
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The Ottawa Naturalist, Vol. 13, No. 4, p. 116, July, 1899. Ottawa.

AMI, H. M.
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The Ottawa Naturalist, Vol. 13, No. 5, pp. 131-132, Aug. 1899. Ottawa.

AMI, H. M.
Excursion to Cumberland, Ont. Geology.
The Ottawa Naturalist, Vol. 13, No. 5, pp. 133-134, August, 1899. Ottawa.

AMI, H. M.
Report of the Geological Branch for 1898-1899. (Addressed "To the Council of the Ottawa Field-Naturalists' Club," March, 1899.)
The Ottawa Naturalist, Vol. 13, No. 9, pp. 218-223, December, 1899. Ottawa.

AMI, H. M.
Belinurus grandaevus, a new species of palaeozoic crustaceans, recently described by Prof. T. R. Jones and Dr. Henry Woodward, from the Eo-Carboniferous of Riversdale, Nova Scotia.
The Ottawa Naturalist, Vol. 13, No. 9, pp. 207-209, Dec. 1899. Ottawa.

AMI, H. M.
(Silurian Fossils recorded from Burnt Island, Manitoulin Island, the nearest outcrop of fossiliferous limestones to the Duck Islands, Lake Huron).
Summary Rep. Geol. Surv. Dept. for 1898, p. 179. Govt. Printing Bureau, Ottawa.

AMI, H. M.
On some Cambro-Silurian and Silurian fossils from Lake Nipissing, Temiscaming and the Mattawa outliers.
Appendix 2, Pt. I., Annual Rep. Geol. Surv. Can., Vol. 10, pp. 289-302, 1899. Ottawa.

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(Note on the Geology of the Duck Islands, Lake Huron.)
Sum. Rep. Geol. Surv. Dept., for the year 1898, pp. 176-180. 1899. Govt. Printing Bureau, Ottawa.

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Notes on Working Mines.
Rep. of the Bureau of Mines, Vol. 8, Pt. 2, 1899, pp./275-279, 1899. Toronto.

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Summer Mining Schools.
Rep. Bureau of Mines, Vol. 8, Pt. 2, pp. 280-282, 1899. Toronto.

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Triassic ? rocks of Digby Basin, Nova Scotia.
Nova Scot. Instit. Sci., Proc. and Trans., Vol. 9, Pt. 4, pp. 356-360, 1898. Halifax.

BAILEY, L. W.

The Mineral Resources of the Province of New Brunswick. Ann. Rep. Geol. Surv. Can., Vol. 10, Part M., 128 pp. and addendum, Ottawa.

BAILEY, L. W.

Some typical sections in Southwestern Nova Scotia. Brit. Assoc. Adv. Sci., Rep. 1897, p. 640, 1898. London, Eng. (Not previously recorded.)

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(Report of the Geological Work of, in Central Ontario.) Sum. Rep. Geol. Surv. Dept., for the year 1898, pp. 106-111, 1899. Govt. Printing Bureau, Ottawa.

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A record of, and Index to, the literature of Echinoderma published during the year 1898, with a few items from previous years. Zoological Record for 1898. Zool. Soc., London, 1899, 73 pp.

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Fossil-like forms on the Sault Ste. Marie sandstone. Abstract, Science, n.s., Vol. 7, p. 80, 1898.

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(Report of geological work of, in the Michipicoten gold-mining region of Lake Superior, Canada. Sum. Rep. Geol. Surv. Dept., for year 1898, pp. 99-106. 1899. Govt. Printing Bureau, Ottawa.

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Mineral Industries of Ontario, Statistics of 1898.
Rep. Bureau Mines, Vol. 8, pt. 1, 1899, pp. 9-28. Toronto.

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Rep. Bureau of Mines, Vol. 8, pt. 2, 1899, pp. 241-249, 1899. Toronto, Ont.

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Michipicoten, Mining Division.
Rep. Bureau of Mines (for Ontario), Vol. 8, pt. 1, pp. 100-105, 1899. Toronto.

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The Parent-rock of the Diamond in South Africa.
Can. Rec. Sci., Vol. 8, No. 2 (July, 1899), (issued Dec. 30, 1899), pp. 95-114. 1899. Montreal.

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Rep. Bureau of Mines, Vol. 8, pt. 1, pp. 49-99, 1899. Toronto.

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Rep. Bureau of Mines, Vol. 8, pt. 2, 1899, pp. 263-274. Toronto, Ont.

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Sum. Rep. Geol. Surv. Dept., for year 1898, pp. 63-71, 1899. Govt. Printing Bureau, Ottawa.

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(Mining operations for gold, coal, etc., in the Province of British Columbia.)
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Rep. Bureau of Mines, Vol. 8, pt. 2, pp. 250-253, 1899. Toronto, Ont.

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Copper regions of the Upper Lakes.
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208 pp. 1899. Govt. Printing Bureau, Ottawa.

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Sum. Rep. 1898, Geol. Surv. Dept., pp. 19-20, 1899. Govt. Printing Bureau, Ottawa.

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Trans. Roy. Soc. Can., Ser. 2, Vol. 5, Sect. 4, pp. 3-38, 1899. Ottawa.

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The Ottawa Naturalist, Vol. 13, No. 1, pp. 14-21, No. 2, pp. 25-36, 1899. Ottawa. (Issued as separate 20 pp., June, 1899.)

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(Report of the Geological Work of, in Eastern Ontario, and adjacent portions of Quebec.)
Sum. Rep. Geol. Surv. Dept., for year 1898, pp. 112-119. 1899. Govt. Printing Bureau, Ottawa.

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(Report on the Structural Geology of a portion of the gold-bearing rocks of Nova Scotia.)
Sum. Rep. Geol. Surv. Dept., for year 1898, pp. 149-159, 1899. Govt. Printing Bureau, Ottawa.

FLETCHER, HUGH.
(Report of the Geology of the Springhill Coal basin, and of the Iron ore deposits of Whycocomagh, in Nova Scotia.)
Sum. Rep. Geol. Surv. Dept., for year 1898, pp. 139-148. 1899. Govt. Printing Bureau, Ottawa.

FRASER, W. A.
(Report on the actual progress of Boring Operations at Victoria, and near Pelican River, Athabasca River.)
Sum. Rep. Geol. Surv. Dept., for year 1898, pp. 32-36, 1899. Ottawa. Govt. Print. Bureau.

GILPIN, E., JR.
Nova Scotia Gold-fields.
"The Mining Journal," London, England, March 4, 1899, pp. 247-248. Gives results of work done by Mr. Faribault, of the Geological Survey of Canada. (To be continued.)

GOODWIN, DR. W. L.
Summer Mining Classes.
Rep. Bureau of Mines, Vol. 8, pt. 2, 1899, Toronto, pp. 282-283, 1899. Toronto.

HOBBS, W. H.
The Diamond Field of the Great Lakes.
Journ. Geol. Vol. 7, No. 4, May-June, 1899, pp. 375-388, with two glacial maps and 1 table, 1899. Chicago.

INGALL, E. D.
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Journ. Can. Banker's Assoc., Toronto, 16 pp., 2 folding plates, 1899. Toronto.

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Annual Report for 1897.
Section of Mineral Statistics and Mines.
Part S, Ann. Rep., Vol. 10, Geol. Surv. Can., 232 pp. 1899. Ottawa.

JONES, T. RUPERT (and WOODWARD, HENRY.)
Contributions to Fossil Crustacea.
Geol. Mag., Dec. 4, Vol. 6, No. 423, pp. 388-390, pl. 15, Figs. 2 and 3, 1899. London, Eng.

KAIN, S. W. (and MATTHEW, G. F.)
On Artesian and Fissure Wells in New Brunswick.
Bull. Nat. Hist. Soc. N. Br., No. 17, Art. 7, Vol. 4, pt. 2, pp. 143-152, 1899. St. John, N.B.

LAMBE, L. M.

(Notes on the reptilian remains from the Belly River and Laramie formations of the North-west Territories of Canada.)

Sum. Rep. Geol. Surv. Dept., for year 1898, pp. 184-190, 1899. Govt. Printing Bureau, Ottawa.

LAMBE, L. M.

On reptilian remains from the Cretaceous of North-western Canada.

The Ottawa Naturalist, Vol. 13, No. 3, pp. 68-70, June, 1899. Ottawa.

LAMBE, L. M.

Notes on a Stromatoporoid from the Hudson River formation of Ontario.

The Ottawa Naturalist, Vol. 13, No. 7, Oct., 1899, pp. 170-171, 1899. Ottawa.

LOW, A. P.

(Report of Geographical and Geological Work of, on the East coast of Hudson Bay.)

Sum. Rep. Geol. Surv. Dept. for year 1898, pp. 124-133, 1899. Govt. Printing Bureau, Ottawa.

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On Artesian and Fissure Wells in New Brunswick.

Bull. Nat. Hist. Soc. N.B., No. 17, Art. 7, Vol. 4, pt. 2, pp. 143-152, 1899. St. John, N.B.

MATTHEW, G. F.

Preliminary Notice of the Etcheminian Fauna of Cape Breton.

Bull. Nat. Hist. Soc. N.B., No. 18, Vol. 4, pp. 198-208, 4 pls. (1-4), 1899. St. John, N.B.

MATTHEW, G. F.

Review of preliminary notice of the Etcheminian Fauna of Newfoundland. From Bull. Nat. Hist. Soc. N.B., June, 1899.

Geol. Mag., No. 422, n.s., Dec. 4, Vol. 6, No. 8, Aug., 1899. London, England.

MATTHEW, G. F.

A new Cambrian Trilobite.

Bull. Nat. Hist. Soc., New Brunswick, No. 17, Article 5, pp. 136-142, March, 1899. St. John, N.B.

MATTHEW, G. F.
Studies on Cambrian Faunas, No. 2.
The Cambrian System in the Kennebecasis Valley.
Part I.—Stratigraphy of the Cambrian in the Valley.
Part II.—Description of the species found.
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Bull. Nat. Hist. Soc. N.B., No. 18, Vol. 4, pp. 189-197. 1899. St. John (pls. 1-3).

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A Palaeozoic Terrane beneath the Cambrian.
Ann. N.Y. Acad. Sc., Vol. 12, No. 2, pp. 41-56, April, 1899. New York City.

MELLINCOTT, A. B. (and COLEMAN, A. P.)
Michipicoten Iron Range.
Rep. Bureau of Mines, Vol. 8, pt. 2, pp. 254-258, 1899. Toronto.

MILLER, WILLET G.
Notes on the Corundum-bearing rocks of Eastern Ontario, Canada.
Amer. Geol., Vol. 24, pp. 276-282, pl. 13, Nov., 1899. Minneapolis.

MILLER, WILLET G.
Corundum and other minerals.
Rep. Bureau of Mines, Vol. 8, pt. 2, pp. 205-240, 1899. Toronto.

McCONNELL, R. G. (and TYRRELL, J. B.)
Preliminary note of the Gold deposits and Gold mining in the Klondike region, Yukon district.
Sum. Rep. Geol. Surv. Dept. for year 1898, pp. 55-62, 1899. Govt. Printing Bureau, Ottawa.

McEVOY, J.
(Report of Geological Work of, in Northern Alberta and the Rocky Mountains, Canada.)
Sum. Rep. Geol. Surv. Dept. for year 1898, pp. 72-86, 1899. Govt. Printing Bureau, Ottawa.

McINNES, WM.
Report on the Geology of the area covered by the Seine River, and Lake Shebandowan map sheets, comprising portions of Rainy River and Thunder Bay districts, Ontario.
Ann. Rep. (pt. H), Vol. 10, Geol. Surv. Can., 65 pp., 2 maps in case. 1899. Ottawa.

McINNES, WM.
(Geological Work of, in the Seine River and Shebandowan map sheets areas.)
Sum. Rep. Geol. Surv. Dept. for year 1898, pp. 87-94. 1899. Govt. Printing Bureau, Ottawa.

PARKS, WM. ARTHUR.
The Nipissing Algoma Boundary.
Rep. Bureau of Mines, Vol. 8, pt. 2, 1899, pp. 175-196. Toronto.

REED, F. R. COWPER.
Woodwardian Museum Notes, A New Trilobite from Mt. Stephen, Field, B.C.
Geol. Mag., No. 42, n.s., Dec. 4, Vol. 6, No. 8, Aug., 1899, pp. 358-361. London.

ROBERTS, AUSTIN.
Nickel Extraction by the Moud process.
Rep. Bureau of Mines for Ontario, Vol. 8, pt. I., pp. 106-120, 1899. Toronto.

ROBERTSON, WM. FLEET.
Mineral Production, etc., of British Columbia.
Ann. Rep. Minister of Mines for 1898, for B.C., pp. 961-1230, 1899. Victoria, B.C.

SPENCER, J. W.
Mr. Huddleston On the Eastern Margin of the North Atlantic Basin.
Geol. Mag., Dec. 4, No. 426, Vol. 6, No. 12, pp. 559-566, Dec., 1899. London, Eng.

TYRRELL J. B. (and McCONNELL, R. G.)
Preliminary note of the Gold Deposits and Gold mining in the Klondike region, Yukon district.
Sum. Rep. Geol. Surv. Dept. for year 1898, pp. 55-62, 1899. Govt. Printing Bureau, Ottawa.

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(Geological Work of, in Yukon district.)
Sum. Rep. Geol. Surv. Dept. for year 1898, pp. 37-55, 1899. Ottawa.

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Some observations on the Illecillewaet and Asulkan Glaciers of British Columbia.
Proc. Acad. Nat. Sc. Philadelphia, pp. 121-124. (1899).

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Bibliography and Index of North American Geology, Palaeontology, Petrology and Mineralogy.
Bull. U.S. Geol. Surv., No. 162, pp. 163, 1899. Washington.

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"Provincial Assay Office."
Report of the Bureau of Mines, Vol. 8, pt. 2, pp. 284-289, 1899. Toronto.

WESTON, T. C.
Reminiscences among the Rocks in connection with the Geological Survey of Canada.
Printed for the author, 1899. Toronto.

WESTON, T. C.
Notes on a Geological trip over a portion of the Canadian North-west Territories.
The Ottawa Naturalist, Vol. 13, No. 8, pp. 177-187, November, 1899. Ottawa.

WILCOX, WALTER D.
A certain type of Lake Formation in the Canadian Rocky Mountains.
Journ. Geol., Vol. 7, pp. 247-260 (4 types of lake), May, 1899. Chicago.

WHITEAVES, J. F.
Recent Discoveries of Rocks of the age of the Trenton formation at Akpotok Island, Ungava Bay, Ungava.
Amer. Journ. Sci., Vol. 7, pp. 433-434, 1899. New Haven.

WHITEAVES, J. F.
The Devonian System in Canada.
Address by J. F. W., vice-pres. and chairman of Section E, Amer. Assoc. Adv. Sci., Columbus, Ohio, meeting, Aug. 21-26, 1899, 31 pp., 1899. Easton, Pa.

WOODMAN, J. EDMUND.
Studies in the Gold-bearing Slates of Nova Scotia.
Proc. Boston Soc. Nat. History, Vol. 28, No. 15, pp. 375-407, with three plates. Boston, March, 1899.

WOODWARD, HENRY (and JONES, T. RUPERT.)
Contributions to Fossil Crustacea.
Geol. Mag., Dec. 4, Vol. 6, No. 423, pp. 388-390, pl. 15, figs. 2-3, 1899. London.

WOODWARD, HENRY.
Sir William Dawson, C.M.G., LL.D. (Edin.), D.C.L., F.R.S., F.G.S.
Geol. Mag., Vol. 6, Dec. 4, whole No. 426, No. 12, pp. 575-578, 1899. London.

WRIGHT, FREDERICK G.
A new method of estimating the age of Niagara Falls.
Appleton's Pop. Sci. Monthly, June, 1899, 10 pp. and 6 figs., 1899. New York City.

Proceedings of the Natural History Society.

Montreal, November 27th, 1899.

The first monthly meeting of the Society was held this evening.

Present—Walter Drake, in the chair; Dr. Campbell, J. A. U. Beaudry, J. S. Buchan, J. H. Joseph, Canon Ellegood and C. S. J. Phillips and others.

The minutes of the previous meeting were taken as read.

It was then moved by the Rev. Robert Campbell, D.D., and seconded by J. S. Buchan, Q.C., and unanimously resolved, that:—

"The Natural History Society of Montreal place on record its sense of the deep loss it has sustained in the decease of Sir J. William Dawson, its Honorary President. From the date of his entering upon office as Principal of McGill University, he took a deep interest in the Society,

recognizing its importance as an agency for extending a knowledge of science in the community and as a centre for rallying scientific workers, the success of which he felt must re-act favorably upon his own work in the University. He was the mainstay of the Society for upwards of forty years, and his communications to its proceedings would fill many volumes.

"He also early perceived how important it was that the Society should have a periodical of its own, through which the researches carried on under its auspices could be communicated to the world; and he loyally supported the CANADIAN NATURALIST, and afterwards the RECORD OF SCIENCE, by publishing first in them a large proportion of his papers on scientific subjects, his articles in the successive series of the periodical numbering in all 168, whilst he was joint author of three additional articles.

"The Society showed its appreciation of his eminence in the scientific world as well as the work he was doing for itself by electing him twenty times to the annual presidency, while for the last ten years he was chosen Honorary President.

"He attended its meetings with unvarying regularity until failing health hindered, and to the last he took the deepest interest in its welfare.

"His memory is warmly cherished by the members of the Society, as his presence at its meetings for so long a period was an inspiration to those who had the privilege of associating with him."

It was unanimously resolved that a copy of the above resolution should be sent to Lady Dawson.

MEMBERS.—Moved by J. A. U. Beaudry, seconded by J. S. Buchan, that the rules be suspended and the following be elected as members:—Ludger Larose, ordinary; Miss J. Cairnie, J. A. Dresser and Miss L. J. Binmore, associate.

It was resolved on motion that the following two papers

be taken as read, and be inserted in the CANADIAN RECORD OF SCIENCE:—"Phenological Observations in Canada," by A. H. Mackay, LL.D., F.R.S.C., of Halifax, N.S.; also the "Lake-on-the-Mountain," near Picton, Ont., by A. T. Drummond, LL.D.

A special communication by Rev. Robert Campbell on "The Plants of the Rocky Mountains" was then listened to with the greatest interest, the pleasure being considerably enhanced by the illustrations from Mr. Van Brunt's colored lantern slides.

DONATIONS.—White Seal; donor, W. Walker, 295 St. Urbain Street. Bald-headed Eagle, shot at Brome Lake, August, 1899; donor, Roland C. McGowan. King Rail (or loon), shot at Sabrevois, P.Q., October, 1899. Euthia Olivacea; donor, B. S. Bowdish, San Juan, Porto Rico.

MONTREAL, January 29th, 1900.

The second monthly meeting of the Society was held this evening, January 29th, 1900, at 8 o'clock.

PRESENT—Prof. Frank D. Adams, Vice-President, in the chair; Rev. Dr. Campbell, J. A. U. Beaudry, O. E. Leroy, B.A.; Edgar Judge, Rev. G. Colborne Heine, C. T. Williams, P. S. Ross, H. McLaren, J. S. Buchan, Q.C.; C. S. J. Phillips and others.

The minutes of the previous meeting were read and confirmed.

COMMUNICATIONS.—A letter was read from Lady Dawson acknowledging receipt of the letter of condolence. A letter was also read from Lachlan Gibb, *re* "Mosquitoes."

COMMITTEES.—Mr. C. S. J. Phillips reported that the programe for the Somerville Course was nearly completed.

The Rev. Dr. Campbell reported in connection with the provincial grant that the application had gone forward, and requested that members would put themselves personally in communication with members of the Legislature.

MEMBERS ELECTED.—Moved by C. T. Williams, seconded by Edgar Judge, that the by-laws be suspended, and that the following persons be elected:—Mr. J. Low, ordinary; Mr. Carey G. Joseph, associate.

PAPER.—O. E. Leroy, B.A, then read a communication on "The Physical Features of Cape Cod," which provoked many questions and an animated discussion.

A vote of thanks was moved by the Rev. Dr. Campbell, seconded by J. A. U. Beaudry, expressing the great obligations of the Society to Mr. Leroy for his very interesting paper.

H. M. Ami, D.Sc., F.G.S., not being present, Dr. Campbell read his paper on the "Subdivisions of the Carboniferous System in Eastern Canada."

A vote of thanks was moved by the Rev. G. Colborne Heine, seconded by J. S. Buchan, Q.C.

The meeting then adjourned.

MONTREAL, February 26th, 1900.

The third monthly meeting of the Society was held this evening at 8 o'clock.

PRESENT—J. A. U. Beaudry, in the chair; J. S. Buchan, Q.C.; E. T. Chambers, Jos. Fortier, Rev. Dr. Campbell, Prof. Donald, C. S. J. Phillips, and many others, including six of Prof. Donald's pupils.

The minutes of the previous meeting were read and confirmed.

The report of the Council was taken as read, all members being present.

VOTE OF CONDOLENCE.—On motion, the Rev. Dr. Campbell, and C. S. J. Phillips, recording secretary, were appointed to draw up a suitable minute regarding the great loss the Natural History Society has sustained in the sudden death of Mr. Walter Drake, one of its vice-presidents and the chairman of one of its important com-

mittees, and to communicate the same to the family of the deceased.

The following is the resolution adopted :

"In recording its sorrow at the sudden death of Mr. Walter Drake, one of the Vice-Presidents of the Natural History Society of Montreal, and Chairman of its Membership Committee, the Society would express its appreciation of his high and noble qualities as a citizen. Every good cause found in him an earnest advocate. Himself possessed of a cultured mind and varied stores of information, he was keenly alive to the valuable service which the Natural History Society, through its Museum, its lectures and its library, is rendering to the citizens of Montreal as a means of promoting especially a knowledge of the wonderful works of God, and he was always ready to aid it both by contributions and personal endeavors on its behalf. Among the last of his acts before finally leaving the city was to address a communication to the Quebec Government in its interests. For these reasons the Natural History Society begs to assure his stricken family that it sincerely shares in their sorrow over his decease."

The attention of the Society having been also drawn to the loss which the Hon. Justice Wurtele, one of the Vice-Presidents of the Natural History Society, had sustained in the death of his son, the Society agreed to record its sympathy with him in his bereavement, and the same Committee was appointed to frame a suitable minute and forward it to him in the name of the Society.

MEMBER ELECTED.—The rules having been suspended, the following gentleman was unanimously elected an ordinary member :—Dr. Louis Laberge.

The Rev. Dr. Campbell then read his paper on "Cap-à-l'Aigle Plants not previously reported," which proved very interesting.

A vote of thanks was moved by J. S. Buchan, seconded by E. T. Chambers, and carried unanimously.

Prof. J. T. Donald, M.A., then gave his "Notes on Recent Laboratory Investigations," which imparted some very valuable information respecting Iron Ores, Water Supply, Food Matters, etc., etc.

An interesting discussion ensued, which was earnestly taken up by the members present.

Dr. Campbell moved and J. S. Buchan seconded a vote of thanks to the eminent Professor for his very valuable and interesting paper.

MONTREAL, March 26th, 1900.

The fourth monthly meeting of the Society was held this evening at 8 o'clock.

PRESENT—Rev. Robert Campbell, Vice-President, in the chair; J. H. Joseph, Joseph Fortier, E. T. Chambers, H. McLaren, J. A. U. Beaudry, Albert Holden, Prof. MacBride, R. C. Adams, Prof. Penhallow, Dr. Jackson, Prof. Donald, the Recording Secretary, and about twenty others.

The minutes of the last meeting were read and confirmed.

MEMBERS ELECTED.—On motion, the rule was suspended and the following members were elected:—Madame Herveiaux, ordinary, proposed by A. Griffin, seconded by C. S. J. Phillips; John Fair, ordinary, proposed by Rev. R. Campbell, seconded by C. S. J. Phillips.

After routine business the following communications were given to the Society: "On Canadian Marine Biological Station," by Dr. F. S. Jackson, Demonstrator of Zoology in McGill College. The subject was treated under two heads—Scientific and Economic. This interesting paper was listened to with more than ordinary attention, as this Society had something to do with its inception.

Prof. Penhallow made a few remarks, stating that the Government had voted $5,000 for construction and $2,000 per annum for five years for its maintenance.

Prof. MacBride, in a few well chosen words, stated that he had spent some time at Naples and also at Plymouth, England, at the stations in those places. At the St. Lawrence station, although the temperature was low, there were lots of food supply for fishes.

Dr. Jackson made replies to several questions put to him.

A vote of thanks was then moved by E. T. Chambers, seconded by F. W. Richards, and carried unanimously.

"The Rock Formation of the Bermudas," by J. S. Buchan, Q.C., B.C.L., was then given, and proved very interesting. It was illustrated by numerous specimens, which drew forth remarks from Prof. MacBride, who spoke of Darwin's opinion on the formation of the Coral islands.

Several other remarks were made by different members.

A vote of thanks was moved by J. H. Joseph, seconded by J. A. U. Beaudry, and unanimously carried.

The meeting then adjourned.

MONTREAL, April 30th, 1900.

The fifth monthly meeting of the Society was held this evening at 8 o'clock.

PRESENT—Rev. Robt. Campbell, D.D., in the chair; F. W. Richards, J. A. U. Beaudry, Edgar Judge, E. T. Chambers, J. S. Buchan, Dr. Jackson and a number of others.

The minutes of last meeting were read and confirmed.

MEMBERS ELECTED.—On motion, the rule was suspended and the following were elected as members:—Oswald H. Duckett, ordinary, moved by A. Griffin, seconded by C. S. J. Phillips; E. S. Phillips, ordinary, moved by A. Griffin, seconded by C. S. J. Phillips; Lieut.-Col.

John Bayne MacLean, ordinary, moved by Dr. Campbell, seconded by Edgar Judge; D. W. Ross, ordinary, moved by Edgar Judge, seconded by Dr. Campbell; W. A. Hastings, ordinary, moved by Edgar Judge, seconded by Dr. Campbell; F. C. Emberson, associate, moved by A. Holden, seconded by Dr. Campbell.

Mr. E. Chambers then announced several additions to the Library, and Mr. Alfred Griffin, the Curator, reported the following list of donations to the Museum :—

A. A. McCulloch, 20 McTavish Street, about 2,000 Shells, a number of Eggs, a number of Mineral Specimens, a small number of Fossil Shells, a Girdle from the Sandwich Islands; Alfred Joyce, Phillips Square, Duck Hawk, shot on mountain, March, 1900 ; G. Egg, 24 Tupper Street, Garter Snake, 3 feet 4 inches long (abnormally large), taken at Abbotsford, July, 1899 ; J. A. U. Beaudry, 107 St. James Street, a number of Geological Specimens.

A vote of thanks was then moved and seconded to the various donors and unanimously carried.

The following communications were then given to the Society :—"The Rate of Propagation of the Venous Pulse," by W. S. Morrow, M.D., which was listened to with great interest. Questions were asked by several of the members, and answered by Dr. Morrow, after which a vote of thanks was moved by J. A. U. Beaudry, seconded by Dr. Jackson, and carried unanimously.

"Note on the Glaciation of Mount Orford, P.Q.," by J. A. Dresser, M.A., was then read by Dr. Campbell in the absence of the author.

Dr. Campbell also read a paper by G. F. Matthew, LL.D., F.R.S.C., on "A Forest Fire at St. John about 2,000 Years Ago."

It was then moved by Edgar Judge, seconded by A. Holden, and carried, that the thanks of the Society be tendered Messrs. Dresser and Matthew.

The meeting then adjourned.

MONTREAL, 28th May, 1900.

The sixth monthly meeting of the Society was held this evening at 8.15 o'clock.

PRESENT—J. H. Joseph in the chair; Rev. Robert Campbell, D.D., J. S. Buchan, C. T. Williams, Jos. Fortier, P. S. Ross, E. T. Chambers, Edgar Judge, Ludger Larose, P. Norris, Mr. Ryan, Mr. Patterson and the Recording Secretary.

The minutes of the last meeting were read and confirmed.

After routine business the following papers were read by Rev. R. Campbell, D.D. :—"Oldhamia," by G. F. Matthew, LL.D., F.R.S.C., of St. John, N.B., and "Some Fungi on Staphylea Trifolia," by J. Dearness, of Normal School staff, London, Ont.

On motion of Dr. Campbell, seconded by Edgar Judge, a vote of thanks was tendered to the authors of the above interesting papers. Carried unanimously.

This being the date appointed for the annual meeting, and many of the members being absent, it was moved by C. T. Williams, seconded by Jos. Fortier, "that this meeting be adjourned until Monday, June 4th, for the reception of annual reports and the election of officers for the session of 1900–1901."

The meeting then adjourned.

MONTREAL, June 4th, 1900.

ADJOURNED ANNUAL MEETING.

The adjourned annual meeting was held this evening in the Library.

PRESENT—Rev. Robert Campbell, D.D., in the chair; A. Holden, P. S. Ross, J. H. Joseph, H. McLaren, F. C. Emberson, J. B. Williams, Jos. Fortier, F. W. Richards, John Harper, H. H. Lyman, J. S. Buchan, A. Griffin, Hon.

J. K. Ward, H. Vennor, Rev. G. Colborne Heine, and the Recording Secretary.

MINUTES.—It was moved by J. H. Joseph, seconded by E. T. Chambers, and carried, "That the minutes be taken as read."

The Curator reported the following donations to the Museum:—

Specimens of Mica from Burgess, Ont.; donor, Rev. R. Campbell. Iron Ores and Fossils from Nova Scotia; donor, P. S. Ross.

The Librarian reported that he had received for the Library a copy of Wood's "British Song Birds;" donor, Mrs. Alfred Griffin.

A vote of thanks was unanimously accorded to the above donors.

It was proposed by J. H. Joseph, seconded by J. B. Williams, and carried, "That the general discussion on the reports should be made after the whole of the reports were read."

ANNUAL REPORTS.—The following reports were then read:—Council, A. Holden; Treasurer, F. W. Richards; Curator, A. Griffin; Librarian, E. T. Chambers; Lecture Committee, C. S. J. Phillips; Editing Committee, Dr. Campbell; Field Day Committee, Dr. Campbell and J. S. Buchan.

Moved by F. W. Richards, seconded by Jos. Fortier, that reports be received and adopted.

DISCUSSION ON REPORTS.—John Harper raised the question of the mitoyen wall rights in connection with the work being done in the hall. J. S. Buchan, Q.C., stated that anyone could get them by paying for them.

J. H. Joseph suggested that the incoming Council should take measures to assist the Librarian.

The Rev. Dr. Campbell responded on behalf of the president, Prof. Wesley Mills, who was unavoidably absent in Europe, that he was proud to state that the efforts made

and results obtained by the Society were superior to those of any previous year. The fact of the Museum being open free, with daily admission, ought to establish a great claim upon the public. The great success that had attended the excursions of the Field Committee, the Saturday Afternoon Talks with the Juveniles and the increased attendance at the Somerville Lectures were most encouraging. Although regretting that the number of working naturalists was not so numerous as might be wished, yet there was a noticeable increase in the workers, who were evidently taking more interest in the study of nature.

He also referred to the number of museums that had been established in all towns in the United States and were benefited and supported by municipal grants or the gifts of private individuals, and expressed his deep regret that such an important institution as the Natural History Society of Montreal was deprived of any such assistance.

The Treasurer, F. W. Richards, stated that the most rigid economy had been observed during the year, and suggested that a special fund should be organized for the future publication of the RECORD OF SCIENCE.

P. S. Ross expressed his deep regret at the stoppage of the Provincial grant to the Society, and urged the advisability of adding to the "Endowment Fund."

The Hon. J. K. Ward wished that special efforts should be made to increase the number of life members, and intimated that he would be pleased to become one.

A letter was read from the Hon. Mr. Justice Wurtele, regretting that owing to his judicial duties, he was unable to be present, but cordially wishing the Society every success.

ELECTION OF OFFICERS.—It was moved by A. Holden, and seconded by J. S. Buchan, Q.C., and carried unanimously, that Lord Strathcona and Mount Royal be the Hon. President of the Society.

The President then vacated the chair, which was tem-

porarily filled by J. H. Joseph, who proposed, seconded by J. S. Buchan, "that the Rev. Dr. Campbell be the President of the Society for the ensuing year." Carried by acclamation.

Messrs. H. McLaren and Jos. Fortier were then appointed scrutineers, and the following gentlemen were nominated and balloted for to act as Vice-Presidents :— Hon. J. K. Ward, Prof. MacBride, Dr. Adams, Prof. Harrington, Hon. Justice Wurtele, C. T. Williams, J. H. Joseph, A. Holden, Dr. T. Wesley Mills.

It was then moved, seconded and carried, that the following gentlemen be elected to their respective positions :— C. S. J. Phillips, Recording Secretary; J. S. Buchan, Corresponding Secretary; F. W. Richards, Treasurer; Alfred Griffin, Curator.

MEMBERS OF COUNCIL —Albert Holden, Chairman; J. A. U. Beaudry, C.E.; E. T. Chambers, Joseph Fortier, N. N. Evans, Edgar Judge, Dr. Girdwood, H. McLaren, John Harper, Geo. Sumner.

EDITING AND EXCHANGE COMMITTEE.—Rev. Robert Campbell, M.A., D.D., Chairman; Frank D. Adams, Ph.D., F.R.S.C.; J. S. Buchan, Q.C.; Prof. J. T. Donald, A. T. Drummond, LL.D.; Prof. E. W. MacBride, M.A.; G. W. Matthew, St. John, N.B.; T. Wesley Mills, M.A., M.D.; J. T. Whiteaves, Ottawa.

LIBRARY COMMITTEE.—E. T. Chambers, Chairman; J. A. U. Beaudry, C.E.; A. E. Norris, Jos. Fortier, Alfred Griffin, G. M. Tod, C. T. Williams.

The meeting then adjourned.

Session 1899–1900.

Report of Council.

The Chairman of Council begs to submit the following report for the year ending May 30th, 1900:

During the year eight meetings of Council have been held, at which reports of the different Committees were received, and all other business of the Society discussed, before being submitted to the regular monthly meetings of the Society.

The regular monthly meetings have been held as usual. The following papers, arranged for by the Lecture Committee, were read at these meetings:

November 27th, 1899.—"The Plants of the Rocky Mountains," by Rev. R. Campbell, D.D.

January 29th, 1900.—"The Physical Features of Cape Cod," by O. E. Leroy, B.A. "The Subdivision of the Carboniferous System in Eastern Canada," by Prof. H. M. Ami, D.Sc., F.G.S.

February 26th.—"Cap-à-l'Aigle Plants not previously reported." Rev. R. Campbell, D.D. "Notes on recent Laboratory Investigations." Prof. J. T. Donald, M.A.

March 26th.—"On Canadian Marine Biological Station." Dr. F. S. Jackson. "The Rock Formation of the Bermudas." J. S. Buchan, Q.C., B.C.L.

April 30th.—"The Rate of Propagation of the Venous Pulse." W. S. Morrow, M.D. "Note on the Glaciation of Mount Orford, P.Q." J. A. Dresser, M.A.

April 30th.—"A Forest Fire at St. John about 2000 years ago," by G. F. Matthews, LL.D., F.R.S.C.

May 28th.—"Oldhamia." G. F. Matthews, LL.D., F.R.S.C. "Some Fungi on Staphylea Trifolia." J. Dearness.

New members elected during the year: 13 ordinary, three associate and two life members.

We regret to have to record the removal by death of the following members:

T. J. Claxton, Sir J. W. Dawson, Walter Drake, E. K. Greene, James Johnston, Hugh McLennan, John Stirling, F. Wolferstan Thomas, J. H. Winn.

The "Somerville Course" of six lectures and the "Half Hour Talks to Young People" on Saturday afternoon of eight lectures, all of which were illustrated by the electric lantern, were most successful, and the Lecture Committee who arranged for these lectures are to be congratulated on the great success of the same.

The Annual Field Day Excursion to Montfort was held on June 10th, and was largely attended, by about 270 members and their friends, and was in every way a success.

An agreement has been made with Mr. Kearney to close up the two windows in the large hall, for the sum of $200, also for the purchase of the mitoyen rights, which are to be paid for at the current value of same. The deeds for this transaction are now being prepared.

A. HOLDEN,
Chairman of Council.

ANNUAL REPORT OF EDITING AND EXCHANGE COMMITTEE.

Your Editing and Exchange Committee beg leave to report that, as instructed a year ago, they have continued the publication of the RECORD OF SCIENCE, three numbers of Volume VIII being since issued, and the fourth number being now in the printer's hands. Interesting and valuable material has been furnished by the correspondents of the Society, residing in other parts of the Dominion, as as well as by the local members; and so far there has been sufficient matter always on hand to make up each

number, as the time for going to press came round. The three numbers issued during the year have received favorable notice from the press and correspondents, and your Committee trust that the journal's reputation has been fairly well sustained in their hands. A large number of valuable scientific periodicals has been received in exchange, in which there is a record of the progress made in science during the past year. These are valuable for reference, and may be consulted by members of the Society who are interested in one or other of the branches of Natural History.

In name and by authority of the Committee.

ROBERT CAMPBELL,
Chairman.

MONTREAL, June 4th, 1900.

MUSEUM REPORT, SESSION 1899–1900.

GENTLEMEN,—I have devoted considerable time and attention to the requirements of the Museum, but the work has been of a limited character, chiefly owing to the want of space.

Acting on the suggestion of my predecessor, I am cleaning and re-arranging the fossil collection in the same manner as was done with the shells.

Some of the large mammals have been cleaned with benzine and freed from moths. I have also treated some of the birds in the same way.

I am glad to say that the donations during the past year have been of a valuable character. Among the most important were a large collection of shells, numbering 2000 specimens; also a number of geological specimens, fossils, eggs, and a girdle from the Sandwich Islands; the whole donated by A. A. McCulloch, Esq.

We are also indebted to Mr. Alfred Joyce for a fine specimen of the Duck Hawk (*falco peregrinus via "anatum"*) shot by one of his employees on the mountain during the month of March. This is the first instance on record of its having been observed in Montreal.

A very fine white seal was presented by Mrs. W. Walker, and a number of plants by the Rev. R. Campbell, D.D.

The attendance at the Museum was nearly double that of last year, probably owing to the free admission every day.

The Saturday afternoon lectures were well attended, the electric lantern adding considerably to the interest. Many of the audience also visited the Museum.

When time will permit, I would suggest that a list of our duplicates be printed in the RECORD OF SCIENCE. This would be the means of securing by exchange many specimens of which we are in need.

The Saturday afternoon excursions inaugurated by the Field Work Committee should be the means of adding many specimens to our "Local Collection."

In conclusion, I would again call your attention to the want of space, a fact that prevents us from displaying many hundreds of specimens now unavoidably stowed away.

Respectfully submitted,

ALFRED GRIFFIN,
Curator.

REPORT OF THE LIBRARIAN.

It gives me great pleasure to be able at last to report that a catalogue of the books in the cases in the Library, with the exception of those in the French and German languages, has been completed and the whole re-arranged.

All the works on the shelves are represented by cards, which will be arranged in proper cases according to subjects. The number of books catalogued is 2428. Many of these were presented by their authors to the Society, but by far the greater number have been received as exchanges for the CANADIAN NATURALIST and for the CANADIAN RECORD OF SCIENCE. Other valuable works have been presented by the U. S. Geological Survey, the Canadian Geological Survey, and the Smithsonian Institution.

Besides the books in the Library, some 350 volumes have had to be placed in the committee room on the opposite side of the hall. These cannot be catalogued until some arrangements have been made for providing proper accommodation for them and for books which are continually being received, as well as for the large number of volumes awaiting binding. This want of space will, I trust, be taken into serious consideration by the House Committee.

As regards the binding, does it not seem a pity that the latest works of scientific interest should be really out of reach of members while the matter is fresh and of the greatest use? Above 300 volumes have already been made up, and many more will be ready in a very short time. It is therefore hoped that the Council will see the necessity of furthering the interests of the Society by making a liberal grant for binding 350 volumes.

In going over the contents of the Library I find that the Society is in possession of several very old and valuable works. Among these are the following:

1. Historia Plantarum. 3 vols. Joanni Raio. 1686.
2. History of Four-footed Beasts and Serpents, collected out of the writings of Conradus Gesner and others by Edward Topsel. Many curious engravings. 1608.
3. Historia Muscorum. J. J. Dillenii. 1811. With copper-plate engravings.

4. Harmonicon Cœleste. An Absolute and entire piece of Astronomie. By Vincent Wing. London, 1651.
5. Les Reports des divers special cases argue & adjude en le Court del Bank le Roy. Black letter. 1683.
6. The Herball or Generall Historie of Plantes gathered by John Gerarde. Enlarged and Amended by Thos. Johnson. London, 1636.
7. Hakluyt's Voyages (great part in black letter). London, 1589.
8. Biblia Sacra. A. Theodore Beza. Amstelœdami, 1551.
9. Italian Grammar. 1639.
10. Ovid. Bound in wooden boards. 1531.

Many of these are in poor condition, and it would be to the credit of the society if they could be put in a better state.

I have to acknowledge the receipt of the following donations:

From the late Walter Drake, Esq.:
Pyrenomycetes, by Ellis and Everhart.
Lichenology.
Mosses, by Lesquereux & James.

From Mrs. Griffin.—Wood's British Song-Birds.

From the Leigh Baron Trust.—Biological Experimentation. Dr. Richardson.

From Dr. H. Ami, of Ottawa.—18 pamphlets on scientific subjects, by the donor.

I cannot close this report without acknowledging the great help I have received from Mr. Griffin, who has spent so many hours with me in the Library, and without whose help the work of arranging and cataloguing the Society's works could not have been so nearly completed.

Respectfully submitted,

E. T. CHAMBERS,
Hon. Librarian.

NATURAL HISTORY SOCIETY OF MONTREAL

IN ACCOUNT WITH

F. W. RICHARDS, *Hon. Treas.*

STATEMENT.

To cash on hand June 1st, 1899			$162 83
" Receipts:—			
Rents	$803 50		
Members' Subscriptions	630 00		
Field Day Surplus	53 59		
Donations	27 75		
*Entrance Fees Museum	13 30		
RECORD OF SCIENCE	6 65		
Sale of 2 Boxes	50		
			1535 29
By Disbursements:—			
A. Griffin, Salary	$552 00		
RECORD OF SCIENCE	210 39		
Sundry Expenses	197 92		
Lighting	137 00		
Insurance 3 years	127 50		
Fuel	111 41		
Repairs	95 51		
Printing	72 79		
Lecture	57 50		
†Taxes	49 02		
Commissions on Collections	46 37		
Museum	24 20		
Library	17 85		
			$1699 46
" Interest on Overdraft			41 88
" Bank Overdraft 1st June, 1899			492 60
" Cash on hand			15 68
To Bank Overdraft 31st May, 1900		551 50	
		$2249 62	$2249 62

*Museum open free after Aug. 1st, 1899.

†Included in this amount is a special assessment $14.10 for opening Inspector Street

CASH ACCOUNT.

To Balance on hand June 1st, 1899	$ 162 83	
" Receipts as per Cash Book	1535 29	
" Loans " Bank "	725 30	
By Deposits " " "		666 40
*" Interest " " "		41 88
" Disbursements as per Cash Book		1699 46
" Cash on hand		15 68
	$2423 42	$2423 42

BANK ACCOUNT.

Due Bank 1st June, 1899		492 60
" " New Loans		725 30
Paid " on account Loans	666 40	
Due " 31st May, 1900	551 50	
	$1217 90	$1217 90

Montreal, May 31st, 1900.

Audited and found correct. JOSEPH FORTIER.
C. T. WILLIAMS.

*$15.68 of this was paid on last year's loans.

DUCK HAWK ON MOUNT ROYAL.

Among the many interesting donations to the Natural History Society's Museum during the past year one of the most unique and rare was a a fine specimen of the Duck Hawk (*Falco Peregrinus*, variety *anatum*), presented by Mr. Alfred Joyce, of Montreal. It was shot during the month of March by one of his employees on Mount Royal, and is the first authenticated instance on record of its having been observed in the vicinity of Montreal.

E. D. Wintle in his " Birds of Montreal " refers to it as follows :—" Summer resident," scarce. While out black duck shooting in the first week of October, some years ago on Lake St. Peter, a duck hawk swooped down on the live decoy ducks, breaking the wing bone of one of them, but the ducks evidently saw the hawk coming, as suddenly, uttering loud quacks of alarm, they dived under the water

just in time to save themselves from the hawk, which passed so quickly over them that I could not get a shot at this terror of the ducks. The late Mr. Caulfield received a beautiful pair of these hawks to stuff for the Museum of the Natural History Society of Montreal, from Mr. N. C. Fisk, of Abbottsford, which were shot May 7, 1890, on Yamaska Mountain, at Abbottsford, about 40 miles east of Montreal. Mr. Fisk said this pair of duck hawks had a nest on the western side of the mountain, and he has observed this species there every year for forty years past.

He took two eggs of the duck hawk in April, 1891, there, from under a rocky ledge; no material was used for the nest, only a slight hollow scratched out by the hawks under a shelving rock. These eggs were presented to the Museum of the Natural History Society of Montreal by Mr. Fisk, and his son kindly gave me a fine female specimen of the duck hawk which he shot about April 18, 1892, on Yamaska Mountain, and it is now in my collection of birds' skins; so that it appears the locality is a very attractive one for this species for a breeding-place, because when a pair of these hawks are shot there another pair takes their place. Mr. Fisk wrote to me, under date of May 4, 1893, that the hawks were there and had been for some time past, and that he heard them "squeal" to-night for the first time; and writing again, under date of June 10, 1893, he said that his son had shot one of the hawks, but could not obtain the other one. He kindly sent me the one shot, which was a beautiful male specimen, but, unfortunately, by the time it reached me it was too much decomposed to have the skin preserved for my collection.

The specimen above referred to, presented by Mr. Joyce, has been cleverly mounted by A. B. Dumouchel, taxidermist, of this city, and has been placed on view in the Society's collection.

ALFRED GRIFFIN,
Curator.

List of the Members of the Natural History Society of Montreal.

LIFE MEMBERS.

Burland, J. H.	Molson, John
Claxton, F. J.	Molson, J. T.
Drummond, Hon. G. A.	Molson, J. W.
Ferrier, J.	McCulloch, F.
Finley, S.	McFarlane, T.
Hingston, Sir W. H.	McGibbon, A.
Hodgson, Jonathan.	Nivin, W.
Hague, Geo.	Sumner, Geo.
Iles, Geo.	Sutherland, L.
Joseph, J. H.	Watt, D. A. P.
Latour, Major L. A. H.	Watson, Hugh.

HONORARY MEMBERS.

Baldwin, Bishop, Rt. Rev.....London, Ont.
Beaubien, Hon. Louis .....Montreal, P.Q.
Hall, Prof. J.....Albany, N.Y.
Lefroy, General J. H.....London, Eng.
Montgomery, T.....Toronto, Ont.
Rae, D.....London, Eng.
Rogers, C.....London, Eng.
Selwyn, D. A., R.C.....Ottawa, Ont.
Whiteaves, J. F.....Ottawa, Ont.

CORRESPONDING MEMBERS.

Brown, John.....Hamilton, P.O.
Bailey, L. W.....Fredericton, N.B.
Baylis, Rev. J. G.....Longueuil, P.Q.
Campbell, Dr. A.....
Hubbard, O. P.....Hanover, N.S.
Jowett, A. A.....Sheffield, Eng.
Laberge, C.....St. Johns, P.Q.
Langevin, J.....Rimouski, P.Q.
Latour, Dr. C. H.....Boucherville, P.Q.
Lavallée, Rev. M. C.....St. Vincent de Paul.
Leacroft, J. W.....Quebec.
Lemoine, J. M.....Quebec.
Lee, Dr. J. C.....London, Ont.
Macoun, Prof. J.....Ottawa, Ont.

Marsh, Prof. J. W.....Forest Grove, Oregon, U.S.
Matthew, G. F.....St. John, N.B.
Mackay, A. H.....Pictou, N.S.
McDougall, P. L.....Toronto, Ont.
McCantee, Dr. T. B.....Boston, Mass.
Macfarlane, T.....Ottawa, Ont.
Nelson, Dr. Wolfred.....
Newcombe, Dr. W.....Troy, N.Y.
Niles, B. F.....Washington, D.C.
Osler, Dr. C. B.....Philadelphia. Pa.
Pilote, Rev. F.....St. Anne de la Pocatière, P.Q.
Packard, A. S.....Providence, R.I.
Robinson, Rev. P.....Abbotsford, P.Q.
Rose, H.....Granby, P.Q.
Sailsbury, D. J. W.....New York.
Saunders, W.....London, Ont.
Sicotte, Judge.....St. Hyacinthe, P.Q.
Spencer, J.....Pointe Claire, P.Q.
Taché, J. C.....Quebec, P.Q.
Thieleke, H.....Quebec, P.Q.
Turcot, Dr. M.....St. Hyacinthe, P.Q.
Westwood, Prof. J. O.....Oxford, Eng.
Winslow, Dr. W. C.....Boston, Mass.
Wurtele, Rev. L.....Acton Vale, Eng.
Woodward, A. Smith.....London, Eng.

ORDINARY MEMBERS.

Alexander, C.
Allan, Andrew.
Adams, Prof. F. D.
Adami, Dr. J. G.
Beattie, John.
Brainerd, T. C.
Brown, J. Stevenson.
Bemrose, Jos.
Beaudry, J. A. U., C.E.
Bond, E. L.
Browne, Dr. A. A.
Botterell, E. H.
Birkett, Dr. H. S.
Baby, Hon. Mr. Justice.
Boulter, G.
Buchan, J. S.
Brodie, A.
Bovey, Prof. H. J.
Baker, Dr. M. C.
Byarelle, Aug.
Campbell, Rev. R.
Chambers, E. T.
Costigan, W. T.
Craik, Dr. R.
Cassils, C.
Cameron, Dr. J. C.
Cox, Prof. John.
Cushing, H. B.
Cayford, James.
Campbell, Dr. G. G.
Coristine, James.
Drysdale, W.
Donald, Prof. J. T.
Diverall, G. J.

Duff, J. M. M.
Deeks, Dr. W. E.
Drummond, G. E.
Dougall, J. R.
Dunlop, G. C.
Dumouchel, A. B.
Duckett, Oswald H.
Ewing, A. S.
Ewing, S. H.
Ewing, S. H.
Evans, N. N.
Fortier, Jos.
Fyshe, Thos.
Fair, John.
Gardner, James.
Garth, C.
Girdwood, Dr. G. P.
Goode, J. B.
Graham, Hugh.
Gault, A. F.
Greene, G. A.
Gurd, C.
Gibb, Lachlan.
Griffin, Alfred.
Gascoigne, Frank.
Harrington, Dr. B. J.
Henshaw, F. W.
Holden, Albert.
Harvie, R.
Harper, John.
Hodgson, T. E.
Heine, Rev. G. C.
Hooper, Angus W.
Hervieux, Madam.
Hastings, W. A.
Judge, Edgar.
Joyce, Alfred.
Kinloch, W. G.
Lyman, H. H.
Lovejoy, Dr. G. W.
Laing, Peter.
Leroy, O. S., B.A.
Lyman, A. C.
Larose, Ludger.
Low, J.
Laberge, Dr. Louis.
Mathewson, J. A.
Morrice, D.
Mills, Prof. Wesley.
Morgan, Jas.
Morrice, W. J.
Marling, J. W.
Molson, Mrs. J. H. R.
Macfarlane, A. B.
McCallum, Dr.
McDonald, Sir W. C.
McEachran, Dr. D.
McKenzie, H.
McGregor, Jas.
McLaren, H.
MacBride, Prof. E. W.
McLachlan, R. W.
McLean, Lt.-Col. J. B.
Norris, A. E.
Oughtred, A. R.
Penhallow, Prof. D. P.
Prowse, G. R.
Phillips, C. S. J.
Paton, Hugh.
Paton, Jas.
Prefontaine, Mayor.
Picken, J. B.
Phillips, E. S.
Roddick, Dr. T.
Ruttan, Dr. R. F.
Robertson, Alex.
Richards, F. W.
Rolland, Hon. J. D.
Robertson, David.
Ross, Capt. W.
Rexford, Rev. E. I.
Ross, P. S.
Roy, W. Ormiston.
Ross, D. W.
Shearer, Jas.
Silverman, S.
Strathcona, Lord.
Slessor, J.

Stirling, Dr. J. W.
Small, E. A.
Stewart, Dr. J.
Scott, W. A.
Shepherd, Dr. F. J.
Springle, Dr. J. A.
Smith, R. Wilson.
Thomas, H. W.
Thibodeau, A. A.
Tiffin, H. J.
Ussher, C. E. E.
Van Horne, Sir W. C.
Vasey, T. E.
Williamson, J.
White, R.
Wurtele, Hon. Mr. Justice.
Ward, Hon. J. K.
Williams, J. B.
Williams, C. T.
Yates, Dr. H. B.

ASSOCIATE MEMBERS.

Austin, Mrs. H. H.
Bickley, Miss.
Binmore, Miss L. J.
Corley, Miss M.
Cameron, Miss.
Cairnie, Miss J.
Dunlop, G. A.
Drummond, Mrs. A. P.
Davis, M. Waring.
Dresser, Prof. J. A.
Emberson, F. C.
Fisher, Arthur.
Fairley, Miss.
Hausen. J. F.
Holden, A. E.
Hamilton, Mrs. S.
Iles, Miss G.
Joseph, Carey J.
Laing, Miss.
Leclair, J. H.
Moore, G.
McBratney, Miss I. G.
O'Keeffe, Miss Howard.
Phillips, Miss.
Ryan, Mrs. P.
Sonne, C. N.
Stevenson, Dr. G. H. A.
Sinclair, Miss L. A.
Tod, G. M.
Vennor, H. E.

ABSTRACT FOR THE MONTH OF JANUARY, 1900.

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

DAY	THERMOMETER. † Mean.	Max.	Min.	Range.	*BAROMETER. † Mean.	Max.	Min.	Range.	‡Mean relative humidity.	WIND. General direction.	Mean velocity in miles per hour	Per cent. possible Sunshine.	Rainfall in inches.	Snowfall in inches.	Rain and snow melted.	DAY.
1	1 9	6.8	—3.2	10 0	29.69	29.85	29.55	.30	95	N.	6.9	00	....	0.2	0.02	1
2	7.0	12.0	2.8	9.2	29.56	29.73	29.49	.24	85	S.W.	12.5	57	....	0.2	0.02	2
3	4 9	8.8	—0.2	9.0	30 07	30.34	29.74	.60	85	S.W.	16.2	80	....	....	....	3
4	14.5	22.8	4.8	18.0	30 38	30 46	30.34	.12	89	S.	10.7	00	....	0.1	0.01	4
5	31.0	36.7	21.4	15.3	30.15	30.30	30.09	.21	77	S.W.	21.8	03	....	....	..	5
6	23.1	34.8	18 5	16.3	30.36	30.44	30.15	.29	80	S.W.	15.1	85	....	....	....	6
SUNDAY. 7	29.7	33.2	19.8	19 4	29.99	30.39	29.67	.72	87	S.E.	22.1	00	....	....	....	7.....SUNDAY
8	17.2	39.8	4.0	35.8	30.23	30.57	29.67	.90	80	W.	18.2	82	....	....	....	8
9	12.3	20.7	3.0	17.7	30.34	30.58	29 95	.63	79	E.	9.8	33	....	....	....	9
10	19 8	36.2	2.8	33.4	29 92	30.30	29.68	.62	84	S.W.	22.6	51	0.01	2 0	0.21	10
11	1.6	10.5	—2.8	13.3	30 20	30.41	29.81	.60	92	N.	11.0	62	....	6.0	0.70	11
12	17.0	21 5	10.5	11.0	29.71	29 91	29.59	.32	93	S.W.	9.1	16	....	4.5	0.60	12
13	9.4	16 0	7.0	9.0	30.09	30.15	29.92	.23	94	S.	0.4	43	...	0.0	0.00	13
SUNDAY.....14	14.5	20.0	9.5	10.5	30.00	30.09	29 92	.17	94	N.	3.0	21	....	0.8	0.08	14.....SUNDAY
15	21.9	26.2	8.8	17.4	30.24	30.32	30.06	.26	94	S.	3.9	00	....	....	....	15
16	24.0	30.5	18.0	12.5	30.11	30.34	30.04	.30	87	S.W.	11.1	51	....	1.2	0.12	16
17	—0.7	17.7	—4.8	22.5	30.63	30.73	30.35	.38	92	N.	14.1	70	....	....	....	17
18	14.8	26.2	—4.0	30.2	30.29	30.58	30.15	.43	98	N.E.	5.3	00	....	0.8	0.08	18
19	34.9	39.2	24.2	15.0	29.94	30.13	29.86	.27	98	S.W.	22.0	00	0.00	....	0.00	19
20	36.0	38.7	34.0	4.7	29.49	29.86	29.26	.60	99	N.W.	14.4	00	1.16	....	1.16	20
SUNDAY..... 21	7.8	33.5	—1.5	35.0	29.95	30 12	29.40	.72	84	W.	14.6	95	....	....	....	21..... .SUNDAY
22	31.1	38.5	12.5	26 0	29 96	30.01	29 86	.15	85	S.W.	18.1	33	....	....	....	22
23	28.5	42.0	2.3	39.7	29.81	30.22	29.59	.63	71	S.W.	26.8	32	0.00	....	0.00	23
24	— 2.1	5.5	—7.8	13.3	30.31	30.48	30.01	.47	85	N.	15.0	24	....	....	....	24
25	30.3	33.8	5.5	28.3	29.64	29 99	29.41	.58	90	S.E.	17.9	00	0.29	1.3	0.42	25
26	7.5	31.2	—1 5	32.7	29.40	29.47	29.34	.13	91	S.W.	19.7	00	..	17.3	1.73	26
27	3.1	8.8	—2.0	10.8	29.91	30.17	29.48	.69	84	W.	25.4	86	....	0.0	0.00	27
SUNDAY.....28	21 3	32.0	4.5	27.5	30.05	30 16	29.91	.25	89	S.E.	12.9	00	....	0.2	0.02	28.....SUNDAY
29	15 3	32.8	7.8	25.0	29.72	29.91	29.60	31	86	S.W.	22.0	00	....	1.9	0.19	29
30	13.3	18 3	5.6	12.7	29.70	29 75	29.62	.13	81	S.	11.3	15	...	0.0	0.00	30
31	13.7	20.5	3.5	17.0	29.60	29 67	29.50	.17	73	S.W.	11.0	00	....	0 1	0.01	31
Means.....	16.28	25.85	6.55	19 29	29 983	30.175	29 775	.401	87.4	S. 47.5° W.	14 36	30.2	1.46	36.6	5 37	.... Sums.
26 Years means or and including his month	12 30	20.72	4.39	16.32	30.053	..	.....	.331	82.3	....	s 16 57	¶34.97	0.861	30.14	3.738	26 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	908	251	316	1454	978	4399	1480	500	
Duration in hrs..	88	28	26	93	80	231	83	55	60
Mean velocity....	10.3	9.0	12 2	15.6	12.2	19.0	17.8	16.4	

Greatest mileage in one hour was 36, on the 21st and 23rd

Greatest velocity in gusts, 38 miles per hour on the 25th.

Resultant mileage, 5,000.

Resultant direction, S. 47 5° W.

Total mileage, 10,680

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

† Mean of bi-hourly readings taken from self recording instruments.

‡ Humidity relative; mean from observations at 8, 15, and 20 hours.

¶ 19 years only. s 14 years only.

The greatest heat was 42°.0 on the 23rd: the greatest cold was −7°.8 on the 24th, giving a range of temperature of 49.8 degrees.

Warmest day was the 20th. Coldest day was the 24th. Highest barometer reading was 30.73 on the 17th. Lowest barometer was 29.26 on the 20th, giving a range of 1.47 inches.

Minimum relative humidity observed was 64, on the 31st.

Rain fell on 5 days.

Snow fell on 17 days.

Rain or snow fell on 20 days.

Lunar halo on 9th.

Lunar coronas on the 6th, 9th, 13th, 15th, 16th and 17th.

Fog on 4 days.

ABSTRACT FOR THE MONTH OF FEBRUARY, 1900.

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

DAY	THERMOMETER. † Mean.	Max.	Min.	Range.	*BAROMETER. † Mean.	Max.	Min.	Range.	‡Mean relative humidity.	*a* WIND. General direction.	Mean velocity in miles per hour	Per cent. possible Sunshine.	Rainfall in inches.	Snowfall in inches.	Rain and snow melted.	DAY.
1	—4.5	3.5	—9.2	12.7	29.60	29.86	29.43	.43	84	S.W.	29.4	75	....	....	....	1
2	—3.8	2.5	—11.2	13.7	29.91	29.96	29.86	.10	90	S.W.	7.9	83	....	....	....	2
3	11.0	18.5	2.0	16.5	30.00	30.14	29.88	.26	80	S.W.	14.8	61	....	0.2	0.02	3
SUNDAY..... 4	15.7	19.0	9.5	9.5	29.95	30.14	29.72	.42	94	E.	12.6	69	....	6.5	0.68	4..... .SUNDAY
5	17.3	22.2	10.0	12.2	29.85	30.04	29.72	.32	83	S.W.	21.8	00	....	0.0	0.00	5
6	12.5	15.0	7.0	8.0	30.02	30.18	29.89	.29	96	S.	6.1	01	....	1.9	0.12	6
7	0.2	14.8	1.8	13.0	30.31	30.36	30.18	.18	93	N.E.	5.3	48	...	0.1	0.01	7
8	23.5	38.8	10.0	28.8	30.08	30.30	29.87	.43	93	N.E.	10.7	00	0.32	0.0	0.32	8
9	33.5	40.8	24.5	16.3	30.07	30.43	29.74	.69	85	S.	28.2	36	0.54	....	0.54	9
10	22.1	26.0	19.0	7.0	30.45	30.52	30.34	.18	77	W.	8.2	80	....	....	....	10
SUNDAY.....11	23.1	31.2	14.5	16.7	30.35	30.34	30.22	.12	86	N.E.	5.3	81	....	....	....	11.....SUNDAY
12	31.4	39.0	20.3	18.7	30.24	30.30	30.12	.18	83	S.E.	8.2	57	0.07	....	0.07	12
13	37.4	44.2	28.7	15.5	29.54	30.12	29.24	.88	92	S.W.	15.9	00	2.05	...	2.05	13
14	19.2	28.7	15.2	13.5	29.94	30.06	29.51	.55	77	S.W.	35.7	99	....	....	...	14
15	17.8	21.2	14.5	6.7	29.92	30.05	29.79	.26	88	S.W.	19.8	09	....	0.9	0.09	15
16	13.9	17.8	10.0	7.8	30.00	30.09	29.85	.24	84	S.W.	25.3	96	....	....	....	16
17	13.0	18.2	7.8	10.4	30.06	30.12	29.95	.17	85	N.E.	3.9	79	....	....	....	17
SUNDAY.....18	13.8	19.6	9.6	10.0	29.73	29.95	29.62	.33	82	N.	18.3	00	....	0.1	0.01	18..... .SUNDAY
19	16.1	21.2	12.0	9.2	29.80	30.02	29.64	.38	86	W.	24.2	45	....	2.0	0.20	19
20	19.2	24.0	13.0	11.0	30.23	30.31	30.02	.29	84	S.W.	21.5	99	....	....	....	20
21	23.0	28.5	17.0	11.5	30.23	30.31	30.15	.16	85	N.E.	11.5	28	....	...	....	21
22	25.1	29.2	22.7	6.5	29.77	30.15	29.43	.72	96	N.E.	29.7	00	....	3.8	0.38	22
23	25.3	29.6	20.5	9.1	29.39	29.51	29.33	.18	83	S.W.	19.1	15	....	5.0	0.67	23
24	32.8	38.8	28.2	10.6	29.44	29.60	29.18	.42	89	S.	18.4	00	0.00	0.0	0.00	24
SUNDAY.....25	10.5	35.2	—5.0	40.2	29.05	29.82	28.92	.30	94	S.W.	40.1	00	....	9.4	1.03	25.....SUNDAY
26	—9.5	—5.0	—11.5	6.5	29.80	30.23	29.22	1.01	86	S.W.	31.8	64	....	0.3	0.03	26
27	—4.3	4.5	—13.5	18.0	30.54	30.70	30.23	.47	77	S.	21.8	99	....	....	....	27
28	6.5	16.5	—1.8	18.3	30.55	30.68	30.41	.27	93	S.E.	13.6	00	....	1.3	0.13	28
Means.....	16.03	22.99	9.49	13.50	29.958	30.132	29.767	.365	86.6	S. 44¾° W.	18.19	43.7	2.98	31.5	6.35	.....Sums.
26 Years means for and including this month	15.67	23.61	7.48	16.13	30.024	.....	.....	.311	80.5	....	S 18 17	¶42.0	.838	23.13	3.112	26 years means for and including this month.

a ANALYSIS OF WIND RECORD.

Direction.....	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	CALM.
Miles	1338	715	645	576	1259	6402	1149	143	
Duration in hrs..	106	38	74	41	76	240	61	7	29
Mean velocity....	12.6	18.8	8.7	14.1	16.5	26.7	18.8	20.4	

Resultant mileage, 5,950.

Greatest mileage in one hour was 62, on the 13th.

Greatest velocity in gusts, 72 miles per hour on the 13th.

Resultant direction, S. 44½° W.

Total mileage, 12,227.

a Wind velocities from the 10th to the 20th are from the City Hall, and are corrected to Mountain Anemometer.

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

† Mean of bi-hourly readings taken from self recording instruments.

‡ Mean from observations at 8, 15, and 20 hours. Percentage of Saturation.

¶ 19 years only. *s* 14 years only.

The greatest heat was 44.2 on the 13th: the greatest cold was —13.5 on the 27th, giving a range of temperature of 57.7 degrees.

Warmest day was the 13th. Coldest day was the 26th. Highest barometer reading was 30.70 on the 27th. Lowest barometer was 28.92 on the 25th, giving a range of 1.78 inches.

Minimum relative humidity observed was 54, on the 14th.

Rain fell on 5 days.

Snow fell on 15 days.

Rain or snow fell on 18 days.

Hoar frost on 3 days.

Lunar halos, on 11th, 17th.

Lunar coronas on the 6th, 7th, 10th, 11th.

Fog on 5 days.

ABSTRACT FOR THE MONTH OF MARCH, 1900.

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

DAY	THERMOMETER. † Mean.	Max.	Min.	Range.	*BAROMETER. † Mean.	Max.	Min.	Range.	‡Mean relative humidity.	α WIND. General direction.	Mean velocity in miles per hour	Per cent. possible Sunshine.	Rainfall in inches.	Snowfall in inches.	Rain and snow melted.	DAY.
1	15.0	19.8	10.0	9.8	29.97	30 41	29.42	.99	98	E.	35.5	00	....	18.2	1.82	1
2	22.5	26.4	20.0	6.4	29.34	29.53	29.23	.30	96	N.W.	27.1	00	....	3.6	0.36	2
3	18.4	22.8	15.0	7.8	29.92	30.17	29.53	.64	87	N.W.	26.6	68	....	0.3	0.03	3
SUNDAY..... 4	12.2	20.5	3.0	17.5	30.23	30.35	30.10	.25	80	S.	13.2	18	....	1.5	0.15	4.....SUNDAY
5	1.0	5.2	—4.0	9.2	30.58	30.67	30.35	.32	82	E.	11.2	88	....	....	....	5
6	13.6	35.2	—3.3	38.5	30.06	30.64	29.60	1.04	96	S.E.	24.9	91	0.00	6.0	1.10	6
7	21.6	35.2	16.0	19.2	30.05	30.44	29.64	.80	81	S.W.	41.8	93	....	0.1	0.01	7
8	20.2	26.8	12.1	14.7	30.48	30.57	30.40	.17	82	S.W.	16.3	47	....	....	....	8
9	27.6	36.7	15.5	21.2	30.07	30.40	29.87	.53	82	S.	16.2	00	....	0.0	0.00	9
10	23.3	34.0	9.2	24.8	29.83	29.97	29.75	.22	85	W.	16.1	00	....	5.0	0.50	10
SUNDAY.....11	2.7	9.3	—4.0	13.3	30.07	30.15	29.97	.18	75	N.W.	21.6	97	....	....	....	11.....SUNDAY
12	1.2	7.5	—5.8	13.3	30.23	30.30	30.15	.15	79	W.	20.3	99	....	....	....	12
13	11.2	25.5	—2.2	27.7	29.97	30.18	29.87	.31	81	S.E.	16.6	05	....	0.0	0.00	13
14	16.0	22.8	5.5	17.3	29.95	30.05	29.89	.16	90	S.W.	25.7	50	....	0.2	0.02	14
15	4.5	9.2	—1.0	10.2	30.14	30.21	30.05	.16	84	W.	13.6	00	....	..	....	15
16	12.7	21 0	4.5	16.5	29.68	30.11	29.47	.64	88	S.W.	21.0	11	....	6.8	0.75	16
17	11.6	17.8	7.0	10.8	29.92	30.05	29.72	.33	82	S.W.	26.0	62	....	0.2	0.02	17
SUNDAY..... 18	9.8	15.7	0.5	15.2	30.07	30.18	29.98	.20	89	S.	18.7	91	....	...	....	18..... .SUNDAY
19	29.8	39.2	16.0	23.2	29.67	29.98	29.39	.59	93	S.	18.9	22	0.10	3.8	0.44	19
20	32.9	38.8	26.0	12.8	29.58	29.69	29.38	.31	82	S.W.	31.0	72	0.03	0.0	0.03	20
21	22.6	25.3	16.3	9.0	29.90	29.99	29.70	.29	81	S.W.	26.7	92	....	0.1	0.01	21
22	28.3	35.5	18.0	17.5	29.91	30.04	29.77	.27	89	S.	19.7	36	....	0.3	0.03	22
23	31.7	38.0	19.7	18.3	29.82	29.99	29.73	.26	94	S.W.	23.3	94	....	0.2	0.02	23
24	13.6	19.7	6.5	13.2	30.03	30.10	29.99	.11	90	S.W.	21.6	96	....	....	....	24
SUNDAY.....25	20.0	26.8	9.8	17.0	30.02	30.12	29.94	.18	97	S.W.	17.2	95	....	....	....	25.....SUNDAY
26	27.1	33.7	15.3	18.4	29.75	29.94	29.64	.30	95	S.E.	12.5	62	....	0.0	0.00	26
27	32.3	36.7	29.3	7.4	29.66	29.73	29.58	.15	97	S.W.	13.1	45	....	0.1	0.01	27
28	32.4	38.5	26.1	12.4	29.81	29.85	29.73	.12	73	W.	20.4	39	....	0.0	0.00	28
29	32.6	38.2	25.8	12.4	29.93	30.01	29.85	.16	96	W.	21.0	97	....	....	....	29
30	30.3	35.4	25.5	9.9	30.03	30.07	29 99	.08	92	N.W.	10.0	86	....	...	....	30
31	30.8	36.3	23.5	12.8	29.91	30.00	29.85	.15	92	N.W.	18.6	85	.. .	....	....	31
Means.....	19.66	26.89	8.25	15.41	29.954	30.13	29 79	.334	87.4	S. 47.5° W.	20.82	50.6	0.13	46.4	5.30	.....Sums.
26 Years means for and including this month	24.31	31.46	16.76	14.59	29.975	.....	.....	.272	77.06	....	§ 13 18	¶ 47.38	1.103	24.37	3.651	26 Years means for and including this month.

α ANALYSIS OF WIND RECORD.

Direction.....	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	CALM.
Miles	337	842	697	1593	1290	7048	2005	1699	
Duration in hrs..	36	38	40	77	86	274	112	81	
Mean velocity....	9.36	22.16	17.42	20.69	15 00	25.72	17.90	20.98	

Greatest mileage in one hour was 54, on the 1st.

Greatest velocity in gusts, 56 miles per hour on the 7th.

Resultant mileage, 7,795.

Resultant direction, S. 47.5° W.

Total mileage, 15,511

Average velocity, 20.85 miles per hour.

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

† Mean of bi-hourly readings taken from self recording instruments.

‡ Humidity relative. Mean from observations at 8, 15, and 20 hours.

¶ 19 years only. § 14 years only.

The greatest heat was 39.2 on the 19th: the greatest cold was —5.8 on the 12th, giving a range of temperature of 45.0 degrees.

Warmest day was the 20th. Coldest day was the 5th. Highest barometer reading was 30.67 on the 5th. Lowest barometer was 29.23 on the 2nd, giving a range of 1.44 inches.

Minimum relative humidity observed was 73, on the 28th.

Rain fell on 3 *days.*

Snow fell on 20 days.

Rain or snow fell on 20 days.

An aurora was observed on the 12th.

A lunar halo on 1 night.

Lunar coronas on 2 nights.

Fog on 2 days.

ABSTRACT FOR THE MONTH OF APRIL, 1900.

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

DAY	THERMOMETER. † Mean.	Max.	Min.	Range.	*BAROMETER. † Mean.	Max.	Min.	Range.	‡Mean relative humidity.	a WIND. General direction.	Mean velocity in miles per hour	Per cent. possible Sunshine.	Rainfall in inches.	Snowfall in inches.	Rain and snow melted.	DAY.
SUNDAY..... 1	35.09	40.3	29.4	10.9	29.86	29.90	29.83	.07	84	N.W.	22.4	60	....	....	....	1 .....SUNDAY
2	37.87	42.3	31.6	10.7	29.94	30.00	29.87	.13	96	S.	10.6	36	0.00	....	0.00	2
3	35.85	39.5	33.1	6.4	29.79	29.91	29.73	.18	93	S.W.	11.6	00	0.06	...	0.06	3
4	34.49	38.8	29.5	9.3	29.99	30.14	29.76	.38	90	W.	17.2	48	....	0.2	0.02	4
5	36.90	43.0	30.3	12.7	30.00	30.14	29.83	.31	89	S.W.	29.1	61	0.00	....	0.00	5
6	42.33	47.7	36.4	11.3	29.80	29.85	29.76	.09	77	W.	18.2	87	....	....	....	6
7	40.99	48.9	33.0	15.9	29.68	29.78	29.61	.17	70	N.W.	15.5	90	....	.. .	....	7
SUNDAY..... 8	32.43	37.7	24.5	13.2	29.74	29.84	29.66	.18	89	N.W.	22.0	78	...	....	....	8.....SUNDAY
9	26.03	30.3	21.9	8.4	29.90	30.00	29.85	.15	92	W.	17.2	00	....	0.4	0.04	9
10	30.65	37.6	22.7	14.9	30.12	30.30	29.98	.32	77	S.W.	13.3	28	0.00	0.1	0.01	10
11	40.55	48.5	34.3	14.2	30.33	30.38	30.27	.11	69	S.W.	6.6	85	....	....	....	11
12	37.09	41.1	32.8	8.3	30.17	30.27	30.06	.21	88	E.	9.7	03	0.04	....	0.04	12
13	36.29	41.1	33.8	7.3	29.89	30.06	29.79	.27	96	S.W.	13.5	00	0.16	0.0	0.16	13
14	35.94	40.0	32.5	7.5	29.80	29.94	29.76	.18	90	S.W.	24.7	09	0.06	0.0	0.06	14
SUNDAY.....15	41.62	49.1	33.6	15.5	30.19	30.31	29.94	.37	65	S.W.	19.1	98	....	..	....	15..... .SUNDAY
16	44.20	52.5	35.9	16.6	30.41	30.48	30.31	.17	65	S.	9.2	82	....	....	....	16
17	44.95	57.0	32.5	24.5	30.30	30.42	30.12	.30	78	S.E.	13.4	66	0.02	....	0.02	17
18	54.79	63.7	44.9	18.8	29.85	30.12	29.77	.35	89	S.E.	20.1	18	0.66	.	0.66	18
19	50.37	56.2	44.7	11.5	29.80	29.97	29.72	.25	84	W.	25.3	07	0.07	....	0.07	19
20	52.49	61.3	43.0	18.3	30.13	30.20	29.97	.23	69	S.W.	16.5	96	....	....	.	20
21	61.01	72.7	48.8	23.9	30.04	30.14	29.94	.20	70	S.	14.7	80	....	....	....	21
SUNDAY.....22	53.47	60.8	44.6	16.2	29.94	29.97	29.91	.06	76	S.E.	8.4	00	0 01	....	0.01	22 .....SUNDAY
23	54.06	62.2	43.9	18.3	29.90	29.96	29.86	.10	87	N.E.	8.1	12	0.30	....	0.30	23
24	46.46	54.0	37.8	16.2	30.06	30.15	29.97	.18	55	N	18.0	98	...	....	....	24
25	48.72	59.1	37.9	21.2	30.11	30.18	30.04	.14	42	N.W.	20.0	99	....	....	....	25
26	48.27	56.6	39.8	16.8	29.92	30.07	29.81	.26	46	N.W.	25.4	99	....	...	....	26
27	44.50	49.0	40.0	9.0	29.88	29.92	29.85	.07	63	N.W.	14.9	09	0.00	....	0.00	27
28	47.63	53.1	40.3	12.8	30.03	30.11	29.92	.19	65	N.	11.7	45	0.00	....	0.00	28
SUNDAY.. 29	54.22	66.6	36.2	30.4	29.94	30.11	29.81	.30	61	S.W.	14.0	97	....	....	....	29.....SUNDAY
30	55.15	71.7	40.6	31.1	29.61	29.81	29.40	.41	65	S.W.	24 4	35	0.01	...	0.01	30
Means.....	43.48	50.75	35.68	15.07	29.971	30.081	29 870	.211	76.0	S. 68.5° W.	16.52	51.0	1.39	0.7	1.46	....Sums.
26 Years means for and including this month	47.47	48.95	32.67	16.27	29.964	.....	.....	.201	66.50	....	§16.26	¶52.09	1.623	5.29	2.161	26 Years means for and including this month.

a ANALYSIS OF WIND RECORD.

Direction.....	N.	N.E.	E.	S E.	S.	S.W.	W.	N.W.	CALM.
Miles	907	350	420	1157	510	4324	1307	2362	
Duration in hrs..	73	46	46	81	38	211	78	147	
Mean velocity....	1.24	7.61	9.13	1.43	1.34	2.05	1.75	1.95	

Greatest mileage in one hour was 41, on the 30th.

Greatest velocity in gusts, 48 miles per hour on the 30th.

Resultant mileage, 3,295.

Resultant direction, S. 68.5° W.

Total mileage, 11,897.

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

‡ Humidity relative, saturation being 100. Mean from observations at 8, 15, and 20 hours.

¶ 19 years only. § 14 years only.

The greatest heat was 72.7 on the 21st; the greatest cold was 21.9 on the 9th, giving a range of temperature of 50.8 degrees.

Warmest day was the 21st. Coldest day was the 9th. Highest barometer reading was 30.48 on the 16th. Lowest barometer was 29.40 on the 30th, giving a range of 1.08 inches.

Minimum relative humidity observed was 34, on the 26th.

Rain fell on 15 days.

Snow fell on 5 days.

Rain or snow fell on 17 days.

Lunar halo on the 16th.

Lunar corona on the 9th.

Fog on the 2nd, 3rd, 12th, 16th, 17th, 23rd, and 29th.

ABSTRACT FOR THE MONTH OF MAY, 1900.

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

DAY	THERMOMETER. † Mean.	Max.	Min.	Range.	*BAROMETER. † Mean.	Max.	Min.	Range.	‡Mean relative humidity.	a WIND. General direction.	Mean velocity in miles per hour	Per cent. possible Sunshine.	Rainfall in inches.	Snowfall in inches.	Rain and snow melted.	DAY.
1	40.84	48.7	34.7	14.0	29.81	29.95	29.71	.24	62	W.	15.7	38	....	....	....	1
2	51.42	65.2	34.2	31.0	29.75	29.94	29.61	.33	58	S.E.	20.1	83	....	....	....	2
3	54.02	67.4	41.0	26.4	29.54	29.62	29.44	.18	75	S.W.	19.0	90	0.03	....	0.03	3
4	41.51	51.6	36.7	14.9	29.69	29.77	29.63	.14	61	S.W.	19.6	60	...	0.0	0.00	4
5	40.88	49.0	32.7	16.3	29.86	29.92	29.77	.15	64	S.	19.2	77	....	0.0	0.00	5
SUNDAY..... 6	42.03	53.4	35.0	18.4	29.94	30.15	29.87	.28	61	S.W.	18.8	55	....	...	....	6.....SUNDAY
7	41.39	50.4	31.2	19.2	30.18	30.27	30.10	.17	52	S.W.	15.1	93	....	..	....	7
8	44.27	47.8	36.8	11.0	29.77	30.10	29.55	.55	91	E.	16.0	00	0.59	....	0.59	8
9	38.67	44.2	33.8	10.4	29.76	29.98	29.55	.43	70	N.W.	21.8	14	0.25	....	0.25	9
10	34.54	42.0	28.0	14.0	30.00	30.04	29.96	.08	65	W.	18.9	20	....	0.0	0.00	10
11	41.45	51.2	30.7	20.5	29.97	30.05	29.90	.15	60	W.	11.0	93	....	....	....	11
12	47.24	57.3	34.0	23.3	29.98	30.07	29.91	.16	62	S.	14.9	96	....	....	....	12
SUNDAY.....13	58.24	68.7	50.9	17.8	29.91	29.93	29.87	.06	55	S.W.	16.4	22	....	....	....	13.....SUNDAY
14	59.14	74.1	45.1	29.0	29.75	29.92	29.62	.30	81	S.W.	15.0	41	0.10	....	0.10	14
15	61.71	78.7	51.5	27.2	29.80	30.05	29.64	.41	89	S.W.	23.2	17	0.48	....	0.48	15
16	55.12	63.4	45.3	18.1	30.14	30.18	30.05	.13	72	N.W.	7.9	92	....	.. .	...	16
17	46.62	55 3	43.0	12.3	30.06	30.17	29.90	.27	87	N	16.3	00	0.92	....	0.92	17
18	45.09	48.2	42.2	6.0	29.75	29.90	29.83	.07	92	N.	16.1	00	0.16	....	0.16	18
19	49.56	57.6	42.0	15.6	29.73	29.83	29.68	.15	70	N.	19.6	34	...	....	....	19
SUNDAY.....20	50.00	59.2	41.7	17.5	29.69	29.71	29.66	.05	70	N.	13 7	24	....	....	....	20..... .SUNDAY
21	47.16	53.4	42.7	10.7	29.73	29.79	29.70	.09	90	N.W.	9.7	00	0.26	....	0.26	21
22	54.82	68.8	41.6	27.2	29.80	29.89	29.77	.12	60	W.	19.1	100	0.00	....	0.00	22
23	58.60	69.7	43.1	26.6	29.92	29 99	29.86	.13	60	S.W.	12.2	89	....	....	....	23
24	52.86	73.4	49.6	23.8	29.97	30.03	29.89	.14	65	N.	17.0	78	...	....	....	24
25	61.45	73.2	46.5	26.7	30.15	30.19	30.03	.16	63	S.E.	11.8	95	....	....	..	25
26	60.99	76 1	49.0	27.1	30.13	30.23	30.00	.23	61	S.	15.7	96	....	....	....	26
SUNDAY.....27	64.14	75.8	52.7	23.1	29.98	30.08	29.93	.15	72	N.	17.1	46	....	....	....	27.....SUNDAY
28	57.44	67.3	48.7	18.6	30.22	30.30	30.08	.22	61	N.	18.9	69	....	....	....	28
29	59.29	72.4	44.3	28.1	30.31	30.39	30.24	.15	59	N.	8.0	94	....	...	....	29
30	62.59	76.0	48.0	28.0	30.09	30.24	29.94	.30	74	S.	11.2	60	0.04	....	0.04	30
31	67.89	80.0	60.1	19.9	29.89	29.94	29.84	.10	73	S.W.	16.6	81	0.28	....	0.28	31
Means.....	51.32	61.92	41.83	20.09	29.880	30.020	29 824	.196	68.9	W. 6.5° N.	15.99	54.0	3.11	0.0	3.11	.....Sums.
26 Years means for and including this month	64.66	64.01	45.74	18.28	29.931	.....	.....	.169	66.47	....	§ 14 32	¶51.04	29.16	....	2.969	26 Years means for and including this month.

a ANALYSIS OF WIND RECORD.

Direction.....	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	CALM.
Miles	3124	472	409	1248	902	2853	1808	1082	
Duration in hrs..	193	42	28	84	68	152	105	72	
Mean velocity....	16.19	11.24	14.25	14.86	13.26	18.77	17.22	15.03	

Greatest mileage in one hour was 34 S.W. on the 15th.

Greatest velocity in gusts, 36 S.W. miles per hour on the 14th.

Resultant mileage, 2990.

Resultant direction, W. 6 5° N.

Total mileage, 11,898.

Average velocity 15.99 *m.p.h.*

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

† Mean of bi-hourly readings taken from self-recording instruments.

‡ Humidity relative, saturation being 100. Mean of observations at 8, 15, and 20 hours.

¶ 19 years only. § 14 years only.

The greatest heat was 80.0 on the 31st; the greatest cold was 28.0 on the 10th, giving a range of temperature of 52.0 degrees.

Warmest day was the 31st. Coldest day was the 10th. Highest barometer reading was 30.39 on the 29th. Lowest barometer was 29.44 on the 3rd, giving a range of .95 inches.

Minimum relative humidity observed was 40, on the 4th.

Rain fell on 11 days.

Snow fell on 3 days.

Rain or snow fell on 14 days.

An aurora was observed on the 5th.

Fog on the 3rd.

ABSTRACT FOR THE MONTH OF JUNE, 1900.

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

DAY	THERMOMETER. † Mean.	Max.	Min.	Range.	*BAROMETER. † Mean.	Max.	Min.	Range.	‡Mean relative humidity.	WIND. General direction.	Mean velocity in miles per hour	Per cent. possible Sunshine.	Rainfall in inches.	Snowfall in inches.	Rain and snow melted	DAY.
1	71.12	79 2	60.2	19.0	29.97	30.05	29.90	.15	61	N	9 0	85	0.00	....	0.00	1
2	60.31	67.4	57.6	9.8	29.80	29.94	29.72	.22	92	N.E.	19.0	02	1.96	....	1.96	2
SUNDAY..... 3	59.40	68.0	53.5	14.5	30.04	30.15	29.83	.32	59	N.	20.8	30	....	....	....	3 .....SUNDAY
4	62.73	74.5	49.0	25.5	30.13	30.21	30.04	.17	72	S.	9.2	98	...	....	....	4
5	68.41	76.6	58.0	18.6	30.00	30.04	29.96	.08	74	S.W.	16.9	99	....	....	....	5
6	69.37	81.3	58.0	23.3	29 96	30.05	29.84	.21	70	S.	8.8	92	....	.	....	6
7	67.72	74.5	62.5	12.0	29.74	29.84	29.64	.20	89	S.E.	16.6	00	0.18	..	0.18	7
8	70.82	80.6	65.3	15.3	29.66	29.69	29.64	.05	81	S.	11.5	51	0.00	....	0.00	8
9	62.43	69.8	55.6	14.2	29.87	30.08	29.67	.41	71	W.	12.5	98	....	....	....	9
SUNDAY.....10	59 61	68.4	47.6	20.8	30.04	30.17	29.88	.29	62	S,E.	11.0	99	....	....	....	10.....SUNDAY
11	68.15	79.3	59.9	19.4	29.84	29.88	29.80	.08	74	S.	18.4	46	0.03	....	0.03	11
12	61.57	68.3	54.2	14.1	30.12	30.18	29.88	.30	65	N.W.	11.4	98	....	....	....	12
13	65.02	77.5	50.0	27.5	30.08	30.18	29.96	.22	68	S.E.	12 6	87	....	....	....	13
14	64.71	75.0	54.6	20.4	29.86	29.96	29.81	.15	81	S.	20.6	48	0.49	....	0.49	14
15	63.94	72.7	53.2	19.5	30.02	30.08	29.93	.15	63	S.W.	21.2	99	....	.. .	....	15
16	66.42	76.0	56.3	19.7	29.97	30.02	29.92	.10	68	S.W.	13.0	82	0.01	....	0.01	16
SUNDAY.....17	59.85	67.2	49.4	17.8	30.04	30.07	29.97	.10	65	N.	8.2	99	....	....	....	17..... .SUNDAY
18	62.34	72.0	49.3	22.7	30.12	30.15	30.06	.09	68	N.	14.0	99	....	....		18
19	68.99	78.8	54.8	24.0	30.13	30.19	30.07	.12	60	N	8.6	99	....	....	....	19
20	73.07	83.9	60.0	23.9	29.93	30.07	29 80	.27	58	S.W.	19.6	92	....	....	....	20
21	70.39	80.0	60.0	20.0	29.74	29.81	29.67	.14	68	S.W.	23.5	93	....	....	....	21
22	60.65	67.9	52.6	15.3	29.81	29.91	29.69	.22	82	S.W.	11.1	34	0.09	....	0.09	22
23	62 11	72.0	49.9	22.1	29.93	29.99	29.87	.12	71	S.	11.1	99	...	....	....	23
SUNDAY.....24	69.53	78.4	61.5	16.9	29.74	29.87	29.62	.25	70	S,W.	21.9	46	0.05	....	0.05	24 .....SUNDAY
25	67 97	74.7	63.0	11.7	29.78	29 89	29 62	.27	62	W.	14.7	99	0.05	....	0.05	25
26	63.97	74.0	53.3	20.7	29.80	29.89	29.65	.24	81	S.E.	7.5	31	0.02	...	0.02	26
27	69.13	86.0	56.0	30.0	29.55	29.67	29.48	.19	97	S.W.	19.9	33	1.32	....	1.32	27
28	71.60	77.3	66.0	11.3	29.55	29.60	29.50	.10	68	S.W.	12.2	05	....	....	....	28
29	62 00	74.0	51.0	23.0	29.49	29 59	29.37	.22	76	S.W.	20.2	46	0 04	....	0.04	29
30	51.49	56.6	47.5	9.1	29.60	29.76	29.46	.30	84	S.W.	39 5	00	0.09	....	0.09	30
Means.....	65.16	74.40	55.66	18.74	29.877	29.966	29 775	.191	75.3	S. 48.8° W.	15.49	68.5	4.33	....	4.33	.....Sums.
26 Years means for and including this month	64.90	73.66	56.34	17.55	29.905	.....	.....	.154	70.18	....	§ 13 20	¶54.63	3.587	....	3 587	26 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	1876	376	145	1374	893	5144	835	503	
Duration in hrs..	148	31	16	98	75	244	60	48	
Mean velocity....	12.7	12.1	9.0	14 0	11 9	21.1	13.9	10.5	

Greatest mileage in one hour was 49 from the southwest on the 30th.

Resultant mileage, 4590.

Resultant direction, S. 48.8° W.

Total mileage, 11,156.

Mean velocity—, 15 49 miles per hour.

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

† Mean of bi-hourly readings taken from self-recording instruments.

‡ Humidity relative, saturation being 100. Mean of observations at 8, 15, and 20 hours.

¶ 19 years only. § 14 years only.

The greatest heat was 86.0 on the 27th; the greatest cold was 47.5 on the 30th, giving a range of temperature of 38.5 degrees.

Warmest day was the 20th. Coldest day was the 30th. Highest barometer reading was 30.19 on the 19th. Lowest barometer was 29.37 on the 29th, giving a range of .82 inches.

Minimum relative humidity observed was 44, on the 19th.

Rain fell on 14 days.

Fog on 3 days.